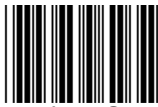


DOCUMENT TITLE:	TEST SPECIFICATION AND PROCEDURE, ALLIANCE SEPARATIONS MODULE / ALTUS A10 SOLVENT & SAMPLE MODULE
SYSTEM/ASSEMBLY NAME:	ALLIANCE SEPARATIONS MODULE, ALTUS A10 SOLVENT & SAMPLE MODULE
PART NUMBER AFFECTED	WAT270008, WAT270880, WAT270886, WAT069885, WAT069887, WAT069889, 186271819, 186271821, 186269501, 186269502, 186269503, 186269504, 186269505, 186269506, 186269507, 186269508, 800000249, 800000250, 800000254, 800000255, 800000386, 800000388, 800000389, 800000390, N2971010
TEST EQUIPMENT NAME:	2690/2790 REAR PANEL TESTER, PRIME/PURGE MODULE, 2690 TEST PROJECT TEMPLATE
TEST EQUIPMENT NUMBER:	TE82573, TE82733, TE82736
TEST SOFTWARE:	 (TE82573) * 1 . 0 *

AUTHOR(S): **RAMKI TIRUR**

DATE: **June 04, 1996**

REVISED BY: **MIKE COTTER**

DATE: **March 23, 2018**

EQUIPMENT REQUIRED

Quantity	Part Number	Description
1	TE82573	2690/2790 Rear Panel Tester
1	TE82733	Prime/Purge Module
1	TE82736	Empower Project, Revision 1.8
1	9119925	Go/No Gage
1	9120056	Modified Carousel
1	999029388	CCD Carousel Alignment Functional Gage
5	999028931	Paper Target, 2690 Carousels
1	009025006	600 ± 100 PSI @ 1mL/min. (Methanol) Restrictor
1	009025575	Fixture, Syringe Draw (Optional)
1	186000139 or equivalent	Empower Workstation w/ multi BusLAC/E, Ethernet cards
1	441000294	RS232 Cable
1	WAT091728/WAT038000	Waters Temperature Control Module
1	186002487/186248900	Waters 2489 UV Detector
1	WAT038040	Waters Column Heater Module
1	WAT270679	Assy., Solvent Tray, 4 – 1 Liter
1	WAT270328	Set, Carousel Trays
2	186000305	Screw cap, with preslit bonded PTFE/silicone septa.
2	186002457	White, 9mm Screw Cap w/Bonded pre-slit P
1	186005827	Blk Cap 12x32mm vial PSlt PTFE Sil Sept
1	186002127	Green Screw Cap (9mm) w/Bonded Pre-Slit
1	186002128	Red Screw Cap (9mm) w/Bonded Pre-Slit PT
10	186000274	Screw cap, with bonded PTFE/silicone septa (R.V. test)
A/R	18600385C (may also use 186000307C)	Total Recovery Vial Kit (vials and blue preslit septum caps) (may also use regular vials)
A/R	WAT024037	Detector Waste Tubing
A/R	WAT055566	Pin Plug
A/R	WAT037525	Cartridge Endfittings
1	HR-200-C	A&D Analytical Balance (or equivalent)
A/R		Syringe (Priming)
1		IEEE Cable
1		RS232 Serial Cable
1		Digital VT 220 or equivalent terminal

DISPOSABLES REQUIRED

Quantity	Part Number	Description
5	999028931	Paper Target, 2690 Carousels
1	186003031	XBridge C18 3.5 um 4.6 x 50 mm Column
A/R	Mobile Phase:	Methanol, Filtered
A/R	Mobile Phase:	Milli-Q Water (change daily)
A/R		Helium (regulated to 100 PSI)
A/R		Aluminum Foil
A/R	700003741	HPLC System UV Test Solutions (ampules 1, 3, 7, 8 & 9)

REFERENCE DOCUMENTATION

Document #	Description
WAT270645 Rev 0	Performance Specification, 2690 Separations Module
WAT270777 Rev B	Performance Specification, PCB CPU Supermodule
WAT270801 Rev B	Performance Specification., Heater/Cooler, 2690
WAT270700 Rev B	Performance Specification, Assy, Degasser
735000585 Rev 1	Performance Specification, In-Line Degasser AF (Phase 2)
721008073 Ver 00	Alliance 2695 Oper Guide
WAT271196SO	SOP, 2690/2790 Millennium Backup Procedure
WAT271402	Instr. Sht, 2690 Config Chk Off
WAT046538	Generic Hi-Pot & Leak Test Procedure
735000164	Test Proc., 2690 Retest Matrix

DEFINITIONS AND ABBREVIATIONS

Term	Definition
A/R	As Required
PSC	Production Support Check
UUT	Unit Under Test
CPU	Central Processing Unit
AC	Alternating Current
IP	Internet Protocol
PSI	Pounds per Square Inch
IEEE	Institute of Electrical and Electronics
IEEE-488	Short-range digital communications 8-bit parallel multi-master interface bus specification, commonly called GPIB (General Purpose Interface Bus).
UV	Ultraviolet (light)
I/O	Input(s)/Output(s)
MeOH	Methyl Alcohol, Methanol, CH ₄ O, CH ₃ OH
H ₂ O	Water, Oxygen Dihydride
PSIA	Pounds per Square Inch, Absolute (relative to full vacuum)
GPV	Gradient Proportioning Valve
CCW	Counter-clockwise, opposite direction of clock hand movement ↺
V#	Sample-Management Valve (V1, V2, V3, V4)
P/N	Part Number
mL	milli Liter (one thousandth of one liter), volume measurement
uL	micro Liter (one millionth of one liter), volume measurement
g	gram, mass measurement
TCM	Temperature Control Module
FPAC	Flow Precision (AC Valve Pair)
FPBD	Flow Precision (BD Valve Pair)
RT	Retention Time
SD	Standard Deviation
%RSD	Percent Relative Standard Deviation (Standard Deviation / Mean * 100)
CCD	Carousel/Carrier Drive
LED	Light Emitting Diode

