



ACQUITY H-Class I-Class Introduction



Course Overview



- Combined H-Class and I-Class Course
- H-Class will be covered as it differs from ACQUITY Classic
- I-Class will be covered as it differs from H-Class and ACQUITY Classic
- Format:
 - Short lectures to introduce system, modules or components
 - Workbook-based lab activities- ~80% of course time
 - All pertinent PM and service procedures covered as they differ from ACQUITY CLASSIC
 - Taking apart modules is encouraged!
 - Cautions will be pointed out for fragile cables etc.
 - Certification based on completion of workbooks service procedures and successful retest of systems



ACQUITY H-Class I-Class Systems Overview

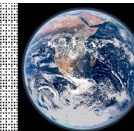


ACQUITY H-Class System

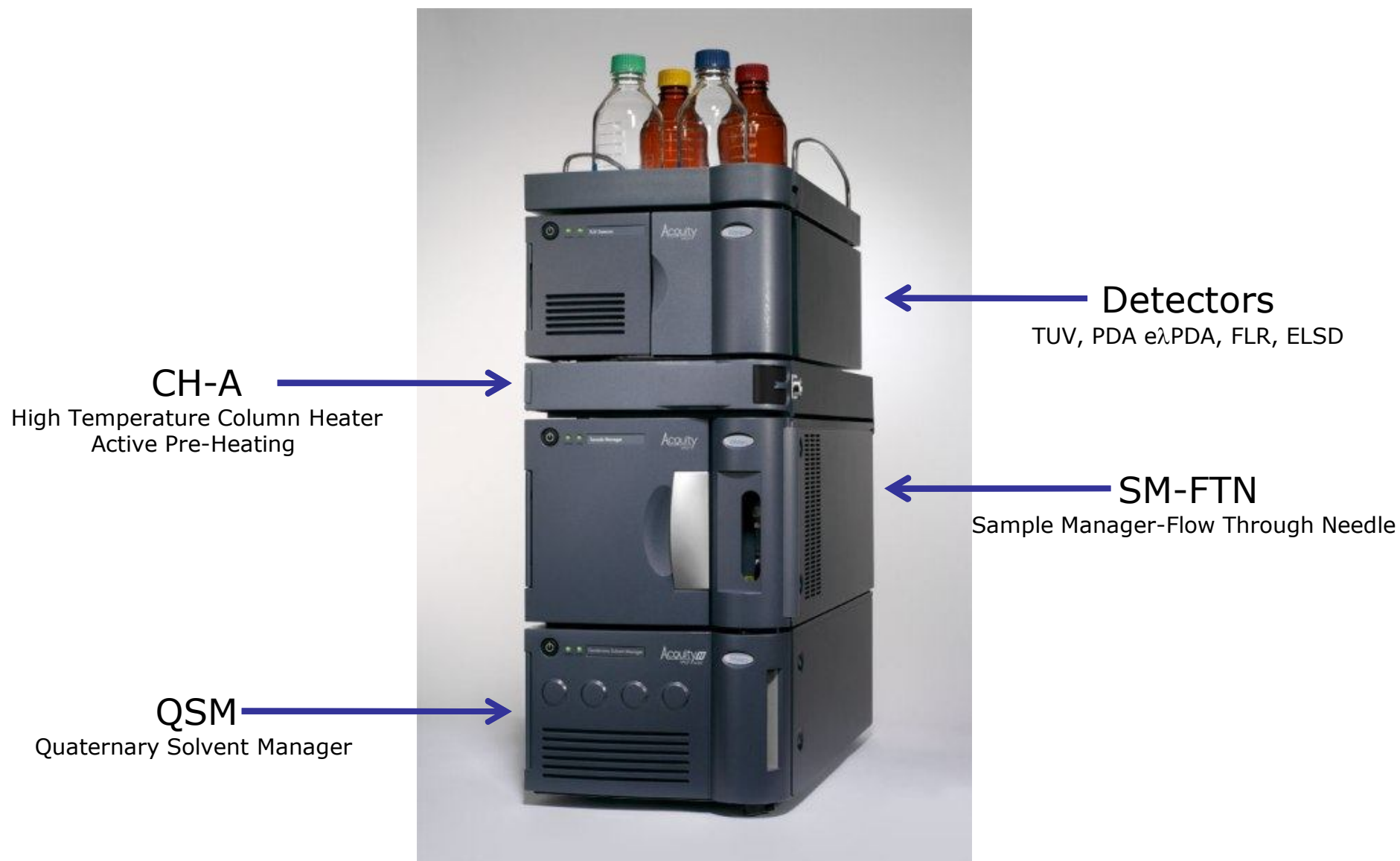


- New addition to the ACQUITY family
- Allows customers to move up to UPLC while making it easier to run existing HPLC methods on the same instrument
- The ACQUITY H-Class System consists of the following:
 - Quaternary Solvent Manager (QSM)
 - Four solvent low pressure gradient mixing
 - Supports UPLC Pressures
 - Low gradient delay volume
 - SM-FTN (Sample Manager-Flow Through Needle)
 - One injection mode- direct inject type
 - Much simpler- Just specify injection volume
 - Excellent recovery and precision
 - CH-A
 - High temperature column heater with active pre-heating
 - Normal choice of detectors
 - More options to be added

