

DOCUMENT TITLE: **CPSM Final Test Maintenance Procedure**

DOCUMENT TYPE: ☐ Calibration ☒ Preventive Maintenance

EQUIPMENT NAME: **CPSM FINAL TEST**

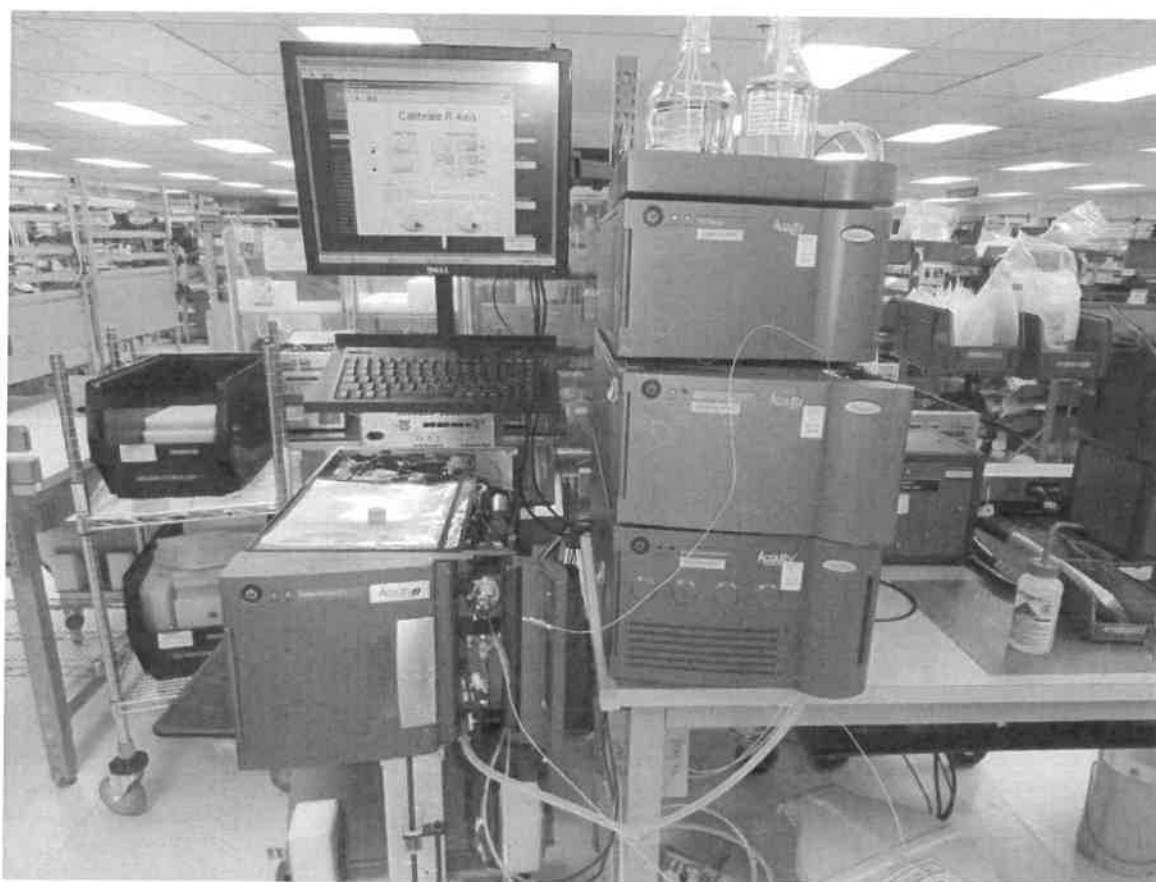
EQUIPMENT NUMBER: **TE83064**
TE0084050

AUTHOR(S): **RICHARD DAVIS**

DATE: **September 23, 2005**

REVISED BY: **RICHARD DAVIS**

DATE: **June 03, 2020**



EQUIPMENT REQUIRED

Quantity	Part Number	Description
1	405003460	.020 V-Detail Union
1	201000186	ACQUITY PDA/TUV 2489/2998 PERF MAINT KIT
1	201000260	ACQUITY I-CLASS BSM PERFORM MAINT KIT
A/R	186002350	ACQUITY UPLC BEH C18 1.7um 2.1x50 mm Column
A/R	186006049	XBRIDGE BEH C8 2.5um 4.6x50mm XP Column
1	430001102	Tube, 316L, SS, 1/16OD X .010 ID, 16 RMA, 45"
1	430001101	Tube, 316L, SS, 1/16OD X .010 ID, 16 RMA, 30"
2	410001400	Plug, 1-Piece
A/R	WAT271143	Ferrule, Flangeless, ETFE
A/R	WAT270993	Comp. Screw, Flangeless
A/R	WAT027-08	PEEK Tube, .040" ID
A/R	405003608	Scr, Comp, 10-32,1/4 Hex,304 SS,Gold,FLT
A/R	410001349	Ferrule, Set, .062. Two-Piece
A/R	700004107	ACQUITY UPLC Carryover Test Solutions (Carryover Challenge & Calibration Standard)
A/R	700004105	ACQUITY UPLC Production Test Solution (Precision and Linearity)
1	205015016	ACQUITY UPLC ID Flow Cell TUV, Analytical
1	TE82871	ACQUITY PDA, Flow Cell Test System

REFERENCE DOCUMENTATION

Document Number	Description
730001799	Operating Procedure, Calibration and PM
730000295MP	Quality System Document Control
715001008	BSM Performance Maintenance Protocol
715000954	TUV Performance Maintenance Protocol
735002010	ACQUITY SDS Final Test (TE82943) Procedure
735001356	ACQUITY TUV 2489 Detector Final Test (TE82903) Procedure
735003678	Preventive Maintenance Procedure for PC's
735001095	ACQUITY PDA and TUV Flow Cell Test
715002378	Install TUV/PDA Flow Cell

DEFINITIONS AND ABBREVIATIONS

Term	Definition/Abbreviation
PM	Preventive Maintenance: The servicing, for the purpose of maintaining equipment in satisfactory working order, by performing systematic inspection, detection, and correction of potential failures.
CPSM	Common Platform Sample Manager
TUV	Tunable Ultraviolet Detector
CM	Column Manager
BSM	Binary Solvent Manager
PDA	Photo Diode Array. In this procedure refers to a PDA Detector
UUT	Unit Under Test. For this test system the CPSM is the UUT.
SS	Stainless Steel
IP	Internet Protocol
PSI	Measure of pressure, Pounds per Square Inch
TSP	Test Specification and Procedure

INTRODUCTION

The CPSM Final Test Station (TE83064 and/or TE0084050) is used to test all Common Platform Sample Managers (CPSM). The test station consists of an ACQUITY stack, Cable Interface Box, and a cable set. To assure consistent and repeatable results the BSM, CM, TUV and Flow Cell will need to be serviced and tested. This means the Flow Cell will need to be sent out to be flushed and tested on a qualified test station.

Alternatively, Waters Global Services can be used to perform this service on the Acquity stack without disassembling the stack. Waters Global Services will also provide the Performance Maintenance Kits required.

After all the instruments have been serviced the test software is used to verify the ACQUITY stack is assembled correctly and functioning properly. A dynamic leak test is performed on the ACQUITY stack, without a UUT to ensure the system leak rate is within operational limits and a known good FTN is tested to ensure the CM with new columns and TUV with new Lamp and Flow Cell are functioning correctly.

To minimize test station down time planning is required so that service parts and/or kits can be procured ahead of time and the required test stations will be available for use.

INSTRUCTIONS

This procedure consists of several parts, one for the overall test system and one for each of the instruments of the ACQUITY stack. Each part generates its own Maintenance Record. A Local Calibration/Maintenance Coordinator will be assigned to oversee all parts of this procedure. It is the responsibility of the local Calibration/Maintenance coordinator to:

1. Procure all the parts required.
2. Review this record and all attachments for accuracy and completeness.
3. Have production sample solutions replaced prior to them becoming expired.
4. Ensure all performers are trained.