TEST SPECIFICATIONS AND TRACEABILITY MATRIX

Test #	Test Specification & Condition	Acceptance criteria	Reference
1	Electrical Safety Tests	<i>First test performed, for safety and regulatory compliance.</i>	WAT046538
2	System Initialization	<i>Firmware loaded successfully and system initialized without alarm.</i>	See BOM for firmware part number.
3	Power Supply Fan Test	<i>Fan turning and blowing out of UUT rear panel</i>	Production Support Check (PSC)
4	Unit Fan Test	<i>Fan turning and blowing out of UUT rear panel</i>	WAT270645, section 3.4.4
5	Keypad Test	<i>All keys functional</i>	WAT270645 section 2 & WAT270133, Keypad, Fluidics Module
6	Display Test	<i>Display functions properly (all pixels)</i>	WAT270645 section 2 & WAT270208, Liquid Crystal Dot Matrix Display
7	Rear Panel Tests	<i>All rear-panel mounted and operator-accessible interfaces functional including IEEE-488, RS232 (2x), Events (in and out), analog output, column heater QSPI port</i>	WAT270645 section 3.4.2 & WAT270777
9	Degasser Test (if equipped)	<i>Pressure ≤ 1.3 PSIA</i>	WAT270700 section 3.3.3 (≤ 1.89 PSIA) & 735000585, Phase II Degasser Production Testing Concept and Test Limits, section 7 (≤ 1.41 PSIA) See Note 1 See Note 2.
10	Sparge Valve Test (if equipped)	<i>Correct sparge line (A, B, C, D) functions as sparge is enabled.</i>	2690 FSD Rev D, section B2 and 7.

Note 1: WAT270700 refers to the original (Phase 1) version of the degasser subassembly. 735000585 refers to the revised (Phase 2) version of the degasser subassembly.

Note 2: In some cases, the manufacturing specification is tighter than documented (performance specification, marketing requirements, etc.), to support product meeting customer expectations, within the capability of the process, accounting for normal variation and measurement uncertainty.

11	Heater/Cooler Test (if equipped)	<i>Heat and cool to within 2°C of set point</i>	WAT270801 section 3.3.1 (Accurate to within 3°C) See Note 2.
13	Solvent Inlet Plumbing Verification	<i>Correct lines fill with solvent as system is primed</i>	WAT270645 section 3.9.1
14	Sealwash Test (if equipped)	<i>Solvent flows out of seal wash exit tube when seal wash pump is turned on. Solvent flow stops when seal wash is turned off.</i>	WAT270645 section 3.9.2
15	Needle Wash Test	<i>Solvent flows out of yellow tube when needle wash pump is turned on. Solvent flow stops when pump is turned off.</i>	WAT270645 section 3.9.3
18	System Leak Test	≤ 160 PSI	WAT270645 section 3.9.2 (160 PSI leak measured from 60-90 seconds). See Note 2.
19	Injector Adjustment Test	Top: 38-50 Width: 60-90	721008073 section 8-7 top: 30-80, width: 50-120 See Note 2.
20	Compression Test	Decay ≤ 50 PSI	721008073 section 3.2.1, Fig 3-10 and Table 3-4. See Note 2.
21	Z-Ram Height Test	<i>Z-Ram height is correct per go/no-go gauge 9119925</i>	PSC – Z-Ram must be at correct height to properly engage carousel. See Note 2. See Note 5.
23	Carrier Alignment/RV Injection Test	<i>Teflon septa of 10 vials punctured by needle (Random Vial Test) or carousel positioned properly with average error $\leq 1^\circ$ for 20 injections (Carrier Alignment Test)</i>	PSC – position carousel accurately to inject from multiple positions to support WAT270645 section 3.9.3

24	Chemistry Tests	<i>Carryover < 0.010%</i>	<i>WAT270645 section 3.9.3 See Note 2.</i>
		<i>Linearity ≥ 0.999</i>	<i>WAT270645 section 3.9.3</i>
		<i>Injector Accuracy ≤ 1 ul</i>	<i>WAT270645 section 3.9.3</i>
		<i>Retention Time Standard Deviation ≤ 0.0090 min.</i>	<i>WAT270645 section 3.9.2 Flow Precision 0.02 min. SD See Note 2.</i>
		<i>Area Precision : ≤ 0.5% RSD</i>	<i>WAT270645 section 3.9.3 Inj. Precision :≤ 0.5% RSD</i>
		<i>System Pressure: Mean Ripple ≤ 65 PSI</i>	<i>PSC See Note 6.</i>

Note 5: Tool 9119925 is made of tool steel for daily production use, and is dimensionally equivalent to (aluminum) Gage, Z-axis, 2690 (405001118), with a height range of 1.880-1.921 (± 0.001).

Note 6: The documented pressure ripple spec was based on, and originally tested with Millennium (Chromatography Data Software, predecessor to Empower) Baseline Noise (filtered), as a standalone test. The pressure is now monitored during chemistry tests (without data filtering) to confirm solvent delivery performance prior to shipment. 65 PSI absolute ripple (max pressure – min pressure) is equivalent to the 2.5% filtered noise specified in WAT270645 and originally reported by Millennium. This specification supports solid chemistry (area and retention time performance) and can assist in troubleshooting issues.

TEST

Note: Before recording a test failure, ensure that the UUT has been thoroughly conditioned by the following methods:

- i. Introduce fully degassed solvent into the unit.
- ii. Properly condition UUT before each test and re-run failed tests at least once.
- iii. Adjust and tighten all critical fittings.
- iv. Verify set-up parameters and connections.

Note: Sections of this procedure assume that the operator has a basic knowledge of computer operation in a Microsoft Windows environment.

Note: To shut down the Empower Workstation:

- i. Log out of Empower. Close all programs.
- ii. Click on **Start, Shut Down**. Select **Shut Down the Computer?**. Click **Yes**.

Failure to follow these instructions may result in workstation damage.

1. ELECTRICAL SAFETY TESTS

- 1.1. Perform Electrical Safety Tests per Generic Hi-Pot & Leak Test Procedure, document WAT046538.
- 1.2. *Record Pass/Fail for Electrical Safety Tests on the Final Test Record.*

2. SYSTEM INITIALIZATION

WARNING: DO NOT POWER THE INSTRUMENT DOWN DURING THE SOFTWARE INSTALLATION PROCESS. BOOT PROM DAMAGE MAY RESULT.