ACQUITY H-Class System



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ACQUITY UPLC I-Class System



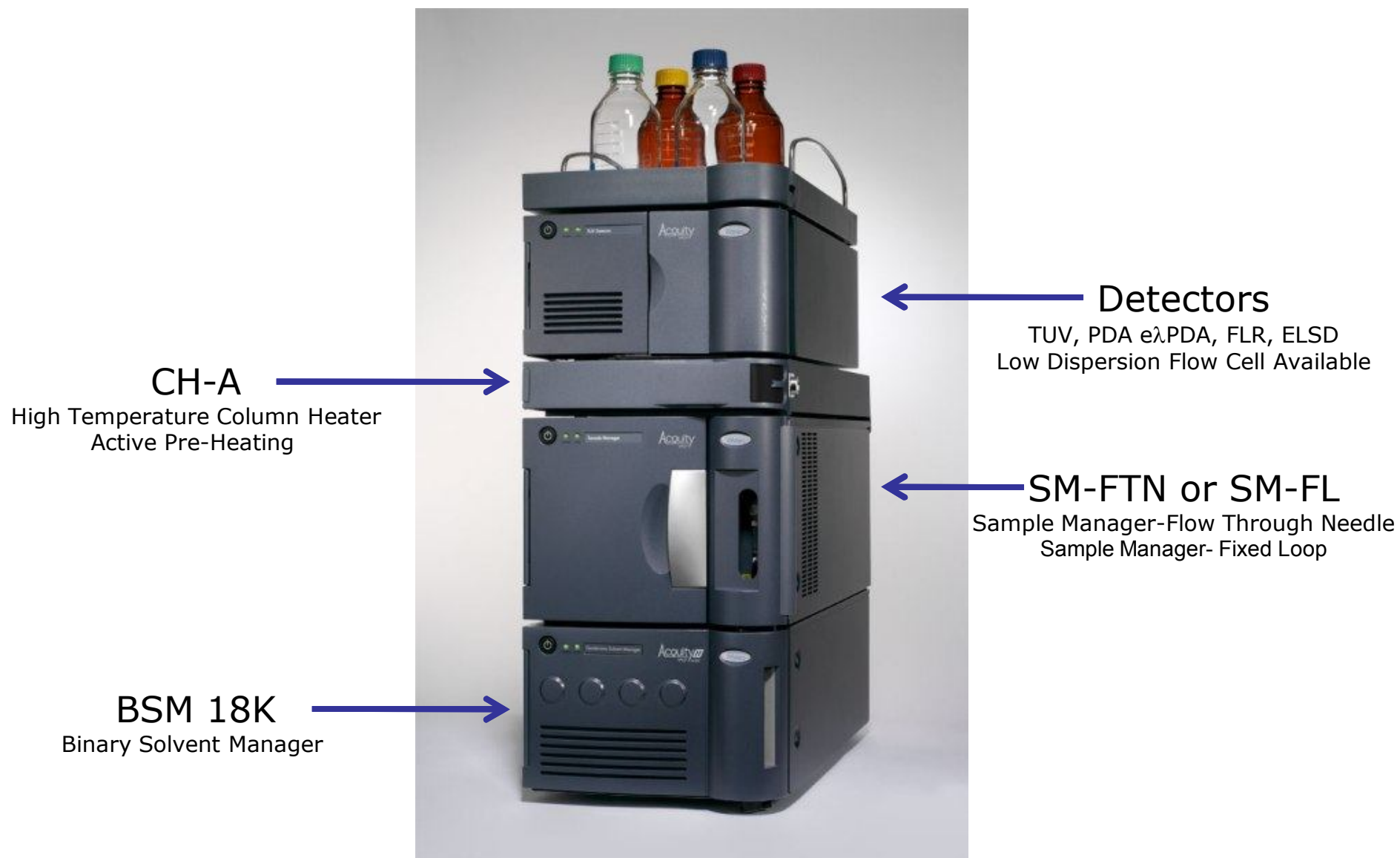
- Binary Solvent Manager (18K PSI Capable)
- Sample Manager (2 options)
 - Fixed-Loop (FL) Sample Manager
 - Flow-Through-Needle (FTN) Sample Manager
- Column Management (2 options)
 - Single Column Heater
 - Dual Column Manager
 - Max 2 columns
 - Optional 2D Technology feature
- Detection
 - MS
 - TUV or PDA only – new lower dispersion flow cells
- New ACQUITY UPLC Systems Driver Pack (DP 3)
- Existing ACQUITY UPLC Chemistries



ACQUITY I-Class System



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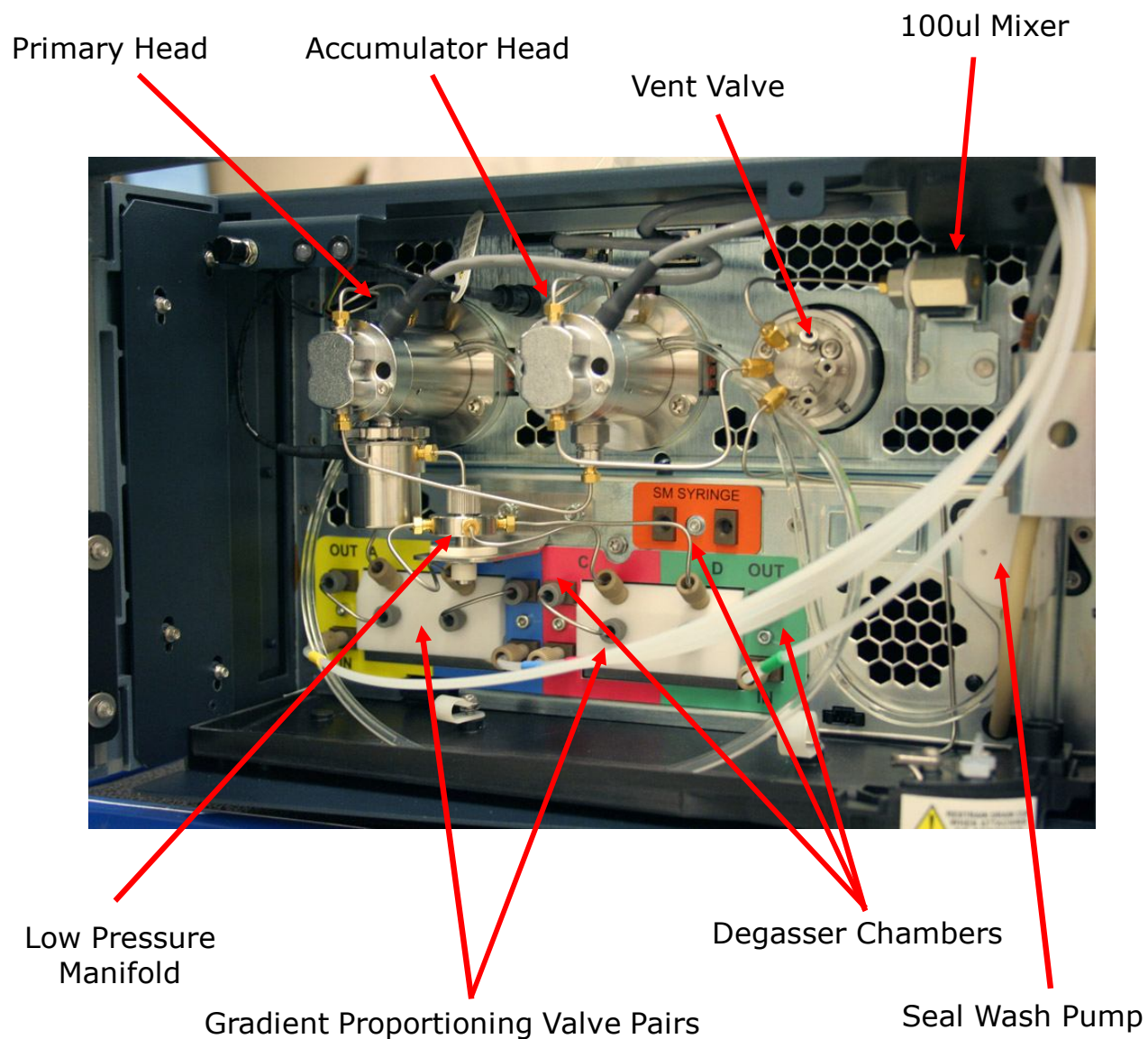
ACQUITY UPLC I-Class Key Product Compatibility



- ACQUITY UPLC I-Class is fully compatible with:
 - All Waters' current high-end MS detectors
 - Empower 1154, Empower 2154 and Empower 3
 - UNIFI version 1.50
- ACQUITY UPLC I-Class is compatible with:
 - AB/Sciex Analyst version 1.4.2/1.50 with Driver Pack v1.50
 - Regulated users cannot move immediately
- ACQUITY UPLC I-Class is not compatible with:
 - Agilent
 - Dionex
 - Thermo
 - ACQUITY UPLC should continue to be positioned