All cables, fluidic and waste lines are going to be inspected. The performer should inspect for the following:

- Nicks, cuts, cracks and abrasions
- Frayed wire
- Bent or damaged pins
- Damaged insulation and/or strain reliefs
- Connectors should be able to be fully seated and their fasteners intact and functional.
- Any other condition which may compromise the integrity of the cable or line being inspected.

PROCEDURE

1. Recording Firmware Versions	
1.1.	Ensure the BSM, CM and TUV are powered on.
1.2.	From the Windows desktop, find and open Loader.exe. click on checkbox "Scan for Instruments", then click on the "Next" button.
1.3.	Loader will display all instruments connected along with their IP address and Firmware Version
1.4.	Record the BSM, the CM and the TUV firmware version in each instruments Preventive Maintenance Record as "Before".
1.5.	Use the "Cancel" button to close Loader.
1.6.	After the test system has been rebuilt repeat steps 1.1 thru 1.5 above, and record firmware versions in each instruments Preventive Maintenance Record as "After".

2. System Maintenance	
2.1.	Inspect the condition of the Ethernet cables. Replace as required.
2.2.	Inspect the condition of the Serial Port cables. Replace as required.
2.3.	Inspect the Condition of the rear Panel QSPI Cable. Replace as required.
2.4.	Inspect the condition of the Event Input/Output Cable. Replace/Repair as required.
2.5.	Inspect the condition of the Leak Detector Cables. Replace/Repair as required.
2.6.	Inspect Solvent Select Valve to UUT lines. Replace as required.
2.7.	Inspect the condition of the waste lines and waste container. Replace as required.
2.8.	Examine ACQUITY UPLC Production Test Solution (Precision and Linearity), 700004105. Record the Expiration Date. Replace if it has expired.
2.9.	Examine ACQUITY UPLC Carryover Test Solutions (Carryover Challenge & Calibration Standard), 700004107. Record the Expiration Date. Replace if it has expired.
2.10.	Perform Preventive Maintenance Procedure for PC's (735003678) on the PC.

3.	BSM Maintenance
3.1.	Execute the Performance Maintenance Protocol (715001008) on the BSM using the ACQUITY I-CLASS BSM PERFORM MAINT KIT (201000260). NOTE: Performing the Performance Maintenance Protocol 715001008 requires a trained operator.
3.2.	NOTE: Do not change firmware, even if a newer version is available, unless a newer version firmware is required to run the test. The original version must be restored before this PM is considered complete.

4.	TUV Maintenance
4.1.	Execute the Performance Maintenance Protocol (715000954) on the TUV using the ACQUITY PDA/TUV 2489/2998 PERF MAINT KIT (201000186) NOTE: Performing the Performance Maintenance Protocol 715000954 requires a trained operator.
4.2.	Replace the Flow Cell from the TUV Detector with a new Flow Cell or a recently tested spare.
4.3.	Send the Flow Cell out for test to: Waters Technologies Corporation 34 Maple Street Milford, Ma. 01517 USA Send in attention to the name of the current Milford site calibration coordinator.

5.	CM Maintenance
5.1.	Note the date which the ACQUITY Column (186002350), in CM position 4, was last replaced. Replace the ACQUITY Column if it is more than 6 months old.
5.2.	If replacing the ACQUITY Column tag the column with the replacement date.
5.3.	Note the date which the XBRIDGE Column (186006049) in CM position 2, was last replaced. Replace the ACQUITY Column if it is more than 6 months old.
5.4.	If replacing the XBRIDGE Column, tag the column with the replacement date.
5.5.	Inspect the Active Pre-Heaters for wear. Replace as required.

6.	Characterize System Leak Rate
6.1.	Find on the Desktop and open the test system program "CPSM Final Test"
6.2.	From the main User Interface page select the "Calibration" button. Enter the system administrator's password. NOTE: It is Test Engineering policy not to publish passwords. Obtain the password from the system administrator. If the system administrator is unavailable or does not know the password, contact the responsible Test Engineer.
6.3.	Select "Characterize System Leak Rate". Follow online instructions. Upon completion, record the leak rates in the Preventive Maintenance Record.

7.	System Verification
7.1.	Test a UUT on the test system using TSP 735002984. If available test an I-Class FTN, PN 186015046. If an I-Class FTN is not available any other instrument will suffice.

WATERS CORPORATION CPSM FINAL TEST SYSTEM PREVENTIVE MAINTENANCE RECORD

Test System I.D. <u>TE83064-15</u>	Test System Location: <u>VENTURE GES</u>	
Due Date: <u>12 DEC 2020</u>	Interval (Months): <u>12</u>	Next Due Date: <u>16 DEC 2021</u>
Calibration/Maintenance Coordinator:		

SECTION 1 Firmware	Firmware Version	Performer	Date
BSM Firmware Version	<u>1.60.267</u>	<u>KHACUM</u>	<u>13 DEC 2020</u>
TUV Firmware	<u>1.60.2275</u>	<u>MUHAMMAD SHAMSUL</u>	<u>08 DEC 2020</u>
CM Firmware	<u>1.69.154</u>	<u>MOORTY</u>	<u>13 DEC 2020</u>

SECTION 2: SYSTEM MAINTENANCE	RESULT	Performer	Date
Step 2.1 Inspect Ethernet Cables	REPLACED: YES ☐ NO ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.2 Inspect Serial Port Cables	REPLACED: YES ☐ NO ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.3 Inspect Rear Panel QSPI Cable	REPLACED: YES ☐ NO ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.4 Inspect the Event Input/Output Cable	REPLACED/REPAIRED: YES ☐ NO ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.5 Inspect the Leak Detector Cables	REPLACED/REPAIRED: YES ☐ NO ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.6 Inspect Solvent Select lines	REPLACED: YES ☐ NO ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.7 Inspect Waste Lines and Container	REPLACED: YES ☐ NO ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.8 Production Test Solution, 700004107	Expiration Date: <u>07 JAN 2023</u>	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.9 Carryover Test Solution, 700004105	Expiration Date: <u>07 MAR 2021</u>	<u>KHACUM</u>	<u>14 DEC 2020</u>
Step 2.10 Preventive Maintenance for PC Attach Maintenance Record	PERFORMED ☒	<u>KHACUM</u>	<u>14 DEC 2020</u>

SECTION 3 BSM Maintenance			
Location: <u>VENTURE GES.</u>			
	RESULT	Performer	Date
Performed Maintenance Protocol	PERFORMED ☒	<u>Kumar</u>	<u>12 Dec 2020</u>

SECTION 4 TUV Maintenance Protocol			
Location: <u>FLEX SINGAPORE</u>			
	RESULT	Performer	Date
Performed Maintenance Protocol	PERFORMED ☒	<u>Muhammad Shamsul</u>	<u>8 Dec 2020</u>

SECTION 5: CM MAINTENANCE			
Location: <u>VENTURE GES.</u>			
	RESULT	Performer	Date
Step 5.1 Replaced ACQUITY Column	REPLACED: YES ☒ NO ☐	<u>Kumar</u>	<u>14 Dec 2020</u>
Step 5.2 Replaced XBridge Column	REPLACED: YES ☒ NO ☐	<u>Kumar</u>	<u>14 Dec 2020</u>
Step 5.3 Inspect Active PreHeaters	REPLACED: YES ☐ NO ☒	<u>Kumar</u>	<u>14 Dec 2020</u>

SECTION 6: Characterize System Leak Rate	RESULT (nL/min)	Performer	Date
ARC System Leak Rate	<u>0.0000400</u>	<u>Kumar</u>	<u>14 Dec 2020</u>
Record H-Class System Leak Rate	<u>0.0000507</u>	<u>Kumar</u>	<u>14 Dec 2020</u>
I-Class System Leak Rate	<u>0.0000640</u>	<u>Kumar</u>	<u>14 Dec 2020</u>