- 2.1. Remove insulator from the CPU battery.
- 2.2. Install UUT left side cover and top cover.
- 2.3. Connect a line cord between the UUT power inlet and an AC outlet.
- 2.4. If UUT is not Ethernet-equipped, skip to step 2.6.
- 2.5. When the download station is powered up and fully initialized, connect a crossover Ethernet cable between the download station and the UUT.
 - 2.5.1. Turn the UUT on. At the first beep, press **Stop Flow** followed quickly by **Menu/Status**. The front panel should display 'Boot Loader Mode'.
 - 2.5.2. Wait for the Ethernet hardware to configure itself and acquire an IP address. The Ethernet hardware configuration is complete when the front panel displays "Please load application or contact Waters Service for assistance." Wait another 30 seconds for the Ethernet hardware to acquire an IP address, and then continue.
 - 2.5.3. Start the AutoLoader application.
 - 2.5.4. At the 'Instrument type could not be determined' message, press **OK**.
 - 2.5.5. Right-click on the Alliance item in the list and select the correct file per the instrument type (Alliance Separations Module or Altus A10 Solvent & Sample module).
 - 2.5.6. Check the Alliance item in the list and click the **Load Firmware** button.
 - 2.5.7. When the load finishes (~ 20 minutes) it will display 'Load Complete'. Cycle UUT power.
 - 2.5.8. For Altus SSM instruments, after a series of short beeps, press **Clear** and **8**. Cycle power at the prompt.
 - 2.5.9. Proceed to step 2.7.

2.6. Firmware Download, via floppy disk:

2.6.1. Insert the Software Disk into the UUT's floppy disk drive and turn the UUT on. After ~ 30 seconds, the system will detect the upgrade diskette and will prompt for an Enter to continue. Press **Enter** on the UUT front panel to continue. The system will read and install the firmware load utility from the floppy diskette.

2.6.2. Follow the instructions on the UUT screen. When prompted to install the available methods, press **Clear** (do not install the methods).

Note: Once completed, the screen will show 'Program Load Complete'.

2.6.3. Remove the floppy diskette and cycle power. Just after the logo appears with a series of short beeps, press **Clear** and **8**. Cycle power at the prompt.

Note: If there is a problem with the disk, the original firmware will remain intact.

2.6.4. *Record Pass/Fail for System Initialization on the Final Test Record.*

2.7. Press **Config** and **Set Clock**. Enter the current date and military time. Press **Set** and **Exit**.

2.8. Enter Serial Number. Press **Diag, Service Utilities** (password = 1147, **Enter**), **Serial Number**. Enter the serial number. Press **Enter, Exit, Exit**.

2.9. Press **Develop Methods**. Select 'Default' and press **Edit**.

2.10. Edit the Max Alarm to **5000** PSI. Press **Enter, Exit, Yes**.

2.11. The firmware type (Alliance/2695 or Altus A10) and version appear on the Main page. Verify that the correct firmware (type and version) is installed. On new instruments, the correct version will be found on the instrument's Bill of Materials.

3. POWER SUPPLY FAN TEST

3.1. Verify that the Power Supply fan is turning and verify that air is blowing out the UUT rear panel.

3.2. *Record Pass/Fail for Power Supply Fan Test on the Final Test Record.*

4. UNIT FAN TEST

4.1. Verify that the rear panel fan or heater/cooler exhaust fan is turning and air is blowing out the UUT rear panel.

4.2. *Record Pass/Fail for Unit Fan Test on the Final Test Record.*

5. KEYPAD TEST

5.1. Press **Diag, Other Tests**. Select **Keypad** and press **Enter**. Press each key and verify that the appearance of corresponding indicator changes. Press **Exit, Exit** when test is complete.

5.2. *Record Pass/Fail for Keypad Test on the Final Test Record.*

6. DISPLAY TEST

6.1. Press **Other Tests**. Select **Display** and press **Enter**.

6.2. Visually verify that the display is functioning properly.

6.3. *Record Pass/Fail for Display Test on the Final Test Record.*

7. REAR PANEL TESTS

- 7.1. Turn Power off.
- 7.2. Plug IEEE-488 cable from PC based test system, TE82573 to UUT rear IEEE port.
- 7.3. Plug Serial Port cable from test computer to modular jack connector J8, on the UUT CPU board.
- 7.4. Plug power cord from TE82573 into an AC outlet.
- 7.5. Plug Serial Port loopback connector(s) into the UUT serial port(s).
- 7.6. Plug the Event I/O Jumper Block into the green UUT Event I/O connectors.
- 7.7. Plug Column Heater cable into Column Heater connector on UUT rear panel.
- 7.8. Turn UUT power on.
- 7.9. If TE82573 is not powered up, turn on computer and monitor. To log in, press the **Ctrl, Alt** and **Del** keys simultaneously. Enter credentials (Login & Password) for the 'Tester' account. Click **OK**.
- 7.10. The test program will run automatically. If the test program is closed, double click the 2695-279x TEST desktop icon to open it.
- 7.11. Follow on-screen directions.
- 7.12. *Record Pass/Fail for Rear Panel Tests on the Final Test Record.*
- 7.13. Turn Power off and remove all cables installed in steps 7.2 to 7.7.

8. WET TEST PREP

- 8.1. Connect a line cord between the UUT power inlet and an AC outlet.
- 8.2. Place Seal Wash inlet line and Needle Wash inlet line (green) into filtered MeOH.
- 8.3. Run system waste (clear), needle waste (yellow), seal wash waste and red line to waste.
- 8.4. Route Solvent Inlet Lines A-D and sparge Lines A-D (if applicable) as follows:

A, B → MeOH C, D → Milli-Q H₂O
- 8.5. If equipped with sparge option, connect a 100 PSI helium source to the sparge inlet.
- 8.6. Wrap bottle openings with aluminum foil to prevent contamination and to contain vapors, but leave a small opening to maintain bottles at atmospheric pressure.
- 8.7. Turn on the instrument and wait for it to initialize. System will display '*Idle*' when ready.

9. DEGASSER TEST (IF EQUIPPED)

- 9.1. Observe the degasser vacuum level reading (PSIA)*.
Specification: Pressure $\leq$ 1.3 PSIA
- 9.2. *Record the pressure (PSIA) and Pass/Fail for Degasser Test on the Final Test Record.*
*** NOTE:** Default degasser state should be 'On' on most new models with new firmware. If degasser is 'Off' by (default state for some older models/older firmware); press **Menu/Status**. Turn degasser on → Move cursor over 'Off'. Press **Enter**. Select 'On' and press **Enter**. Wait for degasser pressure to stabilize before observing the vacuum level reading.