H-Class QSM Fluidics



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I-Class BSM Fluidics

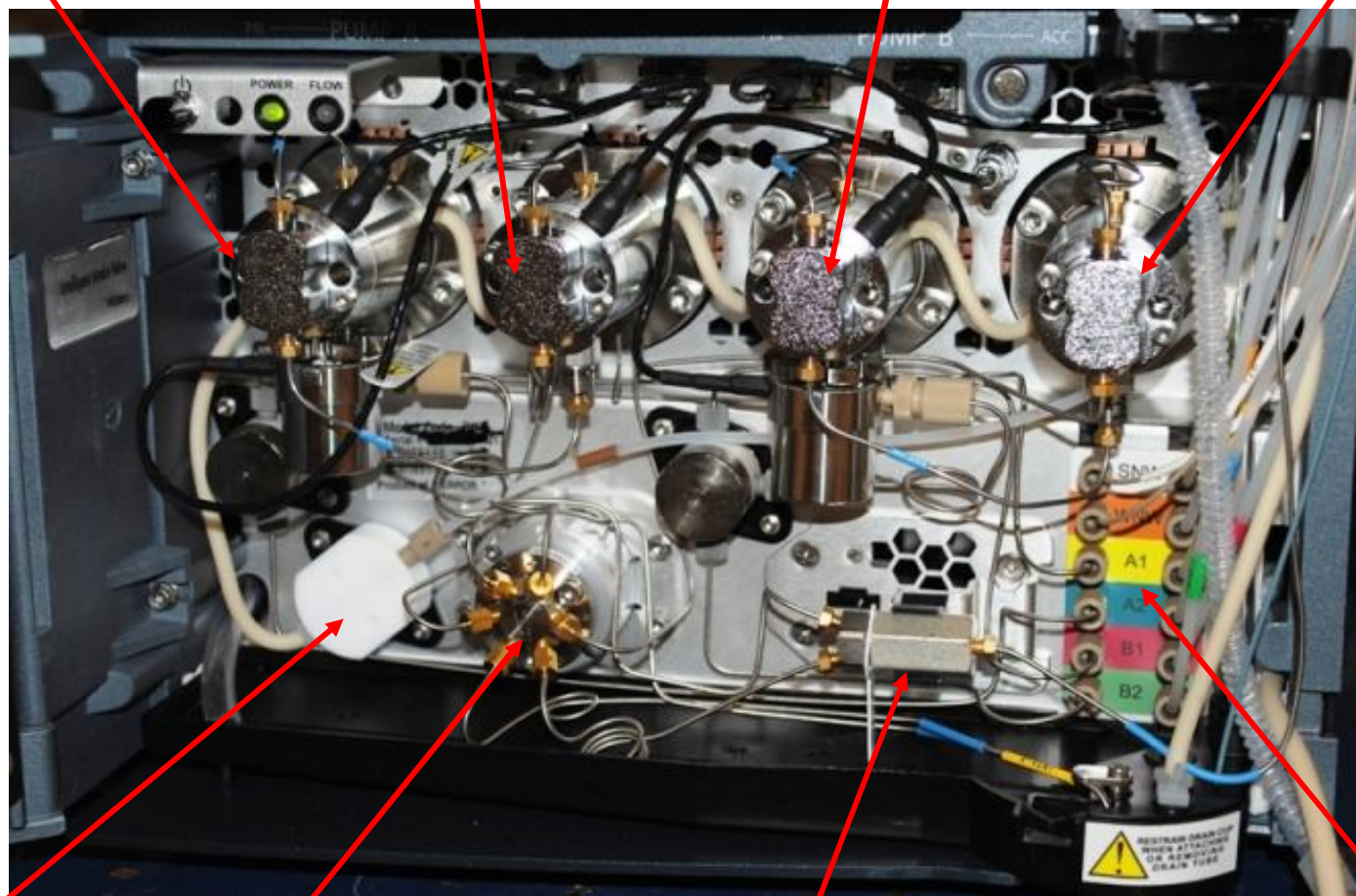


Pump A- Primary Head

Pump A- Accumulator Head

Pump B- Primary Head

Pump B- Accumulator Head



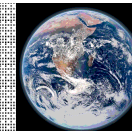
Seal Wash Pump

Vent Valve

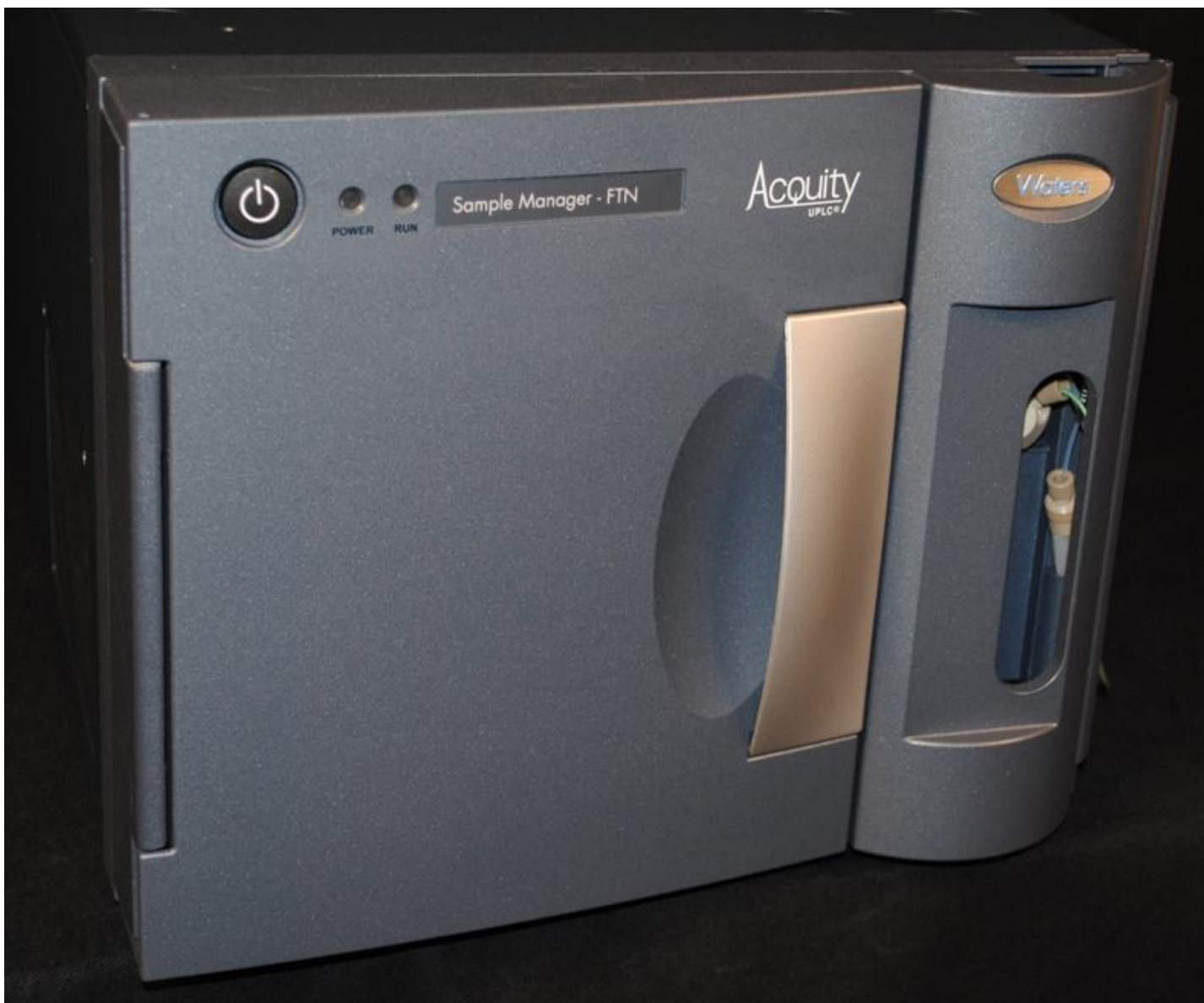
18K 50ul Mixer

Degasser Chamber

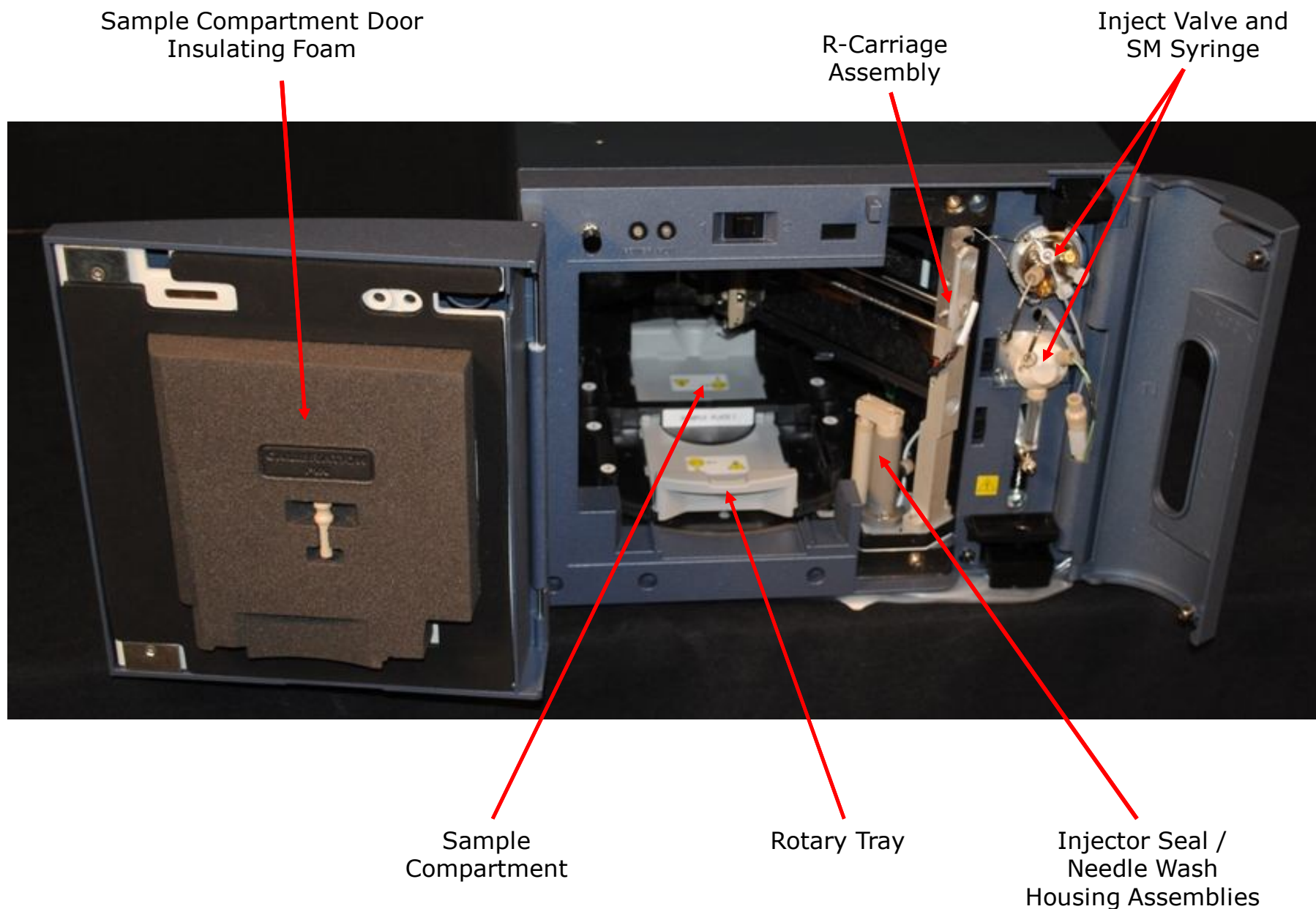
Common Platform SM- (FTN or FL)



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SM- Common Component Overview



ACQUITY UPLC H-Class System Sample Manager



- FTN Is Only Configuration Available
 - Select based on application needs and laboratory work flow



ACQUITY UPLC I-Class System Sample Manager



- FTN or FL Configuration
 - Lower dispersion injector components
 - 18K psi capable
 - Select based on application needs and laboratory work flow



I-Class Sample Managers



Fixed Loop

- New EverFlow inject valve to enable higher pressures
- H-Class chassis and robust rotary sample tray/plate mechanism
- Compatible with newest Sample Organizer (18 shelves)
- New low dispersion fittings, shorter sample path for the FL
 - More robust sample transfer
- Low dispersion 1, 2, 5 and 10 μL loop design
 - Conventional 20, 50, 100 and 250 μL available
- System volume <95 μL

Flow Through Needle

- New EverFlow inject valve design to enable higher pressures
- H-Class chassis and robust rotary sample tray/plate mechanism
- Compatible with newest Sample Organizer (18 shelves)
- New low dispersion fittings, lower dispersion return line for the FTN
- Optional, conventional extension loops
- System volume <100 μL