SECTION 7: System Verification	RESULT	Performer	Date
Execute CPSM Final Test (735002984) Attach the Final Test Record	<u>PASS</u>	<u>Kumar</u>	<u>16 Dec 2020</u>

NOTES/DEVIATIONS

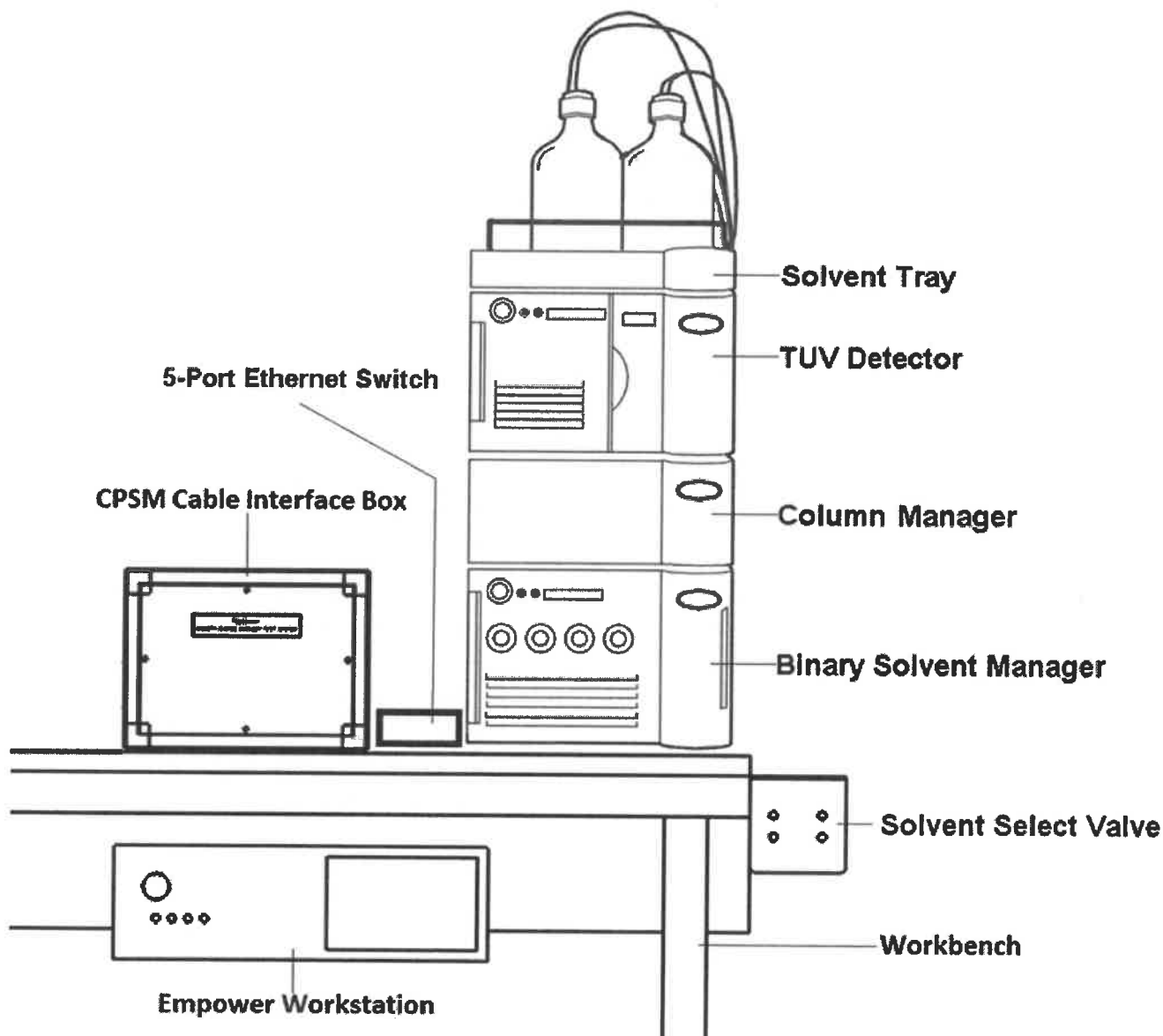
PREVENTIVE MAINTENANCE

I.D. TE8306415/WL176C0117

BY Kholip DATE 12 Dec 19

DUE 12 Dec 2020

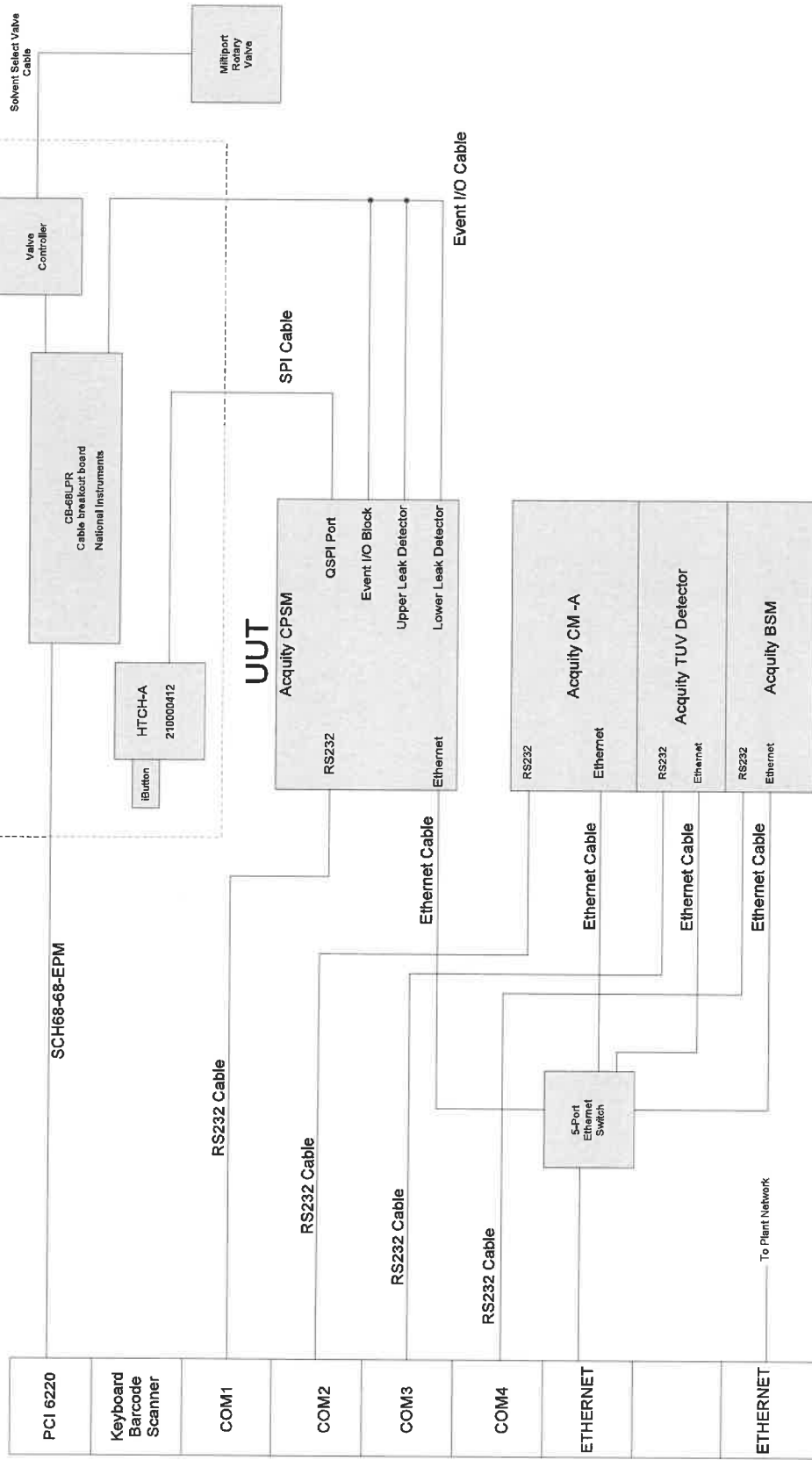
Appendix A



TE83064 – ACQUITY CPSM Final Test System Components Bench Setup

APPENDIX B

PC

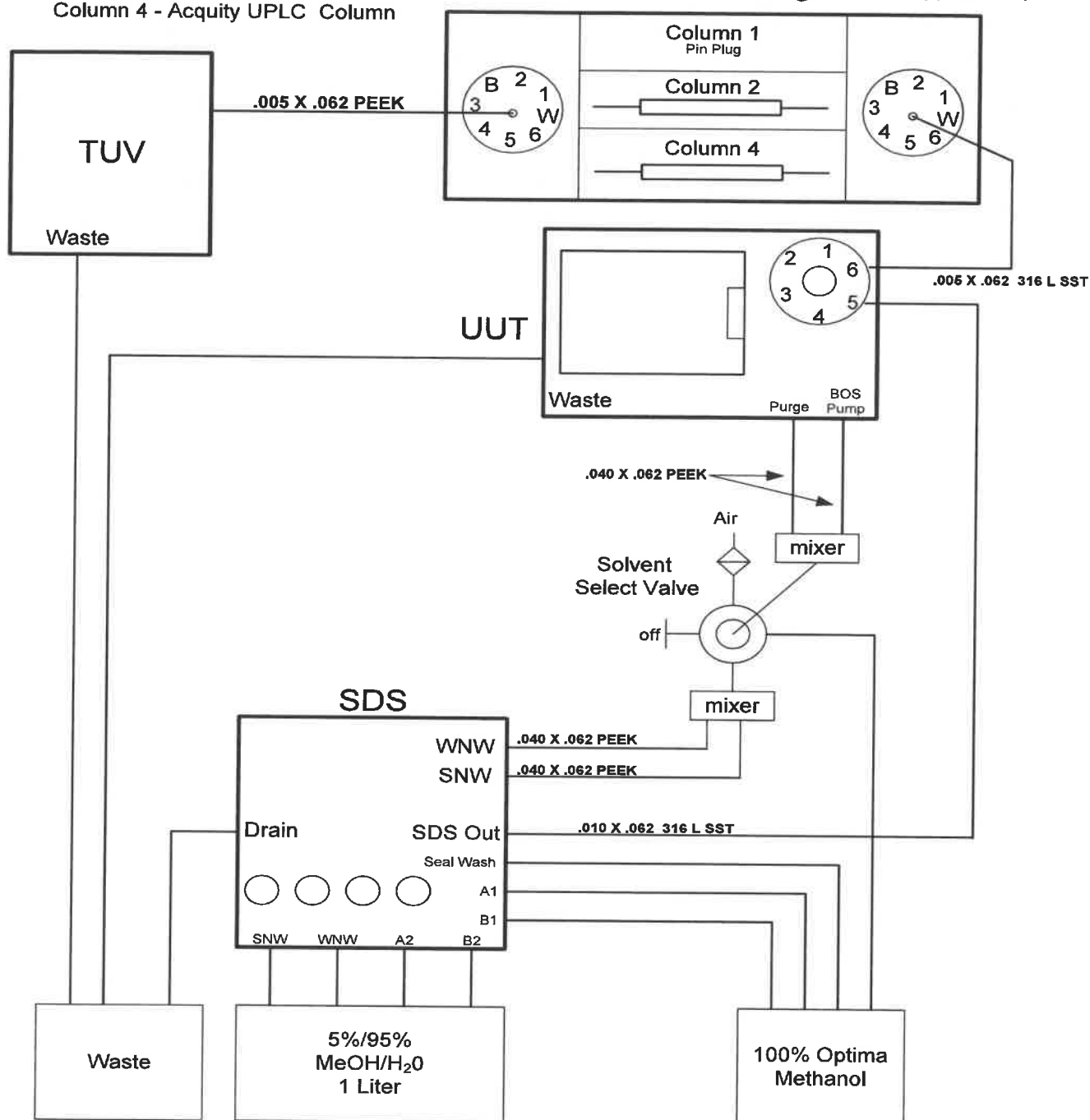


TE83064 Cable Connections Diagram (UUT Shown for Reference)

APPENDIX C

Column 2 - XBridge Column