10. SPARGE VALVE TEST (IF EQUIPPED)

- 10.1. Test each sparge valve in sequence – e.g. 'A', 'B', 'C' and 'D'. → Turn each valve on by entering a value of 100. Confirm that each valve opens by observing bubbles from the associated sparge line. Turn each valve off by entering a value of 0. Confirm that each valve closes by ensuring that no bubbles leave the associated sparge line.
- 10.2. *Record Pass/Fail for each valve and for overall functionality on the Final Test Record.*
- 10.3. Turn all sparge valves on at 100%. After 15 minutes, reduce all valves to 30%.

11. HEATER/COOLER TEST (IF EQUIPPED)

- 11.1. Turn the heater cooler temperature on to 4°C by moving cursor to the 'set' field in the 'sample' box. Press **4**, **Enter**. When the unit reaches 6°C, set the heater cooler to 40°C. After the unit reaches 38°C, turn the heater/cooler "Off" by pressing the **clear** key in the 'set' box.
- 11.2. *Record Pass/Fail for the Heater/Cooler Test (if equipped) on the Final Test Record.*

12. PRIME UUT

- 12.1. Pin-plug the outlet of the pumptray inline filter.
- 12.2. Lightly shake each solvent inlet line and filter to remove any bubbles.
- 12.3. Press **Direct Function**. Select **Dry Prime** and press **Enter**. Press **Open D**.
- 12.4. Attach the line from the prime/purge module or a priming syringe to the GPV outlet tube.
- 12.5. Turn prime/purge module on, or pull a vacuum with a priming syringe until the solvent inlet line is free of air. Visually verify that inlet line 'D' is filled with solvent.
- 12.6. Repeat priming for all four channels, proceeding from 'D' to 'C' to 'B' to 'A'. Visually verify that the correct inlet line fills as the corresponding channel is primed.
- 12.7. Press **Cancel**, **Menu/Status**, **Diag**, **Other Tests**, ▽. Select **Turn off GPV** and press **Enter**.
- 12.8. Remove prime/purge module line or priming syringe and connect GPV outlet tube to primary check valve housing.
- 12.9. Attach a syringe to pumptray prime/vent valve. Open the prime/vent valve (CCW) ½ turn.
- 12.10. Press **OK** to return to normal state. Wait for GPV to reset.
- 12.11. Press **Exit**, **Menu/Status**. Enter a composition of **100% D**.
- 12.12. Press **Direct Function**, **Wet Prime**, enter **5 ml/min** for **1 minute**. Press **OK**.
- 12.13. Verify that the syringe fills with 5 ml of solvent.
- 12.14. Repeat for each remaining channel, proceeding from 'C' to 'A'. → To select different channels, move cursor into the desired composition box. Enter 100%. Press **Enter** and **Change Comp**.
- 12.15. Press **Direct Function**, **Wet Prime** and **OK**.
- 12.16. Verify that the syringe fills with 5 ml of solvent per channel.
- 12.17. Close Prime/Vent valve and remove syringe.
- 12.18. Remove pin-plug from pumptray inline filter.
- 12.19. Connect system line to pumptray inline filter.

13. SOLVENT INLET PLUMBING VERIFICATION

13.1. *Record Pass/Fail for Solvent Inlet Plumbing Verification on the Final Test Record.*

14. SEALWASH TEST (IF EQUIPPED)

14.1. Press **Menu/Status, Diag, Prime Sealwsh** and **Start**.

14.2. Attach a syringe to the sealwash outlet tube and pull a vacuum. There will be a few syringes of air before any solvent appears.

14.3. Check for leaks by looking for air bubbles in the sealwash tubes and solvent around fittings.

14.4. Visually verify that solvent is coming out of the seal wash outlet tube.

14.5. At the end of the test press **Halt** and **Exit** to complete the test.

14.6. Verify that solvent flow stops.

14.7. *Record Pass/Fail for Sealwash Test on the Final Test Record.*

15. NEEDLE WASH TEST

15.1. Select **Prime Ndlwsh** and press **Start**.

15.2. Confirm operation by observing MeOH flowing out the yellow line.

15.3. Verify correct plumbing of the V4 (green) lines.

15.4. After confirming flow, press **Close** to complete the test. Press **Exit**.

15.5. Verify that V4 closes by noting that MeOH stops flowing out of the yellow line.

15.6. *Record Pass/Fail for Needle Wash Test on the Final Test Record.*

16. MANUAL SYRINGE/SYSTEM PURGE PROCEDURE

16.1. Route the V3 inlet tubing to a waste bottle.

16.2. From the 'Main' page, press **Diag, Other Tests**. Select **Motor and Valve** and press **Enter**.

Note: In steps 16.3 to 16.8, press any number key to alter the state of the selected valve.

16.3. **Open V3, V2, V1**. Set flow to **9ml/min**, until flow exits the red line for 1 minute. Stop flow and cap the red line.

16.4. **Close V2**. Set flow to **0.2 ml/min**, until pressure = 4000-4600 PSI. **Stop Flow. Open V2**.

16.5. **Close V2, V1**. Set flow to **0.2 ml/min**, until pressure = 4000-4600 PSI. **Stop Flow. Open V2**. Remove cap from red line.

16.6. **Open V1**. Set flow to **9 ml/min** for **1 minute**.

16.7. Manually prime the syringe by:

16.7.1. Remove the knurled nut located at the bottom of the syringe plunger.

16.7.2. **Carefully**, move the plunger up and down until no bubbles remain in syringe.

16.7.3. Replace the knurled nut.

16.7.4. 'Close' and 'Open' V1 a total of 5 times to clear air from the V1 flow path.

16.8. **Close V1** and maintain flow at **9 ml/min** for **1 minute**.

16.9. Check the 'clear' waste line and verify that there is flow and that the stream contains no air bubbles. If bubbles are present, repeat procedure from step 16.4.

16.10. Stop flow. Connect the V3 inlet tubing to V3. Press **Normal States, Exit** and **Menu/Status**.

17. LEAK DETECTION PROCEDURE

- 17.1. Connect a 600 PSI (@ 1 mL/min MeOH) restrictor to the outlet of the red line.
- 17.2. Set the flowrate to **1.5 ml/min**. **Enter**.
- 17.3. Check all fittings for solvent leakage and tighten as necessary.
- 17.4. After 6 minutes, stop flow and remove the restrictor.