I-Class FTN vs. I-Class FL: Comparison Summary



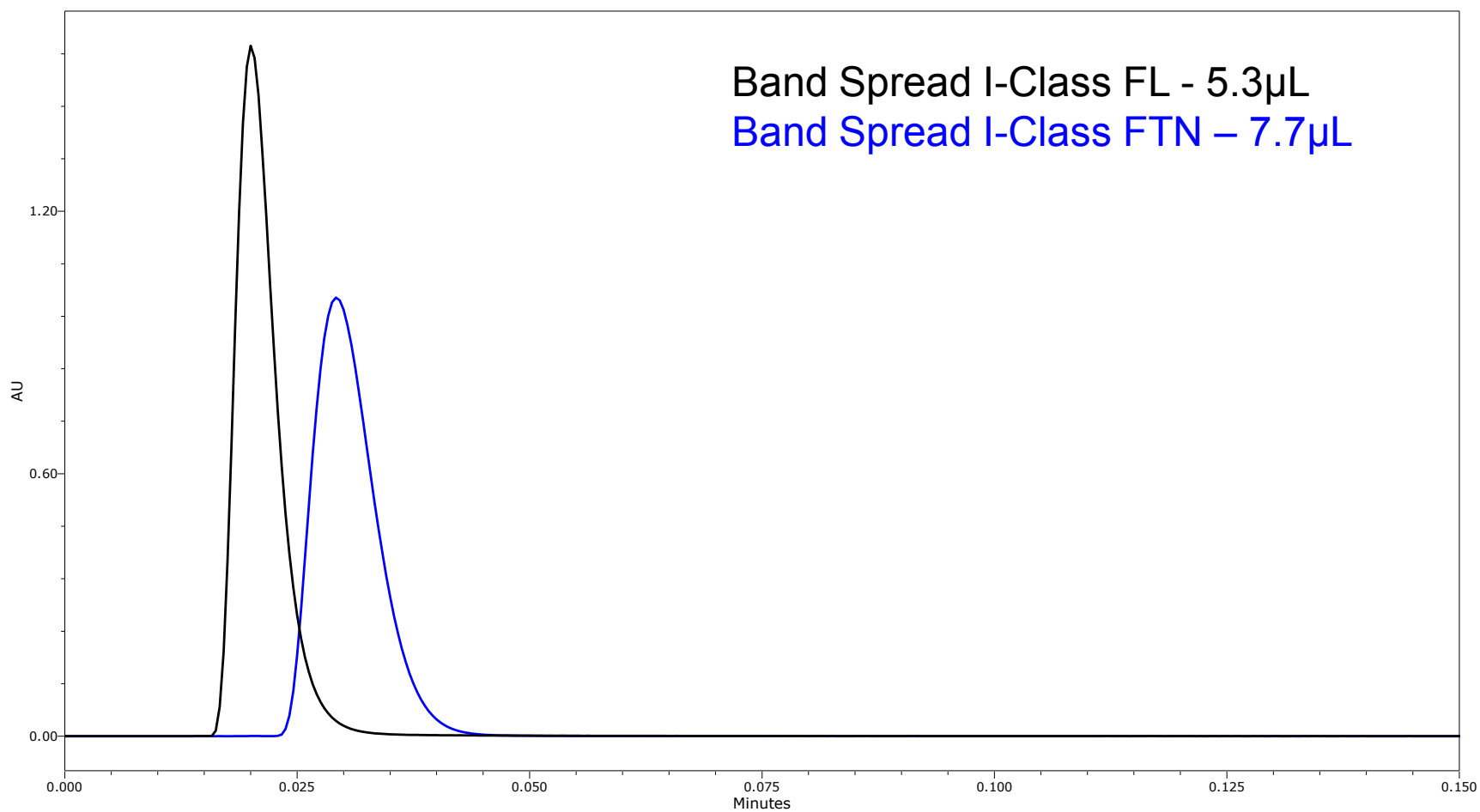
	ACQUITY	I-Class FTN	I-Class FL
Dwell Volume*	120 µL	100 µL	95 µL ✓
Bandsread	12 µL	<9 µL	<7 µL ✓
Precision	<0.3% Full loop <1.0% PLUNO 10% to 75% of loop	<1% 0.2 to 1.9 µL <0.5% 2 to 10 µL	<1% 0.2 to 1.9 µL <0.5% 2 to 10 µL PLUNO 10% to 75% of loop
Carryover	0.005 %	0.001 %* ✓	0.002 %
Sample Discrimination	Hydrophobic Samples	None ✓	Hydrophobic Samples
Cycle Time	< 15 sec w/Load Ahead	TBD	TBD ✓
User Simplicity	3 injection modes, loop changes	Single injection mode ✓	3 injection modes, loop changes

*Specification

Band Spread Comparison

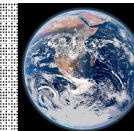


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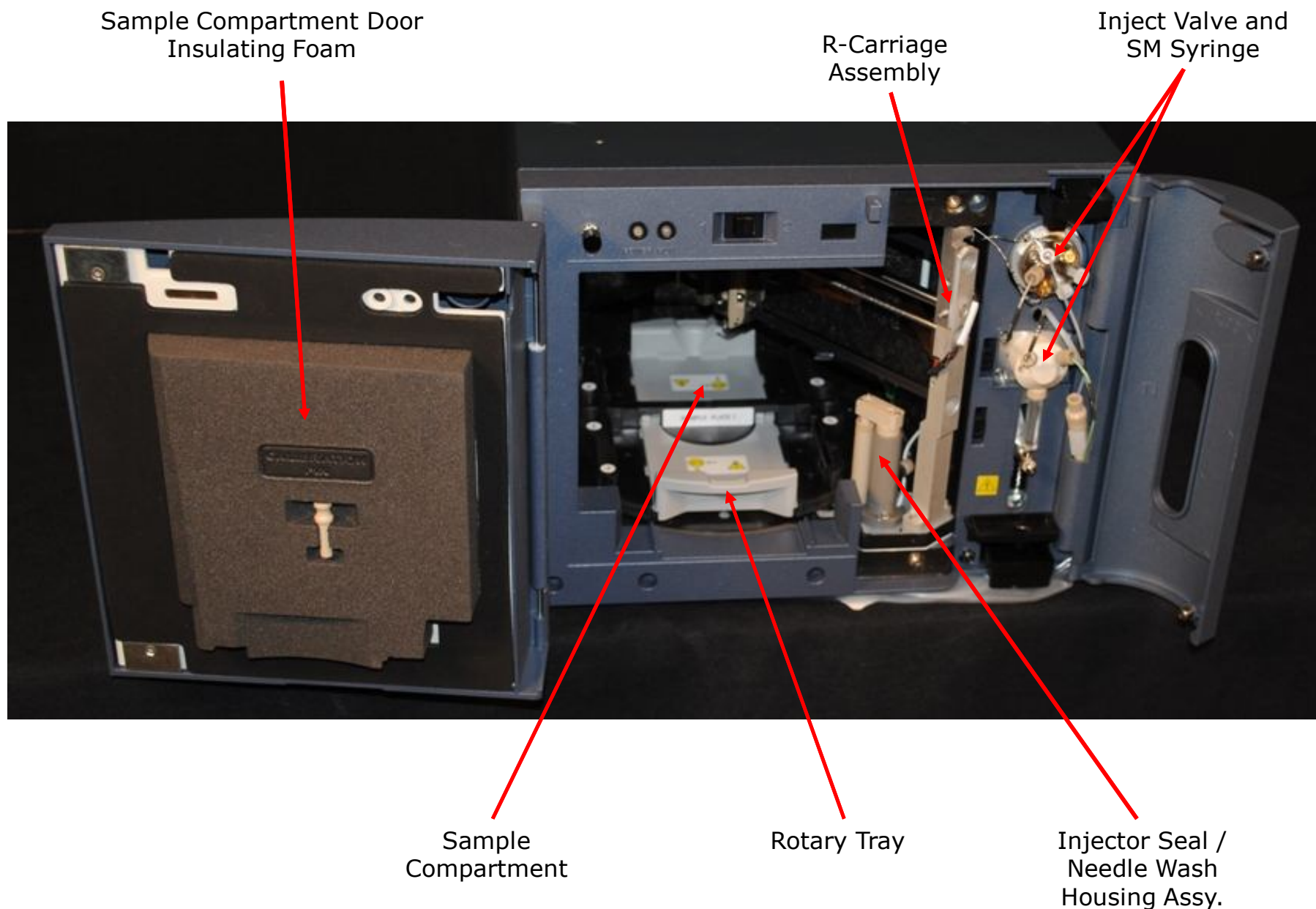