Column 4 - Acquity UPLC Column

Column Manager (See Appendix D)

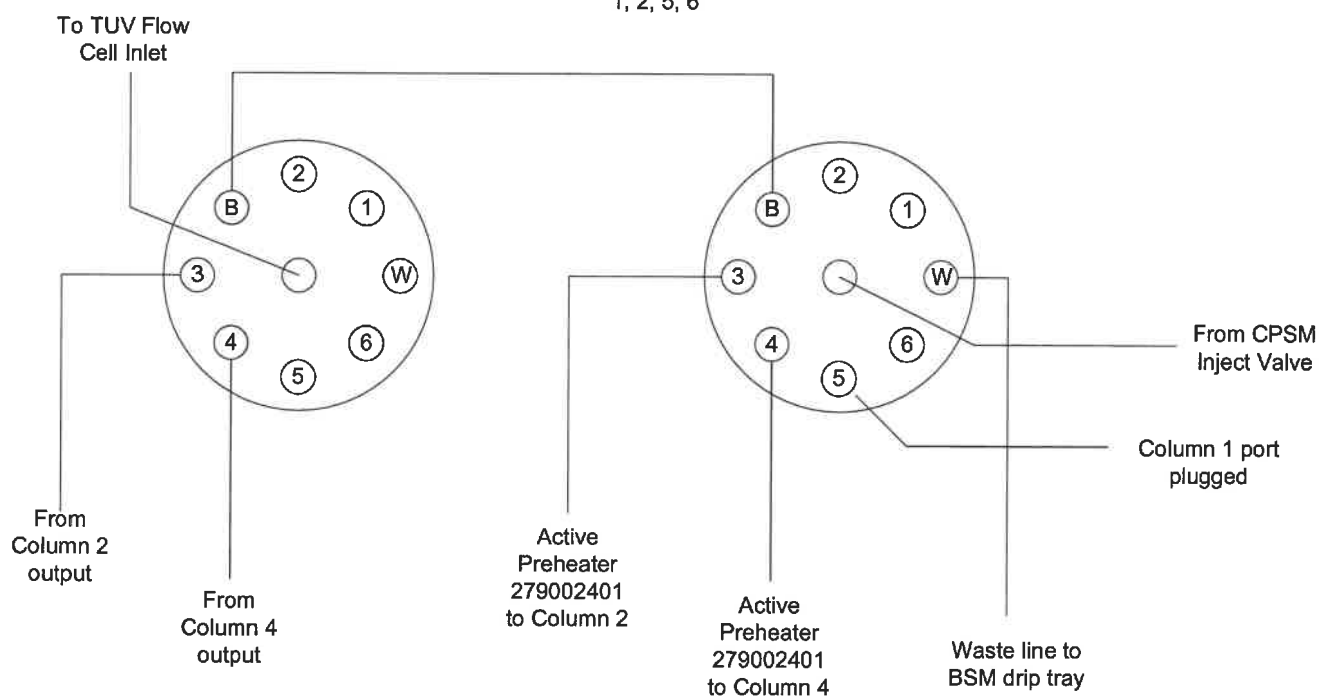


TE83064 Fluidic Connections Diagram (UUT Shown for Reference)

APPENDIX D

Configure CM for 4 columns. Disable preheaters for column 1 and 3

Pin Plug both Valves at positions:
1, 2, 5, 6



TE83064 Fluidic Diagram – Column Manager

CPSM Final Test Station Calibration Utility

class select
I-Class 2

Instructions

Connect the BSM output line to the Column Manager's
Input line using an Acquity union PN 405003460.
Select Characterize System Leak Rate when ready.