18. SYSTEM LEAK TEST

- 18.1. Plug the serial cable from the test station into the monitor port on the UUT CPU. Double-click the **Alliance Terminal** desktop icon.
- 18.2. Click on **T**ransfer, **S**end **T**ext File. Select correct 'Setup' file*. Click **O**pen.
- 18.3. Wait until the 2695> prompt returns.
- 18.4. Exit 'Alliance Terminal' program → **F**ile, **E**xit. Answer **Yes** to disconnect.
- 18.5. Disconnect serial cable from UUT CPU.

Note: Transferring the *Setup** text file configures the UUT for the System Leak Test. To perform a static leak test on the pumptray alone, reset the system to factory defaults by performing steps 18.1 to 18.5, but select the *Reset to Factory Defaults* text file**.

- 18.6. On UUT, press **Menu/Status, Other Tests**. Select **Static Leak Test** and press **Enter**. Follow directions, but plug the red line outlet with a union and pin plug instead of the inline filter.

Specification: Accumulator Decay $\leq$ 160 PSI

- 18.7. *Record Pass/Fail for System Leak Test on the Final Test Record.*
- 18.8. Remove the pin plug and union. Press **Close**.

19. INJECTOR ADJUSTMENT TEST

- 19.1. Connect a 600 PSI (@ 1 mL/min MeOH) restrictor to the red line.
- 19.2. From the UUT, press **Menu/Status, Direct function**. Scroll down and select **Purge Injector**, **Enter**. Accept the default loop volumes (**6**). Press **OK**. Check for air in V3 waste and syringe.
- 19.3. Press **Menu/Status, Adjust Seals** and **Start**.

Specifications: Top: 38 - 50
Width: 60 - 90

- 19.4. If UUT passes the Injector Adjustment Test, press **Accept Results**.

Note: If top value is less than 38, adjust sensor bracket up, if greater than 50, down.

- 19.5. If sensor bracket adjustments are necessary, press **Start Again** to repeat test.

Note: If the UUT reports 'missing restrictor', press **Start Again** to repeat test. If the unit fails, the sensor bracket adjustment is out of spec. Remove and replace injector.

- 19.6. *Record the values of 'Top', 'Width' and Pass/Fail on the Final Test Record.*

* Use 'Setup v 3.04+.txt' for firmware version 3.04+. Use 'Setup v 3.03.txt' for firmware version 3.03. Use 'Setup v 3.02-.txt' for firmware version $\leq$ 3.02.

** Use 'Reset to Factory Defaults v 3.04+' for firmware version $\geq$ 3.04. Use 'Reset to Factory Defaults v 3.03' for firmware version 3.03. Use 'Reset to Factory Defaults v 3.02-.txt' for firmware version $\leq$ 3.02.

20. COMPRESSION TEST

- 20.1. Press **Menu/Status**, **Direct Function**. Select **Purge Injector** and press **Enter**.
- 20.2. Select the following values:
Sample loop volumes: **6.0 Enter**
Compression Check: **Selected** (Press any number key to select.) **Enter**
- 20.3. After test, press **Menu/Status** and **Comp Check** to view results.
Specification: Decay $\leq$ 50 PSI.
- 20.4. *Record Compression Test decay pressure and Pass/Fail on the Final Test Record.*
- 20.5. Press **Close** to return to the diagnostics screen.

21. Z-RAM HEIGHT TEST

Note: If the instrument has a molded plastic sample compartment, refer to Appendix, Section 1.

- 21.1. Ensure that the heater/cooler is off and that the sample compartment is at room temperature.
- 21.2. Open sample compartment door. Press **C** key on UUT keypad.
- 21.3. Using the Go/No-Go gage, P/N 9119925, check the Z-Ram height. The short portion of the tool should pass under the Z-Ram and the tall portion should not (see Figure 1).

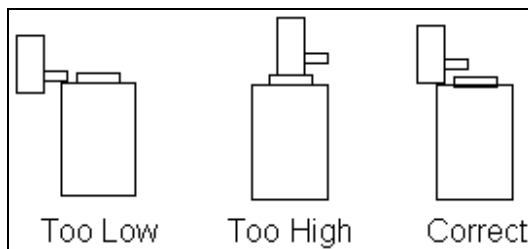


Figure 1 Z-Ram Height Test

- 21.4. If the Z-Ram is adjusted incorrectly, remove and replace the carousel carrier assembly.
- 21.5. *Record Pass/Fail the Z-Ram Height Test on the Final Test Record.*

22. PREP FOR COMPLETION OF TESTS

- 22.1. From the 'Main' page, press **Config**.
- 22.2. Move cursor to the IEEE address box. Set IEEE address as follows:
Test Station 1 → **2** Test Station 2 → **4** Test Station 3 → **6** Test Station 4 → **8**. Press **Exit**.
- 22.3. Connect the IEEE cable from the Empower workstation and I/O cable from 2489 detector to rear panel of the UUT.
- 22.4. Turn the UV detector lamp 'ON' and let it warm up for *at least* 1/2 hour before using it.
- 22.5. Verify that the Temperature Control Module is set to 30°C.
Note: To set TCM, press Select, Column Heater #, Set, 3, 0, 0 and Enter.
Note: If the Empower Workstation is shut down, power up computer and monitor.
 1. When prompted to, press the **Ctrl**, **Alt** and **Del** keys simultaneously.
 2. Log into the 'Tester' account. Click **OK**.
 3. Double-click the Empower desktop icon (login=tester, no password).
- 22.6. From the Empower main screen, right click on **Configure System**. Select **Projects**.
- 22.7. In the Configuration Manager page, right click on **ALLIANCE_TEMPLATE_Rev 1.8** and select **Clone**.

22.8. Set up the Clone Project window as follows (See Figure 2).

New Project Name Seed: Enter (or scan) the **Unit Serial Number**.
of Copies: 1
Prefix: Blank, Increment unchecked
Suffix: Blank, Increment unchecked
Set Project Comment: Unchecked

22.9. Click **OK**.

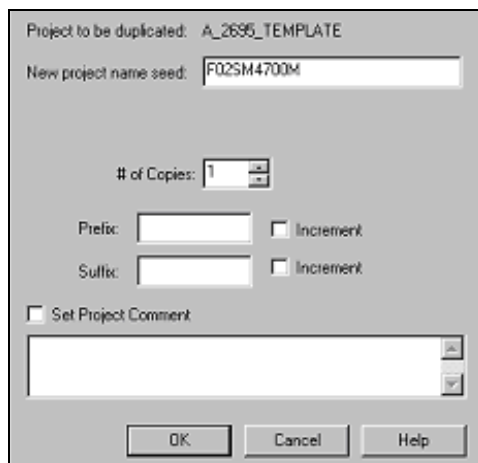


Figure 2 Clone Project Window

23. CARRIER ALIGNMENT/RV INJECTION TEST

23.1. Insert two empty vials with unused septa in each carousel tray, A through E, in position numbers 1, 13, 25, 37, 49, 61, 73, 85, 97 & 109.