0.5 μ L injection @ 500 μ L/min

SM-FTN Component Overview



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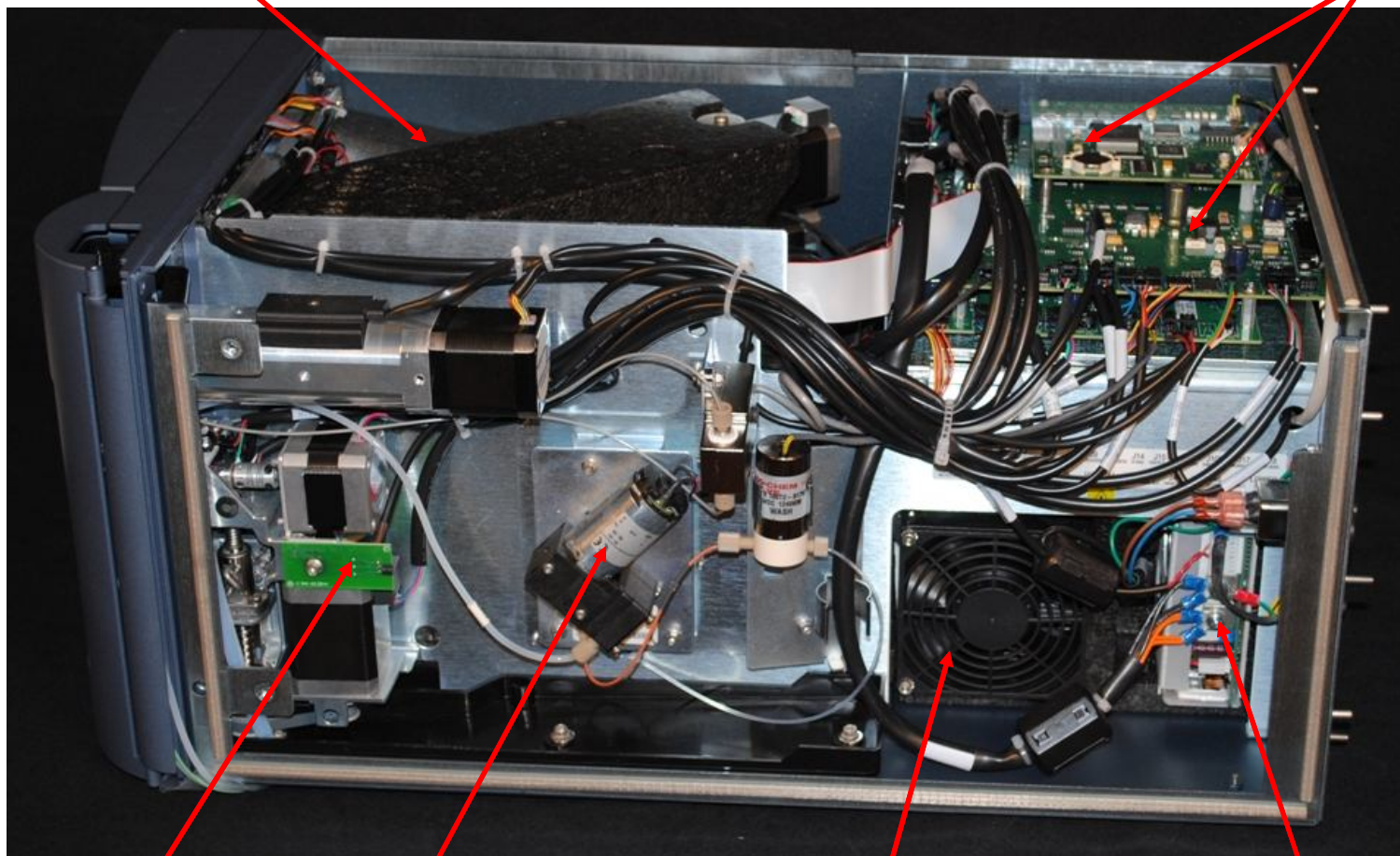
SM-FTN Component Overview



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Sample Compartment
Top Insulating Foam