Characterize System Leak Rate



Iteration
3 of 3

0

Results

0.000080

0.000040

0.000072

ARC Leak Rate

0.0000400

H-Class Leak Rate

0.0000507

I-Class Leak Rate

0.0000640

EXIT

error in (no error)

status	code
☒	0
source	

SN 13

27.6902

Waters Corporation - Test Record

Part Number: <u>186015088</u>	Product: <u>I-Class FTN Plus</u>
Operator: <u>25705598</u>	Start Time: <u>12/16/2020, 15:45:</u>
Serial Number: <u>M20FNP179G</u>	End Time: <u>12/16/2020, 18:39:</u>
Test System: <u>TE83064-15</u>	Order: <u>2011046</u>
Test Software: <u>1.42</u>	Location: <u>GES/Venture,SG</u>

Firmware: 1.71.395 (Feb 14 2018 09:30:12)

Name	LSL	Measurement	USL	Unit	Outcome
Electrical Safety Test					PASS
Power-on Initialization					PASS
Fans					PASS
Firmware Download					PASS
ReStart Initialization					PASS
Sample Compartment Door & Lights					PASS
Jumper Configuration	133	133			PASS
Test Event Inputs					PASS
Test Event Outputs					PASS
Test SPI Interface					PASS
Test Leak Detectors					PASS
Test Ecord Interface					PASS
Theta Drive Calibration					PASS
Tray Cal Offset	-180	-85.18	180	Deg	PASS
R Axis Calibration					PASS
R Offset	-3	0.27	3	mm	PASS
Z Axis Calibration					PASS
Z Offset	-3	-1.07	3	mm	PASS
Needle Seal Calibration					PASS
Needle Seal Position	55	56.48	58	mm	PASS
Needle Seal Force	48	52.24	68	lb/inch	PASS
Zp Offset	-3	1.21	3	mm	PASS
Sample Tray Select Switch					PASS
Check Theta Drive Belt					PASS
R/Theta Positioner Test					PASS
1st Move Error	-0.3	0.13	0.3		PASS
Zp Pierce	-20	0	20	Lost Steps	PASS
Z Pierce	-20	-1	20	Lost Steps	PASS
R Lost Steps	-20	-1	20	Lost Steps	PASS
Sample Cooler Test		-0.8799	-0.6	Deg C/Min	PASS
Test Pressure Transducer	0.45	0.5066	0.55	PSI	PASS
BOS Pump Test					PASS
Methanol Prime					PASS
Sample Syringe Decay	-15	-8.3	15	PSI	PASS
Dynamic Leak Test		-7	500	nL/min	PASS
Needlewash Prime					PASS
Test Preblank Injections		0	740.3	area	PASS
Carryover		0	0.04	ppm	PASS
Chemistry Precision Area	0	0.4944	0.5	%RSD	PASS

Chemistry Precision Height	0	0.6299	0.9	%RSD	PASS
Chemistry X-Intercept	-0.2	-0.0597	0.2	ul	PASS
Chemistry Linearity (R^2)	0.999	0.999993	1		PASS
Methanol Purge					PASS
Air Purge					PASS
Park Inject Valve					PASS
Home Needle					PASS
Save Serial Number					PASS

CPSM Final Test Overall Result - PASS

Signed:

Kian

Date:

16 Dec 2020

END OF DATA

DOCUMENT TITLE: **GENERIC PC MAINTENANCE PROCEDURE**

DOCUMENT TYPE: ☐ Calibration ☒ Preventive Maintenance

EQUIPMENT NAME: **PC'S MAINTAINED BY TEST ENGINEERING**

EQUIPMENT NUMBER: **N/A**

AUTHOR(S): **RICHARD DAVIS**

DATE: **August 13, 2015**

REVISED BY: **TONY FONTES**

DATE: **September 07, 2017**

EQUIPMENT REQUIRED

Quantity	Part Number	Description
1	N/A	Vacuum

DISPOSABLES REQUIRED

Quantity	Part Number	Description
N/A	N/A	N/A

REFERENCE DOCUMENTATION

Document Number	Description
730001799	Operating Procedure, Calibration and PM
730000295MP	Quality System Document Control

DEFINITIONS AND ABBREVIATIONS

Term	Definition/Abbreviation
Calibration	A process to ensure that equipment is capable of producing accurate results. This includes verifying measurements and/or making adjustment(s) to ensure measurement accuracy.
PC	Personal Computer
PM	Preventive Maintenance: The servicing, for the purpose of maintaining equipment in satisfactory working order, by performing systematic inspection, detection, and correction of potential failures. PM activities may include tests, measurements, and parts replacement.
TE	Test Engineering or Test Engineer
Sigmasure	Test data collection system
Camstar	Test data collection system

SCOPE

This procedure has been written by Waters Test Engineering for use on PC's maintained by Test Engineering. While most of the PC's maintained by Test Engineering are used in manufacturing test equipment many are not. It is up to the responsible Test Engineer to decide when to refer to or use this procedure.

PROCEDURE

1. PC Maintenance	
1.1.	Inspect all cabling to the PC (Ethernet, serial, monitor, keyboard, mouse, etc.). Ensure all cables are secure and in good condition. Replace as needed.
1.2.	Check PC fan operation; ensure that all vents are clear of dust. Clean filter if present.
1.3.	Log in as TE-1(administrator) with credentials supplied by TE.
1.4.	Run Disc Cleanup Start>Programs>Accessories>System Tools with default settings.
1.5.	Run Disc Defragmenter Start>Programs>Accessories>System Tools. Run Analyze. If analysis indicates that the volume needs to be defragmented then defragment it. If the analysis indicates that the volume does not need to be defragmented exit the Disk Defragmenter.
1.6.	Verify system date, time and time zone against current time and time zone, if adjustment was required notify Test Engineer.
1.7.	Check for Unsent Test documents. If there are any files in the following directories, notify Test Engineer for resubmission. For Sigmasure systems: Open directory C:\Program Files\SigmaQuest\SigmaProbe\SigmaQueue\Sendbuffer and C:\Program Files\SigmaQuest\SigmaProbe\SigmaQueue. For Camstar systems: Open directory C:\Camstar\Probe\CamstarQueue and C:\Camstar\Probe\CamstarQueue\SENDERBUFFER.

1.8.	Verify that the user 'tester' is a member of the Users group only. Right Click My Computer>Manage>Local Users and Groups>Double Click Users>Right Click Tester>Properties>Member of Tab.
1.9.	If the PC is connected to the network, verify Symantec Antivirus service is running (icon in system tray). Open Symantec Antivirus by double clicking on antivirus icon in system tray and verify dates on each type of protection. Ensure that the definition files for each type of protection are <30 days old, update if necessary. If the definition files cannot be updated, contact TE to upgrade anti-virus software.
1.10.	If the PC is connected to the network, ensure that currently available Windows critical/high-priority/important updates are installed. Click on Automatic Updates from the control panel and verify updates to be installed daily anytime between 12:00 and 4:00AM.
1.11.	If the PC is connected to the network, open the "tester" accounts desktop and delete all internet shortcuts except SigmaSure and/or Camstar.
1.12.	Login as tester, with credentials supplied by TE. If the screensaver tab is available, ensure that the time out is 240 minutes, with star field screensaver selected. Ensure that on resume, 'password protect' or 'display login screen' is selected.
1.13.	Verify desktop wallpaper is the Waters TE approved background or none with a black background.
1.14.	Apply PM sticker to PC upon successful completion of the above steps. Place the removed sticker on the PM Record in the provided location.