23.2. Load carousels into sample compartment.

23.3. From the UUT 'Main' page, select **Diag, Other Tests**, scroll to **Carousel**. Press **OK**.

23.4. In the New Vial window, type in **1, Go To Vial**. Wait until Current Vial displays '1'. Open sample compartment door and check carrier for free-play. Close sample compartment door.

23.5. In the New Vial window, type in **49, Go To Vial**. Wait until Current Vial displays '49'. Open sample compartment door and check carrier for free-play.

23.6. Close sample compartment door. Press **Exit, Exit**.

23.7. If the unit fails the carrier alignment test, remove and replace the carousel carrier assembly.

23.8. From the Empower Main screen, click on **Run Samples**. Select the project created in steps 22.6 to 22.9 and the appropriate system (**2695_1, 2695_2, 2695_3** or **2695_4**). Click **OK**.

Note: If a 'Bringing system 2695_X online' message appears, click **OK**.

23.9. Click on the Load icon

23.10. Choose the default (Load using a previously created sample set method). Click **OK**. Select **RV** (Random Vial). Click **Open**.

23.11. Click on the green Run icon

23.12. When test is complete, remove carousels and verify that each vial septum has a needle puncture.

Note: On one unit per day, perform the CCD test per Appendix, Section 2.

23.13. *Record Pass/Fail for the Carrier Alignment/RV Injection Test on the Final Test Record.*

24. CHEMISTRY TESTS

24.1. If equipped with sparge option, turn all four sparge lines on at 100%.

24.2. Fill vials (with split septum) and place in the following positions (Carousel A).

Vial	Test, Solution	Part Number	Cap Color
1	Precision	700003741-3	Blue
2	Linearity	700003741-1	Black
3	Carryover, Blank	700003741-9	White
4	Carryover, Standard	700003741-7	Green
5	Carryover, Challenge	700003741-8	Red
6	Carryover, Blank	700003741-9	White

24.3. In the Empower 'Run Samples' screen, click on the Load icon .

24.4. Choose the default (Load using a previously created sample set method). Click **OK**. Select **PRIME**. Click **Open**.

24.5. Click on the green Run icon . Click **Run**.

24.6. Click on the Load icon  (It's OK to click Load  while the prime is still running).

24.7. Choose the default (Load using a previously created sample set method). Click **OK**. Select **COMPLETE TEST**. Click **Open**.

24.8. Fill in (or scan) the Operator_Name, Part_Number and UUT_Firmware columns. See Figure 3.
Note: If entering data via keyboard, fill in the first row in each column and press **Ctrl, D** to fill down into the remaining rows below.

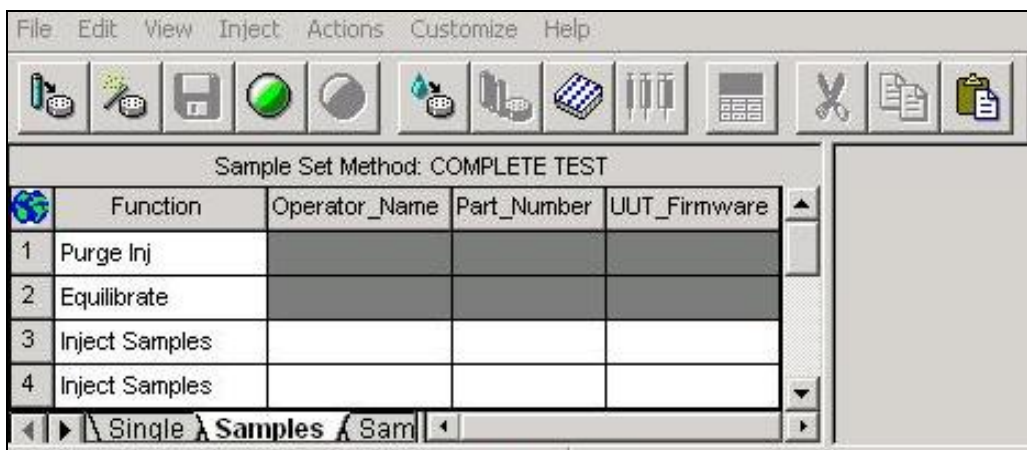


Figure 3 Complete Test Sample Set

24.9. Click on the floppy disk  icon to save the modified sample set.

24.10. Click on the green Run icon .

24.11. Select the desired printer. Click **Run**.

Note: The COMPLETE TEST Sample Set will run after the PRIME sample set is complete.

Note: Empower will generate reports for Carryover, Linearity, Precision AC and Precision BD as the tests are completed.

Note: On the Precision reports, ensure that all seven rows in the Caffeine column contain data. The test results appear in the bottom row of that column. Failing chromatography or ripple test results will appear in a **LARGE BOLD** font (Linearity and Carryover failing data is not flagged in this manner).

Specifications:

- Carryover $\leq 0.002\%$
- Linearity $R^2 \geq 0.999$
- Linearity |X Intercept| ≤ 1 ul
- Precision Tests, Retention Time SD ≤ 0.0090 minutes
- Precision Tests, Area $\leq 0.5\%$ RSD
- AC Precision, System Pressure Mean Ripple ≤ 65 PSI

24.12. *Record Pass/Fail for AC Flow Precision Test, System Pressure Test and BD Flow Precision Test on the Final Test Record.*

Note: If any test fails, repeat from step 24.6, but choose the sample set method to repeat only the required test as outlined below. If the instrument sits for an extended period of time (> 2 hours), run the PRIME sample set per steps 24.3 to 24.5 before repeating from step 24.6.