CPU2000, Control
and Driver PCB



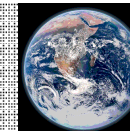
Room Temp.
Sensor

Needle Wash
Pump

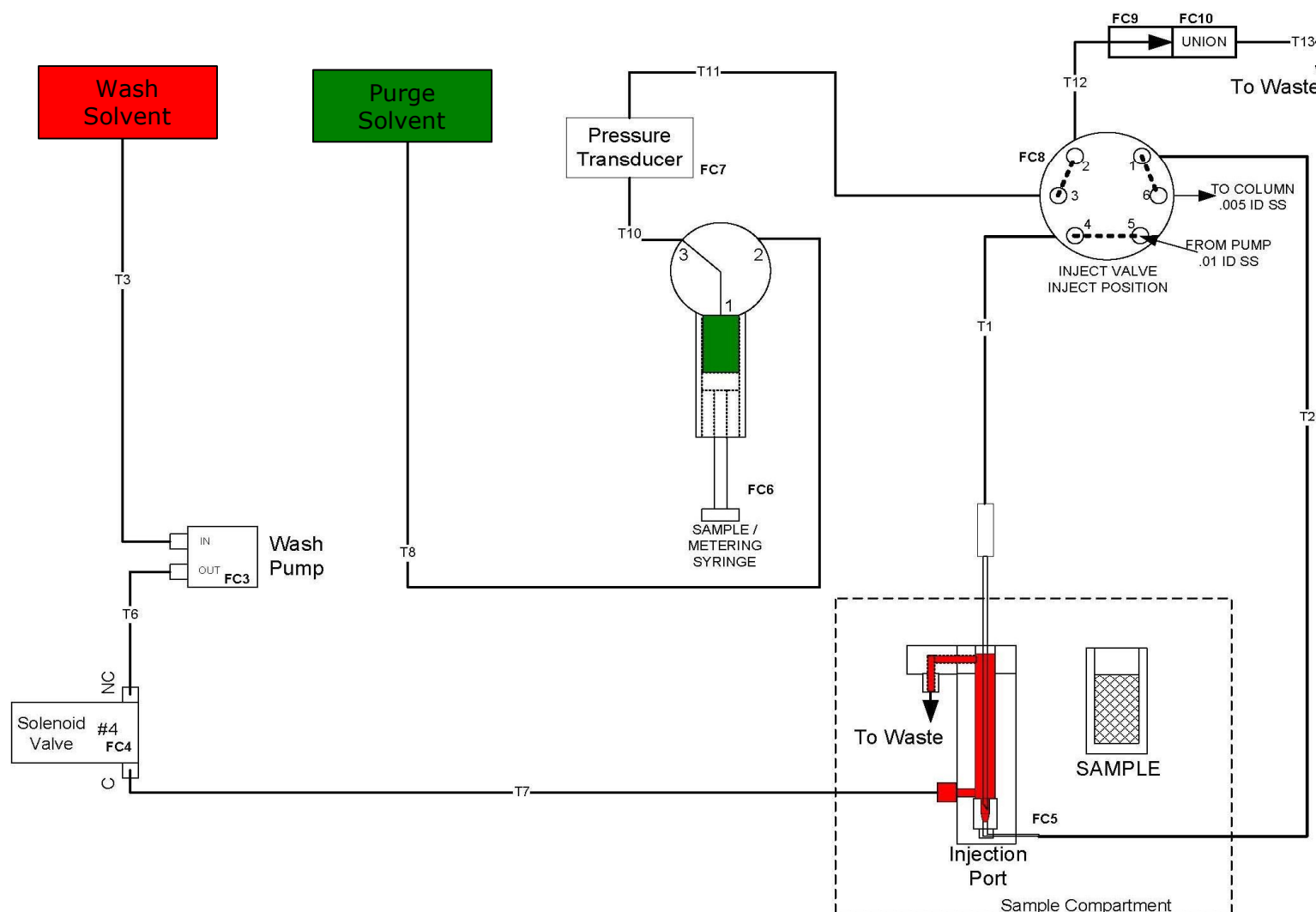
Heater/Cooler
Engine Fan

Power Supply

SM-FTN Flow Diagram- Inject Mode



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SM Instrument Method- General Tab



System Precision IM in GP_Beta_QSM013_SMDI08_TUV as System/Administrator - Instrument Me...

File Edit View Help

Acquity Sample Manager ACQ-SMDI Acquity Quaternary Solvent Manager ACQ-QSM Acquity TUV Detector ACQ-TUV

Acquity Sample Manager DI

General | Data | Dilution | Events

Wash Solvent: Water

Pre-Inject: 0 sec

Post-Inject: 6 sec

Purge Solvent: Water

Comment:

Advanced...

Load Ahead: ☐

Loop Offline: Automatic min

Temperature

Column: 40.0 °C Alarm Band: ± 5.0 °C

Sample: Off °C ± 5.0 °C

Ready

Advanced Settings

Enable any of the following options to override the automatic behavior.

Syringe Draw Rate: Automatic

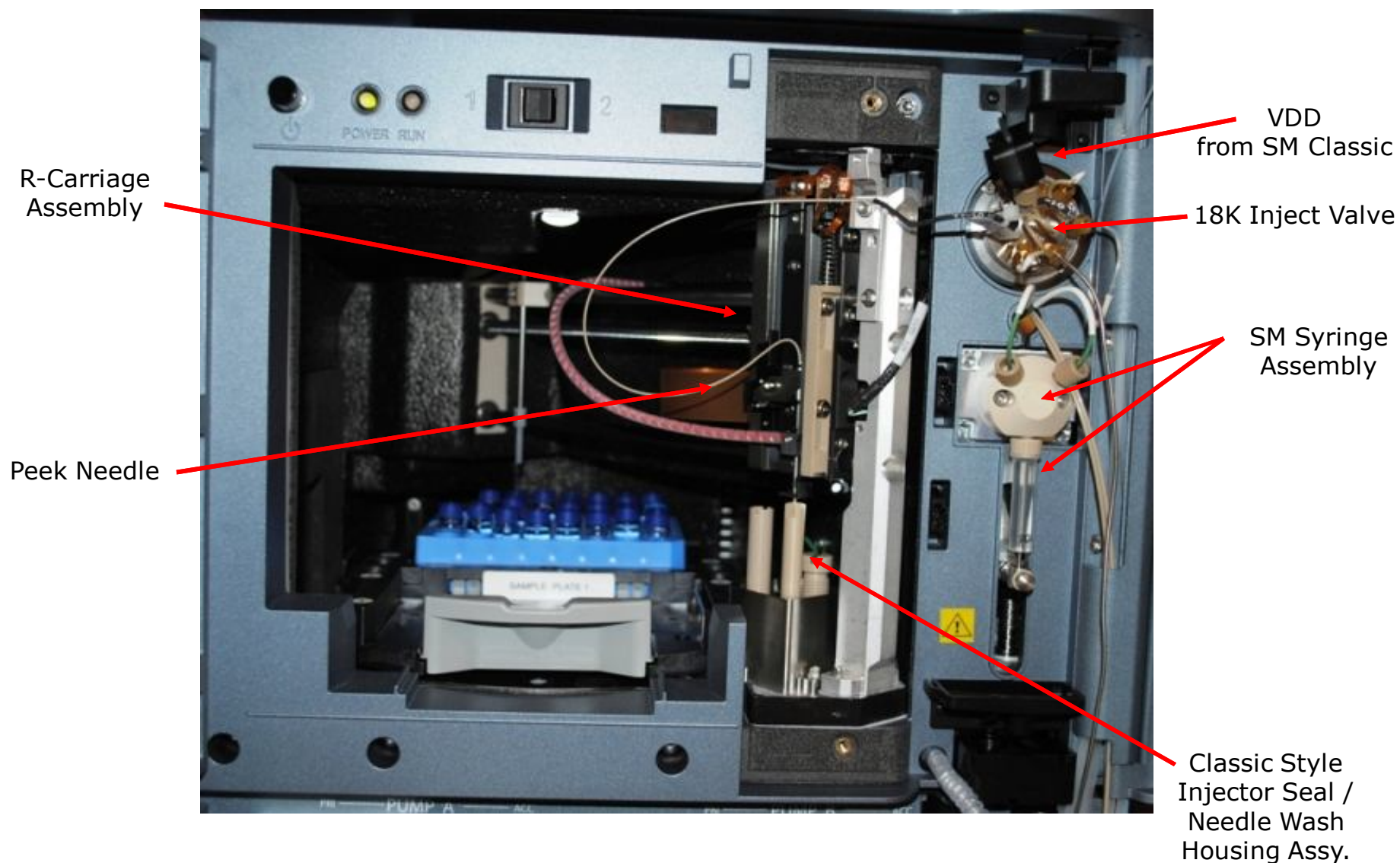
Needle Placement (from bottom): Automatic

