

Performance Maintenance Protocol

ACQUITY UPLC® AutoSampler/IVD
ACQUITY UPLC® Sample Manager
ACQUITY UPLC® I-Class Sample Manager-Fixed Loop
nanoACQUITY UPLC® Sample Manager
µSample Manager-Fixed Loop

Serial Number/ Firmware Version:	F08 4PB 6 69R 1-40-166
Date:	12 Apr 2021
Performer:	WONG LIANG SHENG

Performance maintenance

Goal

This performance maintenance protocol is a guide to performing maintenance tasks on your system. Packaged as part of the performance maintenance kit, it is intended to ensure optimum performance and an uninterrupted period of trouble-free operation.

Schedule

Waters recommends that performance maintenance visits be performed once a year. Systems under heavy use or using aggressive solvents will need more frequent maintenance. For detailed maintenance schedules, refer to the appropriate operator's guide(s) located on the Waters web site. Failure to follow the maintenance schedules as described in the operator's guides may result in unreliable operation and inaccurate laboratory results. For some protocols, optional tests can be performed by Waters field service engineers for added confidence and reliability.

Safety considerations



Caution: Always observe Good Laboratory Practice and, when handling Waters Critical Clean™ parts, refer to the *Controlling Contamination in UPLC/MS and HPLC/MS Systems*, P/N 715001307.



Warning: To prevent personal contamination with biologically hazardous or toxic materials carefully dispose of the replaced component.



Warning: When performing maintenance to components of an ACQUITY UPLC system, remove power to the unit by powering down and disconnecting the power cord.



Warning: Always use proper static protection when handling any printed circuit boards.



Warning: Dispose of components in accordance with local or customer regulations. If the component comes with a Waters Corporation return sheet, follow its instructions.



Warning: Avoid contact with solvents by wearing suitable gloves and safety glasses.



Some protocols may involve removing instrument covers, exposing the performer to high voltages, high currents, and moving parts. This presents risks of electric shock and/or damage to the instrument. To reduce these risks, Waters recommends that these protocols be conducted by certified Waters field service engineers, who have access to the latest information on Waters products. Waters does not advise and is not responsible for an unqualified performer initiating actions that they do not understand. If there is any doubt on the part of the performer, a Waters certified field service engineer should conduct the performance maintenance activity.

Waters Quality Parts

Waters designs and manufactures Waters Quality Parts® to the same strict regulatory standards as your high-performance Waters systems. Waters recommends using Waters Quality Parts for all

maintenance activities. Failure to use Waters Quality Parts may compromise laboratory results and reliability.

Customer education

Waters offers several operation and maintenance courses for ACQUITY® UPLC®, Alliance® HPLC and MS systems as well as courses designed to help you maintain professional competency and further your knowledge in Chromatography, UPLC, Informatics and Mass Spectrometry. For more information on available training courses from [Waters Educational Services](#) please visit the Waters Web site.

Compliance services

Waters Compliance Services help you achieve and maintain the regulatory compliance of your LC and MS instruments and software with a combination of expertise, compliant-ready systems and software, and a portfolio of services to ensure that you have quality data, consistently. To learn more about [Compliance Services](#), please visit the Waters Web site.

General tasks

Use the following guidelines when conducting performance maintenance visits. This information is intended to be a guide only. For example:

- If a particular module has been recently serviced, it may need only testing and replacement of fewer parts.
- Not all procedures apply to all instruments (specify NA in the Comments section if the procedure does not apply).
- If the instrument fails to perform adequately during pre-performance maintenance checks, further service may be required beyond the scope of this protocol. Such service may incur additional parts and labor charges.

The following table lists the general tasks to be performed during a performance maintenance visit. Perform and confirm the steps listed for each procedure and record any comments that you have about the results at the end of each section.

For detailed instructions and a list of the necessary tools, refer to the Operator's Guide located on the Waters website.

Inspect	Maintenance tasks	Post-performance maintenance checks
Firmware version ¹	Sample needle assembly	Initialization diagnostics
Fan	Wash syringes	Calibrations and characterizations
Needle wash system	Sample syringe	Leak tests
Error logs	Injector valve cartridge ³	Reset injection count
Column heater/cooler or column manager ²	Sample loop ³	Create log entry
	Needle wash housing o-ring	
	Tubing & fittings ⁴	
	Chassis air filter	
	Trap valve cartridge ⁵	

- ¹ Firmware upgrades, if required, should be performed by a Waters field service engineer prior to beginning performance maintenance. Firmware upgrades may require re-qualification of the upgraded instrument if it is in a regulated environment.
- ² Inspect the following if applicable: ACQUITY UPLC® High Temperature Column Heater, ACQUITY UPLC® Column Heater/Cooler, ACQUITY UPLC® 30-cm Column Heater/Cooler, ACQUITY UPLC® Column Manager.
- ³ The injector valve cartridge and sample loop are not replaced as part of the μ SM-FL performance maintenance.
- ⁴ Applies to Sample Manager to column (ACQUITY UPLC only); and Sample Manager to BSM (ACQUITY UPLC and I-Class).
- ⁵ nanoACQUITY UPLC System only.

