



Performance Maintenance Protocol

515 Pump

<i>Serial Number /Firmware Version</i>	515 SN: _____ 515 Firmware: _____
<i>Date</i>	
<i>Performer</i>	

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

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 (ISO 9001:2000, ISO 13485:2003, and CGMP) 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 these 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 initial inspection, initialization diagnostics or after post-maintenance tests, 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.

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

Inspect	Maintenance Tasks	Post Performance Maintenance Tasks	Optional Calibration Tests ¹
Fan (inspect from the outside of instrument, clean if necessary)	Plunger Seals	Initialization Diagnostics	Testing the Flow Rate Accuracy
Transducer	Plungers	Ramp Test	
Firmware Version ²	Solvent Filters		
Review Error Logs ³	Inlet Check Valves		
	Outlet Check Valves		
	Tubing ⁴		

¹ Optional tests performed by Waters field service engineers as part of a Total Assurance with Calibration Plan. For those without the plan, the tests can be performed for an additional charge. Some of these tests may require additional chemistry kits that are not supplied in the performance maintenance kit.

² 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.

³ Error logs can only be viewed from the Message Center and Audit Trail in Empower software.

⁴ WAT024036 is a 1.25-inch length of Teflon tubing that is placed on the solvent filter fitting. Mobile phase tubing is attached to this tubing.

Inspect

Inspection complete
Initials

Comment: _____

Firmware version check

Confirm what firmware versions are installed. Update if required.

Firmware check complete
Initials

Comment: _____

Review error logs

Empower

1. From Empower, double-click the **Message Center** icon on the status bar.
NOTE: *If the icon is not present, login again to reactivate it.*
2. The Message Center appears with messages sorted by date and time. New messages are added to the bottom of the list.

Review error logs complete
Initials

Comment: _____

Maintenance tasks

Waters Quality Parts® have been used to replace or rebuild components.
Initials

Comment: _____

Post performance maintenance tasks

Initialization diagnostics

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

Initialization diagnostics check complete. Pass _____ Fail _____
Initials Initials

Comment: _____

Ramp test

1. Prime the system with methanol or water to remove all air bubbles.
2. Cap the transducer with a pin plug.
3. Perform the test.
4. Calculate the system pressure using the formula below.

NOTE: Where *P1* equals the pressure at 30 seconds after the pump shuts off, and
P2 equals the pressure at 5 minutes after the pump shuts off.

- $(P1 - P2) / P1 = \text{System Decay}$
 - Expected Result: Less than or equal to 0.2
5. Record the results.

	Pump	
P1 Value		
P2 Value		
System Decay		
	Pass	Fail

Timer	
Serial/ID Number	
Calibration Date	

Ramp test complete. Pass Fail
Initials
Initials

Comment:

Performance maintenance confirmation

I confirm on behalf of _____

Company Name

that the performance maintenance protocol has been satisfactorily completed

on: _____

Serial Number

Signed: _____ **Date:** _____

Customer

I certify that the performance maintenance protocol has been successfully completed.

Signed: _____ **Date:** _____

Performer

Optional calibration tests

Optional calibration tests are performed by Waters field service engineers as part of a Total Assurance with Calibration Plan. For customers without this plan, these tests can be performed for an additional charge. Some of these tests may require additional chemistry kits that are not supplied in the performance maintenance kit.

Optional calibration tests

1. Testing the flow rate accuracy.

Tools / materials required

- Graduated cylinder, 10 mL
- Pin plug
- Stopwatch (calibrated)
- 100% HPLC -grade methanol

WARNING: ALWAYS OBSERVE SAFE LABORATORY PRACTICES WHEN YOU USE THIS EQUIPMENT AND WHEN YOU WORK WITH SOLVENTS AND TEST SOLUTIONS. KNOW THE CHEMICAL AND PHYSICAL PROPERTIES OF THE SOLVENTS AND TEST SOLUTIONS YOU USE. SEE THE MATERIAL SAFETY DATA SHEET FOR EACH SOLVENT AND TEST SOLUTION IN USE.

CAUTION: NEVER CHANGE DIRECTLY BETWEEN IMMISCIBLE SOLVENTS OR BETWEEN BUFFERED SOLUTIONS AND ORGANIC SOLVENTS. IMMISCIBLE SOLVENTS FORM EMULSIONS IN THE FLUID PATHWAYS. BUFFERED SOLUTIONS AND ORGANIC SOLVENTS IN COMBINATION CAN RESULT IN SALT PRECIPITATION IN THE GRADIENT PROPORTIONING VALVES, PUMP HEADS, CHECK VALVES, AND OTHER PARTS OF THE SYSTEM. CONFIRM THAT ALL FLUIDS IN THE SYSTEM ARE MISCIBLE WITH METHANOL.

Testing the flow rate accuracy

1. Connect a length of 0.009 inch tubing to the outlet of the system that will provide a 1000 - 2000 psi backpressure at 1.0 mL/min.
2. Prime and flush the system with methanol.
3. Using a thoroughly dry 10 mL graduated cylinder or similar container, measure the flow output at 1 mL/min for three minutes.
4. Start the pump flow, allow the cylinder to fill to the 1 mL mark, and start the timer.
5. Stop the timer when the solvent reaches the 4 mL mark on the cylinder. Record the result below.
6. Set the flow to 0.
7. The time to fill the container should be correct within 9 seconds.

NOTE: If the time is not within the acceptable range, other service adjustments may be necessary for an additional charge.

Actual Value	Expected Result	Result	
minutes	2:51 – 3:09 minutes	Pass	Fail

Timer	
Serial/ID Number	
Calibration Date	

Testing flow rate accuracy complete. Pass _____ Fail _____
Initials Initials

Comment: _____

Calibration confirmation

The undersigned performer attests that the calibration tests were performed according to the prescribed procedure, and the results were accurately recorded above.

Performer: _____ **Date:** _____
Signature

I confirm on behalf of _____
Company Name

that the calibration tests were performed according to the prescribed procedure, and the results were accurately recorded

for: _____
Serial Number

Reviewer: _____ **Date:** _____
Signature

Waters Global Services

Waters Global Services focuses on optimizing Waters products with superior service, support, upgrades, training, and Waters Quality Parts®. For more information, go to www.waters.com/servicedoc.

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