Sample Set Method	Description
PreBlank	Injects a blank sample to verify system cleanliness
Manual Carryover*	Runs carryover test injections (standard, challenge & blank)
Linearity	Runs the injector linearity test (5-100 ul)
Precision AC	Runs the A/C valve pair precision Test
Precision AC no ripple	Runs the A/C valve pair precision test without ripple
Precision BD	Runs the B/D valve pair precision test
Ripple Repeat	Runs a 15 minute ripple test

*Note: Manual Carryover sample set is required to see carryover percentage (Carryover sample set will not report carryover percentage).

24.13. Exit 'Run Samples' → **File, Exit** (to obtain manual control of instrument via front panel).

25. FINAL PREP/CONFIGURATION

- 25.1. Remove carousel.
- 25.2. Remove C and D solvent lines from the Milli-Q water bottle and place them into an MeOH bottle.
- 25.3. Set the composition to 50% C and 50% D. Press **Direct Function**, **Wet Prime** and select **10 ml/min** for **4 minutes**. Press **OK**.
- 25.4. After WetPrime is complete, remove all solvent lines from bottles and disconnect red line from column heater inlet.
- 25.5. Cycle UUT power. Just after the logo appears with a series of beeps, press **Clear**, **0**.
- 25.6. At the prompt, cycle UUT power. When the system displays 'idle', all parameters (including all lifetime, error log, trace log and system memory data) have been reset.
- 25.7. If UUT is floppy-drive equipped, and not a 2695D, import AutostartPlus methods. Otherwise, skip to step 25.8.
 - 25.7.1. Place Firmware Software Disk into the UUT diskette drive.
 - 25.7.2. From the 'Main' page, press the **Develop Methods** key.
 - 25.7.3. Press the **More** key 2 times.
 - 25.7.4. Press the **Import Methods** key and wait for the methods to appear.
 - 25.7.5. Press the **Invert Choices** key to select all methods.
 - 25.7.6. Press the **Import Now** key. Wait for import to complete.

Note: Import is complete when floppy drive LED is off for > 10 seconds.
- 25.8. Press **Diag**, **Prime Sealwash**, **Start**. When Sealwash lines are empty, press **Halt**, **Close**.
- 25.9. Press **Prime Needlewash**, **Start**. When prime completes, press **Start** one more time (prime 2X total). Verify that Needlewash lines are dry. Repeat Needlewash prime if necessary.
- 25.10. Press **Close**, **Exit**.
- 25.11. Attach line from the Prime Purge Module (TE82733) to the UUT prime/vent valve.
- 25.12. Open the prime/vent valve by turning counter-clockwise ½ turn.
- 25.13. Turn the Prime/Purge Module pump on and open the Prime/Purge Module valve.
- 25.14. From the Status page press **Direct Function**. Select **Dry Prime**, press **Enter** and **Open A**.
- 25.15. After 2 minutes press **Open B**.
- 25.16. Repeat step 25.15 for the remaining channels (C & D).
- 25.17. Check all lines to verify that they are dry.
- 25.18. After purge is complete, press **Cancel**. Turn the Prime/Purge module switch off and close the Prime/Purge Module valve.
- 25.19. Disconnect the line from, and close the prime/vent valve.
- 25.20. Turn UUT off. Disconnect the AC line cord, IEEE and Event I/O cables from UUT.

26. FINAL TEST RECORD COMPLETION

- 26.1. Ensure that all test results appear on the Final Test Record.
- 26.2. Sign and date the form. **Note:** All entries must be in blue or black ink.

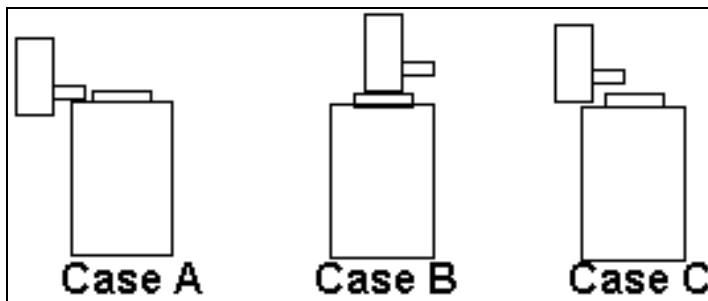
27. FINAL SYSTEM PREP

- 27.1. Refer to the Final Prep Procedure, Doc WAT271402. Fill out the prep and configuration check off sheets as indicated. Initial when each task is completed.

Appendix

1. Z-RAM HEIGHT/OPTO FENCE TEST WITH ROTATIONALLY MOLDED SAMPLE COMPARTMENT

- 1.1. Start with the unit powered 'On' and at room temperature.
- 1.2. Using the Go/NoGo gage, P/N 9119925, check whether the Z-Ram is at the proper height. If no part of the gage will fit under the Z Ram, the Z-ram is adjusted too low. Call this case "A". Go to step 1.3.



If the Go/No Go gage passes completely under the Z-Ram, the Z-ram is adjusted too high. Call this case "B". Go to step 1.4.

If the Go/No-Go test passes, the Z-ram is adjusted at the correct height. Call this case "C". Go to step 1.5.

1.3. Case "A"

Remove the sample compartment cover. Remove 0.012" tape from skid plate using WD-40 or equivalent. Replace skid plate and re-check again using Go/No-Go gage. If the check fails, contact engineering for resolution. If the check passes then continue.

Install the modified carousel (C) and the (D) carousel in their respective positions. Press **'Menu/Status'** and **'Config'** keys. Turn off vial presence sensor and exit the screen by pressing the **'Exit'** key. Press **'Develop Method'** key and select **'Opto Fence Test'**. Run the respective **'Opto Fence Test'** method.

If a Z-axis carousel error message appears, remove and replace the carousel/carrier assembly.

If the carousel/carrier drive passes the test, confirm operation by replacing the modified carousel with a standard carousel. Repeat the **'Opto Fence Test'**

Turn vial sensor back **'ON'**.

Record Pass/Fail on the Final Test Record.

1.4. Case "B"

Check carousel/carrier casting screws. Make sure the three mounting screws are tight.

Add 0.012" tape strips to .012" tape strips on bottom of skid plate. Replace plate and re-do the Go/No-Go test again. If the test fails add another .012" tape strip and re-check. If this test fails, contact engineering.

Install the modified carousel (C) and the (D) carousel in their respective positions. Press **'Menu/Status'** and **'Config'** keys. Turn off vial presence sensor and exit the screen by pressing the **'Exit'** key. Press **'Develop Method'** key and select **'Opto Fence Test'**. Run the respective **'Opto Fence Test'** method.