Inspect

Firmware version

Confirm what firmware versions are installed. Update if required.

NOTE: Refer to *Software Downloads* section under the *Services & Support* tab on the *waters.com* home page for the latest firmware and driver pack release notes. These release notes detail software and data system requirements, and installation notes.

From the ACQUITY Console:

1. Click **Sample Manager** in the Systems tree.
2. From the menu bar, click **Configure > View module information**.
3. Check the firmware version and note it on the cover page.

Firmware check complete.

☒ Yes ☐ No ☐ N/A

Comments: no comments

Fan

To inspect the fan:

1. Observe the fan on the rear of the Sample Manager.
2. Ensure that the fan grate is clear of debris and dust. The fan should be blowing outward.
3. Clean if necessary.

Fan inspection complete.

☒ Yes ☐ No ☐ N/A

Comments: No comments.

Needle wash system

For details, refer to the operator's guide for priming the needle wash, and to wash the needle.

Needle wash system inspection complete.

☒ Yes ☐ No ☐ N/A

Comments: no comments.

Error logs

To inspect the error logs:

1. From the Run Samples window in Empower or the Inlet Editor window in MassLynx, click the **ACQUITY Console** icon in the Sample Manager control editor.
2. In the system tree, click **ACQUITY UPLC System**.
3. Click on **Logs** to review error logs.

Error log inspection complete.

☒ Yes ☐ No ☐ N/A

Comments: No comments

Column heater/cooler or column manager (if equipped)

NOTE: *There are no performance maintenance spare parts or tests for any of the Column Heater/Coolers or the Column Manager.*

Inspect the column trays for solvent residue and clean if necessary.

Column heater/cooler or column manager inspection complete.

☒ Yes ☐ No ☐ N/A

Comments: No comments

Maintenance tasks

The following procedures are routinely performed as part of the performance maintenance. Waters Quality Parts® have been used to replace/rebuild all parts.

- Sample needle assembly
- Wash syringes
- Sample syringe
- Injector valve cartridge

- Sample loop
- Needle wash housing o-ring
- Tubing & fittings
- Chassis air filter
- Trap valve cartridge

☒ Yes ☐ No ☐ N/A

Comments: No comments

Post-performance maintenance checks

Perform the post-performance maintenance checks only in the order listed.

NOTE: Procedures that do not appear here can be found in the ACQUITY UPLC Sample Manager – Fixed Loop Operator’s Overview and Maintenance Information Guide, ACQUITY UPLC System Operator’s Guide, nanoACQUITY UPLC System Operator’s Guide, μ Sample Manager-Fixed Loop Overview and Maintenance Guide, or in the ACQUITY Console Online Help.

Initialization diagnostics

Turn on power, allow instrument to complete and pass on-board software checks.

Initialization diagnostics check complete.

☒ Yes ☐ No ☐ N/A

Comments: No comments.

Calibrations and characterizations

Calibrate the X, Y, and Zp axes (ACQUITY UPLC and nanoACQUITY UPLC only)

NOTE: To calibrate the X, Y, and Zp axes using the teach block for the ACQUITY UPLC Sample Manager or nanoACQUITY Sample Manager, refer to the ACQUITY UPLC System Operator's Guide, nanoACQUITY UPLC System Operator's Guide or ACQUITY Console Online Help.

XY and Zp offset		
X	0.75	mm
Y	0.07	mm
Zp	0.40	mm

Calibration of the X, Y, and Zp axes complete.

☒ Yes ☐ No ☐ N/A

Comments: NO comments.

Calibrate needle Z-axis

Z offset
2.62 mm

Calibration of needle Z-axis complete.

☒ Yes ☐ No ☐ N/A

Comments: NO comments.

Characterize the needle seal

Pass/Fail	Pressure (psi)	Offset (mm)
☒ Pass ☐ Fail	110	59.00

Characterization of the needle seal complete.

☒ Yes ☐ No ☐ N/A

Comments: no comments.

Characterize the needle and loop volumes

System volume w/loop (µL)	System volume w/out loop (µL)	Loop (µL)	Needle (µL)
50.3	39.7	10.3	31.1

Characterization of the needle and loop volumes complete.

☒ Yes ☐ No ☐ N/A

Comments: no comments.

Leak tests

Sample syringe leak test

Pass/Fail	Test pressure (psi)	Compressed volume (μL)	Decompressed volume (μL)	Start pressure (psi)	End pressure (psi)	Pressure change (psi)	Average pressure leak (psi/sec)
☐ Pass ☐ Fail	150	1.8	1.5	158	148	-9	0

Sample syringe leak test complete.