WATERS CORPORATION PC PREVENTIVE MAINTENANCE PREVENTIVE MAINTENANCE RECORD

Date: 05 Dec 2020	Performed By: CHARMAN
Equipment I.D. TE83064-15	Location: VENTURE GES
Due Date: 05 Dec 2020	Interval (Months): 12
Next Due Date: 05 Dec 2021	

SECTION 1: MAINTENANCE	RESULT
Step 1.1: Cable Inspection	PERFORMED ☒ SEE NOTE ☐
Step 1.2: Fan Operation and Clean Venting and filters	PERFORMED ☒ SEE NOTE ☐
Step 1.4: Disk Cleanup	PERFORMED ☒ SEE NOTE ☐
Step 1.5: Disk Defragmenter	PERFORMED ☒ SEE NOTE ☐
Step 1.6: Verify Date, Time and Zone	PASS ☒ FAIL ☐ SEE NOTE ☐
Step 1.7: Check for unsent test files	PERFORMED ☒ SEE NOTE ☐
Step 1.8: Verify "Tester" account "user group"	PERFORMED ☒ SEE NOTE ☐
Step 1.9: If the PC is on the Network perform antivirus check	PERFORMED ☒ SEE NOTE ☐
Step 1.10: If the PC is on the Network Verify Windows updates	PERFORMED ☒ SEE NOTE ☐
Step 1.11: If the PC is on the Network Verify "Tester" account internet shortcuts	PERFORMED ☒ SEE NOTE ☐
Step 1.12: Verify Screen Saver settings	PERFORMED ☒ SEE NOTE ☐
Step 1.13: Wallpaper check	PERFORMED ☒ SEE NOTE ☐

NOTES

PREVENTIVE MAINTENANCE

I.D. TE83064-15
 BY H.C.TAN DATE 05 Dec 19
 DUE 05 Dec 20

Performance Maintenance Protocol

ACQUITY UPLC® Binary Solvent Manager/IVD
ACQUITY UPLC® I-Class Binary Solvent Manager/IVD
nanoACQUITY UPLC® Binary Solvent Manager
nanoACQUITY UPLC® Auxiliary Solvent Manager
µBinary Solvent Manager
Auxiliary Solvent Manager

Serial Number/ Firmware Version:	G09UPB976R 1.60.267
Date:	12 DEC 2020
Performer:	K. Walupm



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	Plunger seals	Initialization diagnostics
Fan	Seal wash seals	Static decay test/Dynamic leak test ³
Waste management system	Plungers	Reset pumped volume
Error logs	Solvent filters	Create log entry
	Check valves ²	
	Inline filter	
	Filter/mixer	
	PTFE O-rings	
	Air filters	
	Tubing and fittings	

- 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 Use Performance Maintenance Kit part number 201000173 if your ACQUITY UPLC® Binary Solvent Manager uses passive check valve cartridges, and part number 201000197 if using *P*² Valve cartridges.
- ³ Refer to the specific test notes at the start of each post-performance maintenance test.

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 **Binary Solvent 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:

N/A

Fan

To inspect the fan:

1. Observe the fan on the rear of the Binary Solvent 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:

N/A

Waste management system

Inspect the waste management system for leaks and proper routing of waste tubing to a waste container positioned below the BSM. Ensure that there are no loops or kinks in the tubing that could result in the back up of solvent.

Waste management system inspection complete.

☒ Yes ☐ No ☐ N/A

Comments:

N/A

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.

Review error logs complete.

☒ Yes ☐ No ☐ N/A

Comments:

N/A

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.

- Plunger seals
- Seal wash seals
- Plungers
- Solvent filters
- Check valves
- Inline filter
- Filter/mixer
- PTFE O-rings
- Air filters
- Tubing and fittings

☒ Yes ☐ No ☐ N/A

Comments:

N/A

Post-performance maintenance checks

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

NOTE: Procedures not included here can be found in the ACQUITY UPLC System support documentation, 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:

N/A

Static decay test

NOTE: For the ACQUITY UPLC and I-Class BSM (non-IVD/IVD), perform the 'static decay test' when using ICS versions lower than 1.50.

For the nanoACQUITY UPLC BSM and nanoACQUITY UPLC ASM, perform the 'static decay test' when using ICS versions lower than 1.30.

NOTE: A confirmation window will appear indicating pass or fail.

Pumps	Decay rate (psi/min)	Pass/Fail
Accumulator (Pump A)	60	☒ Pass ☐ Fail
Primary (Pump A)	26	☒ Pass ☐ Fail
Accumulator (Pump B)	59	☒ Pass ☐ Fail
Primary (Pump B)	78	☒ Pass ☐ Fail

Static decay test complete.

☒ Yes ☐ No ☐ N/A

Comments:

N/A

Dynamic leak test

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

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

For the μ BSM and ASM, perform the 'dynamic leak test'.

NOTE: For ACQUITY UPLC and I-Class (non-IVD/IVD) **only**, choose 'Vent Valve' as the End Point when performing the 'dynamic leak test'.

NOTE: Refer to the Results tab for pass/fail status and leak rate.

Pumps	Leak rate (nL/min)	Pass/Fail
Accumulator (Pump A)	98.1	☒ Pass ☐ Fail
Primary (Pump A)	8.3	☒ Pass ☐ Fail
Accumulator (Pump B)	36.0	☒ Pass ☐ Fail
Primary (Pump B)	10.0	☒ Pass ☐ Fail

Dynamic leak test complete.

☒ Yes ☐ No ☐ N/A

Comments:

N/A

Reset pumped volume**Total pumped volume
(liters)**

27.690 l

Reset pumped volume complete.

☒ Yes ☐ No ☐ N/A**Comments:**

N/A

Create log entries

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

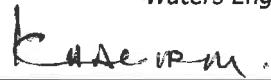
1. In the ACQUITY UPLC Console, click on **Binary Solvent Manager** in the system tree.
2. From the menu bar, click **Maintain > Create log entry**. The Create Log Entry dialog box appears.
3. Enter the operator's name, the date the performance maintenance was performed, and any other comments.

Create log entries complete.

☒ Yes ☐ No ☐ N/A**Comments:**

N/A

Performance maintenance confirmation

I confirm on behalf of <u>N/A</u>		Company Name
that this performance maintenance procedure has been satisfactorily completed on: <u>N/A</u>		Serial No.
Signed: <u>N/A</u>	Date: _____	
Customer		
<u>N/A</u>		
Type Name		
I certify that the installation has been successfully completed.		
Signed: 	Date: <u>12 Dec 2020</u>	
Waters Engineer		
		
Type Name		
Comments: <u>N/A</u>		
PREVENTIVE MAINTENANCE I.D. <u>91849/WI-16GC0044</u> BY <u>Khalip</u> DATE <u>05 Dec 19</u> DUE <u>05 Dec 2020</u>		

Waters Corporation
34 Maple Street
Milford, Massachusetts
01757 USA

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Waters Corporation - Test Record

Part Number: 186015000

Product: Acquity BSM 18K

Operator: 25703003

Start Time: 12/11/2020, 16:49:

Serial Number: G09UPB976R

End Time: 12/12/2020, 19:31:

Test System: TE82943-22

Order: PMB976R

Test Software: 2.4

Location: GES/Venture, SG

Firmware: 1.72.415 (Aug 27 2018 13:51:50)