If a Z-axis carousel error message appears, remove and replace the carousel/carrier assembly.

If the carousel/carrier drive passes the test, confirm operation by replacing the modified carousel with a standard carousel. Repeat the **'Opto Fence Test'**

Turn vial sensor back **'ON'**.

Record Pass/Fail on the Final Test Record.

1.5. Case "C"

Install the modified carousel (C) and the (D) carousel in their respective positions. Press **'Menu/Status'** and **'Config'** keys. Turn off vial presence sensor and exit the screen by pressing the **'Exit'** key. Press **'Develop Method'** key and select **'Opto Fence Test'**. Run the respective **'Opto Fence Test'** method.

If a Z-axis carousel error message appears, remove and replace the carousel/carrier assembly.

If the carousel/carrier drive passes the test, confirm operation by replacing the modified carousel with a standard carousel. Repeat the **'Opto Fence Test'**.

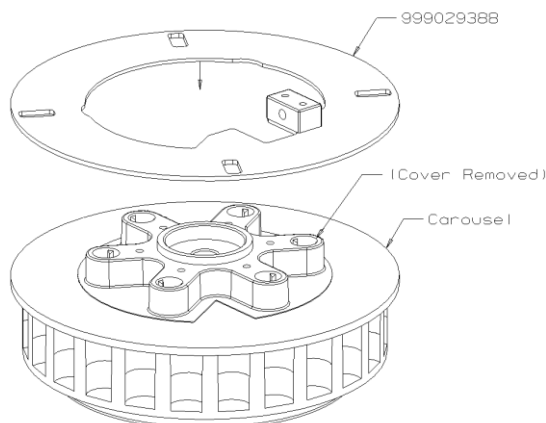
Turn vial sensor back **'ON'** and remove the carousels.

Record Pass/Fail on the Final Test Record.

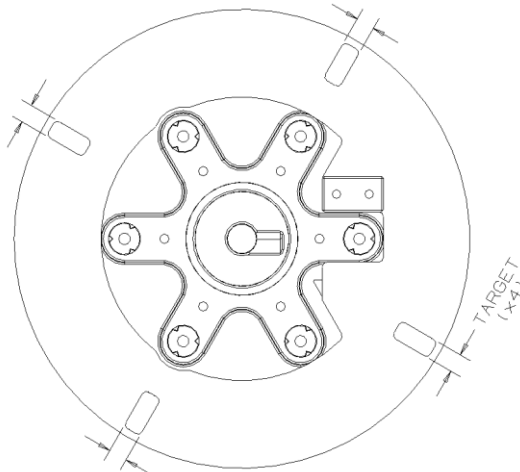
Appendix

2. CCD TEST

- 2.1. Apply a paper target (999028931) to each Alliance carousel.
- 2.2. Turn the vial presence sensor 'off' (Press **Config**, turn sensor 'off', press **Exit**).
- 2.3. From the Empower Main screen, click on **Run Samples**. Select the project created in steps 22.6 to 22.9 and the appropriate system (**2695_1**, **2695_2**, **2695_3** or **2695_4**). Click **OK**.
Note: If a 'Bringing system 2695_X online' message appears, click **OK**.
- 2.4. Click on the Load icon .
- 2.5. Choose the default (Load using a previously created sample set method). Click **OK**. Select **Test CCD**. Click **Open**.
- 2.6. Click on the green Run icon . Click **Run**.
- 2.7. Wait for test to complete and remove carousels.
- 2.8. Turn vial presence sensor back 'on' (Press **Config**, turn sensor 'on', press **Exit**).
- 2.9. Inspect injection puncture locations using SmartScope:
 - 2.9.1. After carousels have been inspected, calculate the average of all 'Average Angle Deviation' values (UUT Average). Archive the SmartScope reports or maintain a log of these values for SPC analysis.
 Specification: UUT Average $\leq 1^\circ$.
- 2.10. Or alternatively, with CCD Test Gage:
 - 2.10.1. Remove all carousels from UUT.
 - 2.10.2. Install the CCD test gage (999029388) to each carousel with the slot aligned with carousel position 1. **Note:** Carousel must be modified (top cover must be removed to install CCD test gage).



- 2.10.3. Ensure that all 4 punctures are completely within the target range for each carousel (20 punctures total).



WATERS CORPORATION - TEST RECORD

Part Number: _____	Product: _____
Operator: _____	Start Date/Time: _____
Serial Number: _____	End Date/Time: _____
Test System: _____	Order: _____
Test Software: _____	Location: _____

TMD:

Firmware:

Test Name	LSL	Measurement	USL	Unit	Outcome		
Electrical Safety Tests	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
System Initialization	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Power Supply Fan Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Unit Fan Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Keypad Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Display Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Rear Panel Tests	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Degasser Test (if equipped)	—		1.3	PSIA	PASS ☐	FAIL ☐	See Event Log ☐
Sparge Valve Test (if equipped)	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Heater/Cooler Test (if equipped)	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Solvent Inlet Plumbing Verification	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Sealwash Test (if equipped)	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Needle Wash Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
System Leak Test	—		160	PSI	PASS ☐	FAIL ☐	See Event Log ☐
Injector Adjustment Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Top	38		50	Steps			
Width	60		90	Steps			
Compression Test	—		50	PSI	PASS ☐	FAIL ☐	See Event Log ☐
Z-Ram Height Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐

WATERS CORPORATION - TEST RECORD

Part Number: _____ Serial Number: _____

Test Name	LSL	Measurement	USL	Unit	Outcome		
Carrier Alignment/RV Injection Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
Carryover Test	—		0.002	%	PASS ☐	FAIL ☐	See Event Log ☐
Linearity – [X-Intercept]	—		1.0	—	PASS ☐	FAIL ☐	See Event Log ☐
Linearity – R-Squared	0.999		—	—	PASS ☐	FAIL ☐	See Event Log ☐
AC Precision Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
RT Precision	—		0.0090	Min.			
Area Precision	—		0.5	% RSD			
PSI Ripple	—		65	PSI			
BD Precision Test	—	—	—	—	PASS ☐	FAIL ☐	See Event Log ☐
RT Precision	—		0.0090	Min.			
Area Precision	—		0.5	% RSD			

Note: Fill in 'N/A' if not applicable.Instrument Final Test Overall Result - PASS ☐ FAIL ☐

Signed:

Date:

END OF DATA