☒ Yes ☐ No ☐ N/A

Comments: No comments

Wash syringe leak test

Syringe	Pass/Fail	Test pressure (psi)	Compressed volume (μL)	Decompressed volume (μL)	Start pressure (psi)	End pressure (psi)	Pressure change (psi)	Average pressure leak (psi/sec)
Weak	☐ Pass ☐ Fail							
Strong	☐ Pass ☐ Fail							

Wash syringe leak test complete.

☐ Yes ☐ No ☐ N/A

Comments:

Needle seal leak test

Pass/Fail	Compressed volume (µL)	Decompressed volume (µL)	Start pressure (psi)	End pressure (psi)	Pressure change (psi)	Average pressure leak (psi/sec)
☒ Pass ☐ Fail	39.2	30.0	108	110	2	0

Needle seal leak test complete.

☒ Yes ☐ No ☐ N/AComments: NO comments.**Backpressure regulator test**

Pass/Fail	Start pressure (psi)	End pressure (psi)	Average pressure (psi)	Standard deviation (psi)
☒ Pass ☐ Fail	146	146	146	0

Backpressure regulator test complete.

☒ Yes ☐ No ☐ N/AComments: NO comments.

Dynamic leak test

NOTE: For ACQUITY UPLC and I-Class (non-IVD/IVD), perform the 'dynamic leak test' when using ICS version 1.50 or higher.

For nanoACQUITY UPLC, perform the 'dynamic leak test' when using ICS version 1.30 or higher.

For the μ Sample Manager-Fixed Loop, perform the 'dynamic leak test'.

1. For ACQUITY UPLC and I-Class (non-IVD/IVD) **only**, do the following:
 - a. In the Parameters tab, set the Accumulator to the typical operating pressure.
 - b. Leave the Pump set to the default of, 'A' and 'prime' enabled.
 - c. Choose **Column** as the End Point.
2. Evaluate the fluid-handling integrity of the Binary Solvent Manager up to, and including the:

☐ 'Inject valve' of the sample manager, by placing a pin plug at port six of the inject valve.
 or
☐ 'outlet of the column', by placing a pin plug at the outlet of the column.
3. Click **Start** to perform the test. When complete, record the results below.

ACQUITY UPLC/I-Class results			
End point column (choose one)		Leak rate (nL/min)	Pass/Fail
Inject valve	Outlet of column		
☒	☐	84	☐ Pass ☐ Fail

Dynamic leak test complete.

☒ Yes ☐ No ☐ N/A

Comments:

No Comments

Set pressure diagnostic

To test the fluidic-handling integrity of the nanoACQUITY UPLC Sample Manager or μ Sample Manager–Fixed Loop, perform the 'set pressure diagnostic'.

NOTE: A potential leak is indicated if the 'A1 solvent' post-sensor flow rate is greater than 0.020 $\mu\text{L}/\text{min}$, or a difference between the pre-sensor and post-sensor flow rates is greater than 0.15 $\mu\text{L}/\text{min}$ for the 'A1' and 'B1' solvents.

Solvent	Pre-sensor flow rate ($\mu\text{L}/\text{min}$)	Post-sensor flow rate ($\mu\text{L}/\text{min}$)	Pass/Fail
A1			☐ Pass ☐ Fail
B1			☐ Pass ☐ Fail

Set pressure diagnostic complete.

☐ Yes ☐ No ☒ N/A

Comments: NA

Reset injection count

Reset injection count complete.

☒ Yes ☐ No ☐ N/A

Comments: NO comments.

Create log entries

After completing performance maintenance, create a log entry as follows:

1. In the ACQUITY UPLC Console, click on **Sample Manager** in the system tree.
2. From the menu bar, click **Maintain > Create log entry**. The Create Log Entry dialog box appears.
3. Enter the operator's name, the date the performance maintenance was performed, and any other comments.

Create log entries complete.

☒ Yes ☐ No ☐ N/A

Comments: No Comments

Performance maintenance confirmation

I confirm on behalf of	<u>Waters.</u>	
		Company Name
that this performance maintenance procedure has been satisfactorily completed on:	<u>POS UPB 6698</u>	
		Serial No.
Signed:	_____	Date: _____
	Customer	

	Type Name	
I certify that the installation has been successfully completed.		
Signed:	<u>[Signature]</u>	Date: <u>12 Apr 2021</u>
	Waters Engineer	
	<u>WORTH LIAISON SHEAR</u>	
	Type Name	
Comments:	<u>NO Comments.</u>	

Waters Corporation
34 Maple Street
Milford, Massachusetts
01757 USA

Waters
THE SCIENCE OF WHAT'S POSSIBLE.™

Waters, MassLynx, The Science of What's Possible and Waters Quality Parts are registered trademarks of Waters Corporation. All other trademarks are property of their respective owners.

©2014 Waters Corporation. Printed in the U.S.A.