Name	LSL	Measurement	USL	Unit	Outcome
Test Electrical Safety					PASS
Test Loader Download					PASS
Test Reboot Firmware for Pump B Download					PASS
Test Firmware Version					PASS
Test Serial Number					PASS
Test Alarms at Bootup					PASS
Test Switch2 Output ON					PASS
Test Switch2 Output OFF					PASS
Test Switch3 Output ON					PASS
Test Switch3 Output OFF					PASS
Test Run Stopped Output ON					PASS
Test Run Stopped Output OFF					PASS
Test Switch1 Output ON					PASS
Test Switch1 Output OFF					PASS
Test Gradient Start Input SHORT					PASS
Test Gradient Start Input OPEN					PASS
Test Stop Flow Input SHORT					PASS
Test Stop Flow Input OPEN					PASS
Test Auxiliary1 Input SHORT					PASS
Test Auxiliary1 Input OPEN					PASS
Test Auxiliary2 Input SHORT					PASS
Test Auxiliary2 Input OPEN					PASS
Test Analog Output2 set to 2.0 VDC	1.9	2	2.1	VDC	PASS
Test Analog Output2 set to 0.0 VDC	-0.1	0	0.1	VDC	PASS
Test Analog Output1 set to 2.0 VDC	1.9	2	2.1	VDC	PASS
Test Analog Output1 set to 0.0 VDC	-0.1	0	0.1	VDC	PASS
Test Leak Detect Connected					PASS
Test Leak Detect Disconnected					PASS
Test Leak Detect Input Low					PASS
Test Leak Detect Input High					PASS
Test Alarms Recheck					PASS
Test Seal Wash Pump Prime/Flow	2	3.3	5	ml/min	PASS
Test Pump A Input 2 Prime with IPA	115	162	280	PSI	PASS
Test Pump B Input 2 Prime with IPA	115	163.1	280	PSI	PASS
Test Pump A Input 1 Prime with MeOH	15	45.7	85	PSI	PASS
Test Pump B Input 1 Prime with MeOH	15	41	85	PSI	PASS
Test Degasser Pressure	0	0.7	1.3	PSI	PASS
Test Degasser Switch Setting					PASS
Test Pump A Dynamic Leak - Accum. Leak Rate	1	34	200	nL/min	PASS
Test Pump A Dynamic Leak - Accum. Percent of Stroke	-10	29	50	%	PASS
Test Pump A Dynamic Leak - Accum. Max Pressure	17000	17032	18000	psi	PASS
Test Pump A Dynamic Leak - Primary Leak Rate	-50	13	200	nL/min	PASS
Test Pump A Dynamic Leak - Primary Percent of Stroke	-10	28	50	%	PASS
Test Pump A Dynamic Leak - Primary Max Pressure	15000	15022	16000	psi	PASS

Ser. No.:G09UPB976R

Test Pump A Dynamic Leak Low PSI - Accum. Leak Rate	1	12	200	nL/min	PASS
Test Pump A Dynamic Leak Low PSI - Accum. Percent of Stroke	-10	9	50	%	PASS
Test Pump A Dynamic Leak Low PSI - Accum. Max Pressure	4000	4019	5000	psi	PASS
Test Pump A Dynamic Leak Low PSI - Primary Leak Rate	-50	6	200	nL/min	PASS
Test Pump A Dynamic Leak Low PSI - Primary Percent of Stroke	-10	6	50	%	PASS
Test Pump A Dynamic Leak Low PSI - Primary Max Pressure	2000	2013	3000	psi	PASS
Test Pump B Dynamic Leak - Accum. Leak Rate	1	31	200	nL/min	PASS
Test Pump B Dynamic Leak - Accum. Percent of Stroke	-10	28	50	%	PASS
Test Pump B Dynamic Leak - Accum. Max Pressure	17000	17024	18000	psi	PASS
Test Pump B Dynamic Leak - Primary Leak Rate	-50	17	200	nL/min	PASS
Test Pump B Dynamic Leak - Primary Percent of Stroke	-10	28	50	%	PASS
Test Pump B Dynamic Leak - Primary Max Pressure	15000	15032	16000	psi	PASS
Test Pump B Dynamic Leak Low PSI - Accum. Leak Rate	1	4	200	nL/min	PASS
Test Pump B Dynamic Leak Low PSI - Accum. Percent of Stroke	-10	9	50	%	PASS
Test Pump B Dynamic Leak Low PSI - Accum. Max Pressure	4000	4011	5000	psi	PASS
Test Pump B Dynamic Leak Low PSI - Primary Leak Rate	-50	8	200	nL/min	PASS
Test Pump B Dynamic Leak Low PSI - Primary Percent of Stroke	-10	5	50	%	PASS
Test Pump B Dynamic Leak Low PSI - Primary Max Pressure	2000	2016	3000	psi	PASS
Test Flow Rate Accuracy Pump A 2ml/min	1.98	2.009	2.02	ml/min	PASS
Test Pump A Pressure Ripple	0	6	15	PSI	PASS
Test Flow Rate Accuracy Pump A 0.5ml/min	0.495	0.502	0.505	ml/min	PASS
Test Flow Rate Accuracy Pump B 2ml/min	1.98	2.011	2.02	ml/min	PASS
Test Pump B Pressure Ripple	0	4	15	PSI	PASS
Test Flow Rate Accuracy Pump B 0.5ml/min	0.495	0.504	0.505	ml/min	PASS
Test Flow Rate Accuracy Pump A&B 1.0ml+1.0ml/min	1.98	2.006	2.02	ml/min	PASS
Test High Pressure Flow Pump A&B	9000	13113	14500	PSI	PASS
Test Dynamic Leak Manifold to Filter Tube	0	0.147	1	ul/min	PASS
Test Serial Number Re-verification					PASS
Test Fans					PASS
Test LEDs					PASS

Acquity BSM 18K Final Test Overall Result - PASS

Signed:

Date:

END OF DATA

Performance Maintenance Protocol

ACQUITY UPLC[®] TUV Detector

<i>Waters system:</i>	G05 UPT 009N
<i>PM date:</i>	08 Dec 20

Guidelines

This performance maintenance (PM) protocol outlines maintenance tasks you should regularly perform on Waters systems. Regular maintenance ensures optimum performance and uninterrupted trouble-free operation.

Schedule

Waters recommends that performance maintenance visits be performed once a year. Systems under heavy use or using aggressive solvents need more frequent maintenance. For detailed maintenance schedules, refer to the appropriate user guide located on [Waters.com](https://www.waters.com). Failure to follow the maintenance schedules as described in the user guide might result in unreliable operation and inaccurate laboratory results.

Safety considerations

Some protocols might involve removing instrument covers, exposing the performer to high voltages, high currents, and moving parts. This presents risks of electric shock or damage to the instrument. To reduce these risks, Waters recommends that these protocols be conducted by certified Waters field service engineers with access to the latest information on Waters products. Waters is not responsible for actions initiated by an unqualified performer. If you are unsure, have a Waters certified field service engineer conduct the performance maintenance activity.

Waters Quality Parts

Waters designs and manufactures Waters Quality Parts® to the same strict regulatory standards it uses for its high-performance Waters systems. Waters recommends using Waters Quality Parts for all maintenance activities. Failure to use Waters Quality Parts might compromise laboratory results and reliability.

Customer education

Waters offers courses on operating and maintaining its high-performance systems, as well as courses designed to help you maintain professional competency and further your knowledge in chromatography, mass spectrometry, and Waters data systems. For more information on available training courses, visit [Waters Educational Services](https://www.waters.com/education) on [Waters.com](https://www.waters.com).

Qualification/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 consistently obtain quality data. To learn more, visit [Qualification/Compliance Services](https://www.waters.com/compliance) on [Waters.com](https://www.waters.com).

PM task overview

Table 1 is an overview of the PM tasks performed.

Note: For instructions on performing these procedures, refer to the online Help or the appropriate user manual on Waters.com.

Table 1 - PM tasks

Inspect	Replace/rebuild	Verify
Firmware version	Lamp	Initialization diagnostics
Fan		Calibrate wavelength
Flow cell		
Error logs		

PM task descriptions

Performance maintenance consists of three task categories:

- Inspect
- Replace or rebuild parts
- Verify

Note: If the instrument fails pre- or post-performance maintenance inspections or verifications, it might need additional service beyond the scope of this protocol. Such service might incur additional parts and labor charges.

Inspect

1. If the instrument is off, power it on and allow it to complete software checks.
2. Inspect the firmware and, if appropriate, update it.
3. Ensure that the fan grate on the rear of the instrument is clear of debris and dust; clean if necessary.
4. Inspect the flow cell for leaks.
5. Review error logs for any errors and troubleshoot as necessary.

Replace or rebuild parts

Using the parts in the PM kit, replace or rebuild parts as necessary.

Note: For instructions on replacing parts, see the appropriate user manual on Waters.com.

Verify

After completing the maintenance tasks, verify instrument performance:

1. Power-on the instrument and allow it to complete on-board software checks.
2. Using the Console, run calibrate wavelength.

If the maximum deviation is less than or equal to ($\leq$) 1 nm, record the result.

If the maximum deviation is greater than ($>$) 1 nm, run calibrate wavelength a second time, ensure the value is less than or equal to ($\leq$) 1 nm, and record the result.

Results/checklist

A Waters field service engineer completes the test results, checklist, and confirmation sections.

Test results

Table 2 – Firmware version

Firmware revision	1.60.2273
-------------------	-----------

Table 3 – Calibrate wavelength results

Pass or fail	Maximum deviation
☒ Pass ☐ Fail	0.01 nm Expected result: Maximum deviation less than or equal to ($\leq$) 1 nm

Checklist

Note: Select N/A if the task does not apply.

Inspect

All inspect tasks completed	☒ Yes ☐ No ☐ N/A
	Comments: Unable to check flowcell for leaks due to limited capabilities of tester

Replace/Rebuild

Lamp	☒ Yes ☐ No ☐ N/A
	Comments: Replaced lamp due to expiry of lamp hours.

Verify

All verify tasks completed	☒ Yes ☐ No ☐ N/A
	Comments: Initialization completed.

Performance maintenance confirmation

I confirm on behalf of _____

Company name

that this performance maintenance
procedure has been satisfactorily completed on: _____

Serial no.

Signed: _____

Customer

Date: _____

Print name

I certify that the maintenance procedure has been successfully completed.

Signed: _____

Waters engineer

Date: _____

Print name

Comments: _____

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WATERS CORPORATION CPSM FINAL TEST PREVENTIVE MAINTENANCE RECORD ACQUITY TUV DETECTOR

Instrument I.D. 91405	Test System Location: Venture Singapore	
Due Date: 05 Dec 20	Interval (Months): 12	Next Due Date: 08 Dec 21
Calibration/Maintenance Coordinator: Mohammad Shamsul f		

TUV Firmware	Firmware Version	Performer	Date
Step 1.4 TUV Firmware Version Before	1.60.2273	Mohammad Shamsul f	08 Dec 20
Step 1.6 TUV Firmware Version After	1.60.2273	Mohammad Shamsul f	08 Dec 20

SECTION 4.1: TUV Maintenance Protocol

Location: Flex Singapore

	RESULT	Performer	Date
Performed Maintenance Protocol	PERFORMED ☒	Mohammad Shamsul f	08 Dec 20

SECTION 4.3: TUV Instrument Final Test

Location: Flex Singapore

	RESULT	Performer	Date
Step 4.3 Execute TUV Final Test (735001356) Attach Test Record	PASS ☒ FAIL ☐	Mohammad Shamsul f	08 Dec 20

NOTES

- 1) Replaced lamp P/N: 402000351 due to expiry of lamp hours.
 - 2) Result is base on known good shunt.
- End of data

PREVENTIVE MAINTENANCE

I.D. 91405/WI-16AC.0046
 BY Khalip DATE 05 Dec 19
 DUE 05 Dec 2020

Currently installed lamp:

State: On

Good Ignitions: 0

Total Ignitions: 0

- 1: Installation Date: 10Jan19
Serial Number: 000173760
Hours: 8.80
- 2: Installation Date: 11Jan19
Serial Number: 000173709
Hours: 5429.85
- 3: Installation Date: 05Dec19
Serial Number: 000232774
Hours: 5362.88
- 4: Installation Date: 08Dec20
Serial Number: 000271805 (Current)
Hours: 0.00

Instrument: ACQ-TUV#^{*}A123456789 G05UPT009N

TUV Detector: Calibrate Wavelength
Deviation Since Last Calibration: 0.01nm

* correction of data entry

f Mohammad Shamsul 246394 08 Dec 20

Waters Corporation

INSTRUMENT FINAL TEST RECORD

Part Number:	186015028	Description:	AcQuity UPLC TUV Detector
Tested By:	MOHAMMAD SHAMSUL	Date of Manufacture:	12/8/2020 3:16 PM
Serial Number:	G05UPT009N_1282020325 PM	Control Number:	N/A
Software Revision:	1.60.2273	Factory Order:	N/A

1) Electrical Safety

Ground Continuity

PASS ☒ FAIL ☐

2) Drift @ 230 nm

(<= 375 μ AU) - Actual: -269.8u AU PASS ☒ FAIL ☐

3) Noise @ 230 nm

(<= 5 μ AU) - Actual: 3.9u AU PASS ☒ FAIL ☐

4) Dual Noise @ 230/280 nm

(<= 75 μ AU) - Actual: 15.8u AU PASS ☒ FAIL ☐

Instrument Result: PASS ☒ FAIL ☐ Signed: *f* (246394) Date: 08/12/20

Notes:

1) Replaced lamp P/N: 402000351 due to expiry of lamp hours.

2) Result was base on known good shunt

End of data

Drift Count: 3

Noise Count: 1

Dual Noise Count: 1

230 nm Energy [nA]: Sample Energy: 78.212997 Reference Energy: 104.613136

This Test Record and any data contained within it are proprietary to Waters Corporation and must be retained by Waters for the time period prescribed in its Quality Records Retention Policy. If any of the individual tests noted above fail; a note must be referenced that details the work performed to correct that specific deficiency. An overall failure indicates a special circumstance in which case a complete retest is to be done. A second form is required to document that testing; the initial form must be attached and retained

Waters Corporation

INSTRUMENT - FINAL TEST RECORD

Part Number: 186015043 Description: ACQUITY UPLC CM-A

Tested By: 25704791 Date: 12/13/2020

Serial Number: D11CMP973N TMD Number: N/A

Firmware Revision: 1.69.154 Factory Order: TEST VERIFICATION

Electrical Safety Test	Pass ☒	Fail ☐	see note#	Pass ☐
Fan Test	Pass ☒	Fail ☐	see note#	Pass ☐
Ethernet Port Test	Pass ☒	Fail ☐	see note#	Pass ☐
LED Test	Pass ☒	Fail ☐	see note#	Pass ☐
Column LED Test	Pass ☒	Fail ☐	see note#	Pass ☐
Door Test	Pass ☒	Fail ☐	see note#	Pass ☐
Ecord 3	Pass ☒	Fail ☐	see note#	Pass ☐
Ecord 4	Pass ☒	Fail ☐	see note#	Pass ☐
Ecord 5	Pass ☒	Fail ☐	see note#	Pass ☐
Ecord 6	Pass ☒	Fail ☐	see note#	Pass ☐
Set Serial Number	Pass ☒	Fail ☐	see note#	Pass ☐
Fuses	Pass ☒	Fail ☐	see note#	Pass ☐
Leak Detector Interface Test	Pass ☒	Fail ☐	see note#	Pass ☐
Pre-Heater Interface TC-CM-APH1	Pass ☒	Fail ☐	see note#	Pass ☐
Pre-Heater Interface TC-CM-APH2	Pass ☒	Fail ☐	see note#	Pass ☐
Pre-Heater Interface TC-CM-APH3	Pass ☒	Fail ☐	see note#	Pass ☐
Pre-Heater Interface TC-CM-APH4	Pass ☒	Fail ☐	see note#	Pass ☐
TOP Auxillary Interface	Pass ☒	Fail ☐	see note#	Pass ☐
BOTTOM Auxillary Interface	Pass ☒	Fail ☐	see note#	Pass ☐
Heater Cooler	Pass ☒	Fail ☐	see note#	Pass ☐
Heater Cooler	Pass ☒	Fail ☐	see note#	Pass ☐
Left Valve	Pass ☒	Fail ☐	see note#	Pass ☐
Right Valve	Pass ☒	Fail ☐	see note#	Pass ☐

Instrument Result: Pass ☒ Fail ☐ Signed: 

Date: 13 Dec 2020

Notes: END OF DATA

PREVENTIVE MAINTENANCE

I.D. 82510/W/1660045

BY Khalip DATE 5 Dec 19

DUE 05 Dec 2020

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