Air Gaps: pre-aspirate Automatic, post-aspirate Automatic

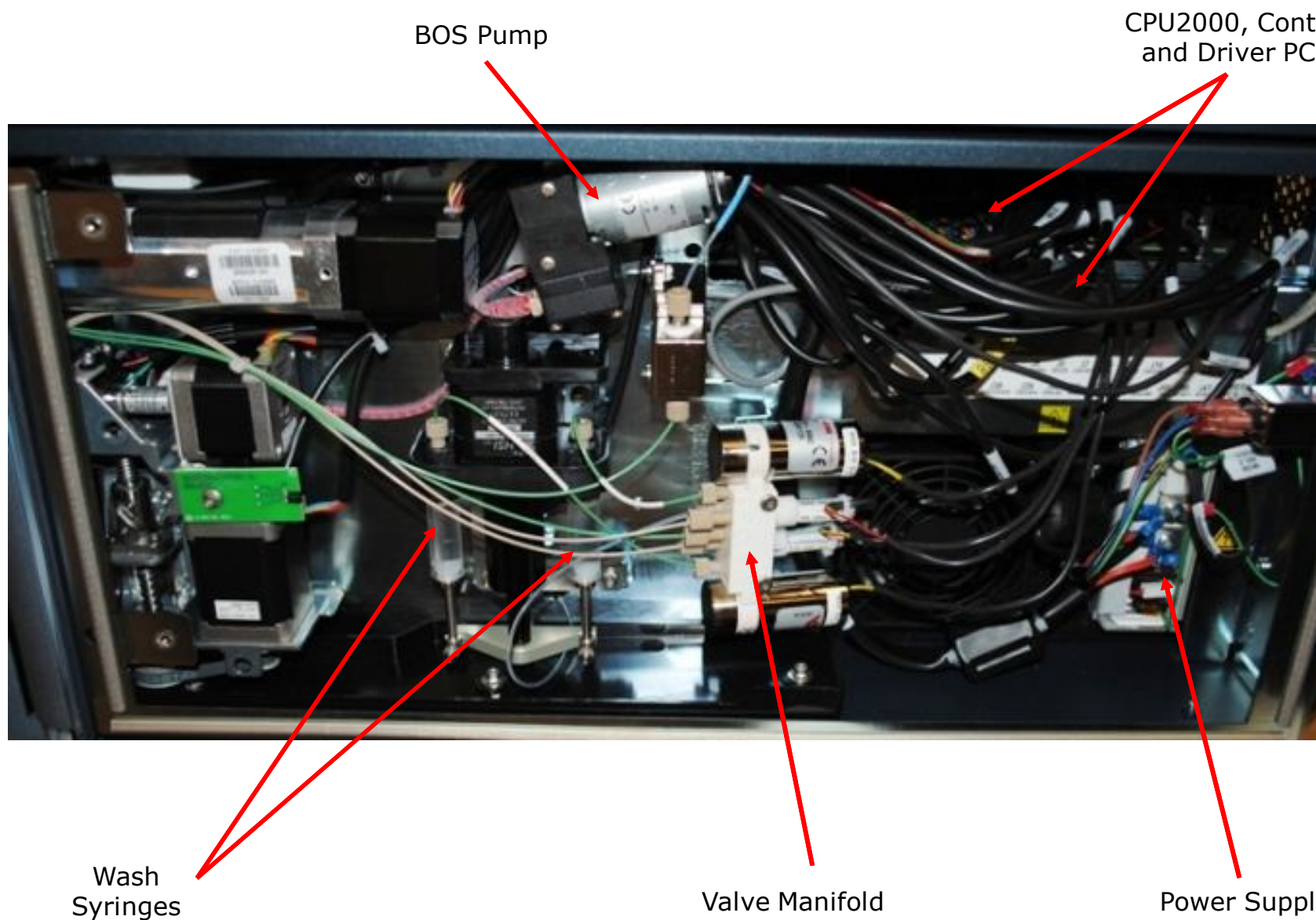
Injection Valve Wash: Automatic

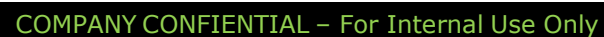
OK Cancel

SM-FL (Fixed Loop)- I-Class Only



SM-FL Component Overview





New Sample Manager Method Page



Fixed Loop Style

Untitled in IClass for Local as System/Administrator - Instrument Method Editor

File Edit View Help

Acquity UPLC Sample Manager ACQ-SM
Acquity UPLC Binary Solvent Manager ACQ-BSM
Acquity UPLC PDA Detector ACQ-PDA

Acquity Sample Manager

General Data Events

Wash Solvents

Weak Wash Name: 90/10 Water/ACN

Strong Wash Name: 70/15/15 ACN/IPA/H2O

Weak Wash Volume: 600 μ L

Strong Wash Volume: 200 μ L

Max Sample Volume: 7.50 μ L

Comment:

Advanced...

Temperature Control

Column: 50.0 $^{\circ}$ C Alarm Band: $\pm$ 5.0 $^{\circ}$ C

Sample: 10 $^{\circ}$ C $\pm$ 5 $^{\circ}$ C

Loop Offline: Disable min

☐ Load Ahead

Ready

Flow-Through -Needle

Untitled in Tanya_Projects\Class\Class System Tests on INFM-EMPSRV-01 as jenki...

File Edit View Help

Acquity UPLC Binary Solvent Manager ACQ-BSM
Acquity UPLC Sample Manager ACQ-FTN
Acquity UPLC PDA Detector ACQ-PDA

Acquity Sample Manager FTN

General Data Dilution Events

Solvents

Wash Solvent Name: 50:50 Acetonitrile:Water

Purge Solvent Name: 50:50 Acetonitrile:Water

Pre-Inject Wash: 0 sec

Post-Inject Wash: 6 sec

Comment:

Advanced...

Temperature Control

Column: 40.0 $^{\circ}$ C Alarm Band: $\pm$ 5.0 $^{\circ}$ C

Sample: 10 $^{\circ}$ C $\pm$ 5.0 $^{\circ}$ C

☐ Loop Offline: Automatic min

☐ Load Ahead

Ready

New Sample Manager Method Page - Advanced Window



Fixed Loop Style

Advanced Settings [X] [?]

Enable any of the following options to override the automatic behavior.

- ☒ Injection Mode [More info](#) Automatic (PLNO) ▼
 - Full Loop
 - Partial Loop
 - Automatic (PLNO)
- ☐ Full Loop Overfill Factor
- ☐ Syringe Draw Rate Automatic
- ☐ Needle Placement (from bottom) Automatic
- ☐ Air Gaps
 - pre-aspirate Automatic
 - post-aspirate Automatic
- ☐ Needle Overfill Flush Automatic
- ☐ No Injection

OK Cancel

Flow-Through - Needle

Advanced Settings [X] [?]

Enable any of the following options to override the automatic behavior.

- ☐ Syringe Draw Rate Automatic
- ☐ Needle Placement (from bottom) Automatic
- ☐ Air Gaps
 - pre-aspirate Automatic
 - post-aspirate Automatic
- ☐ No Injection

OK Cancel



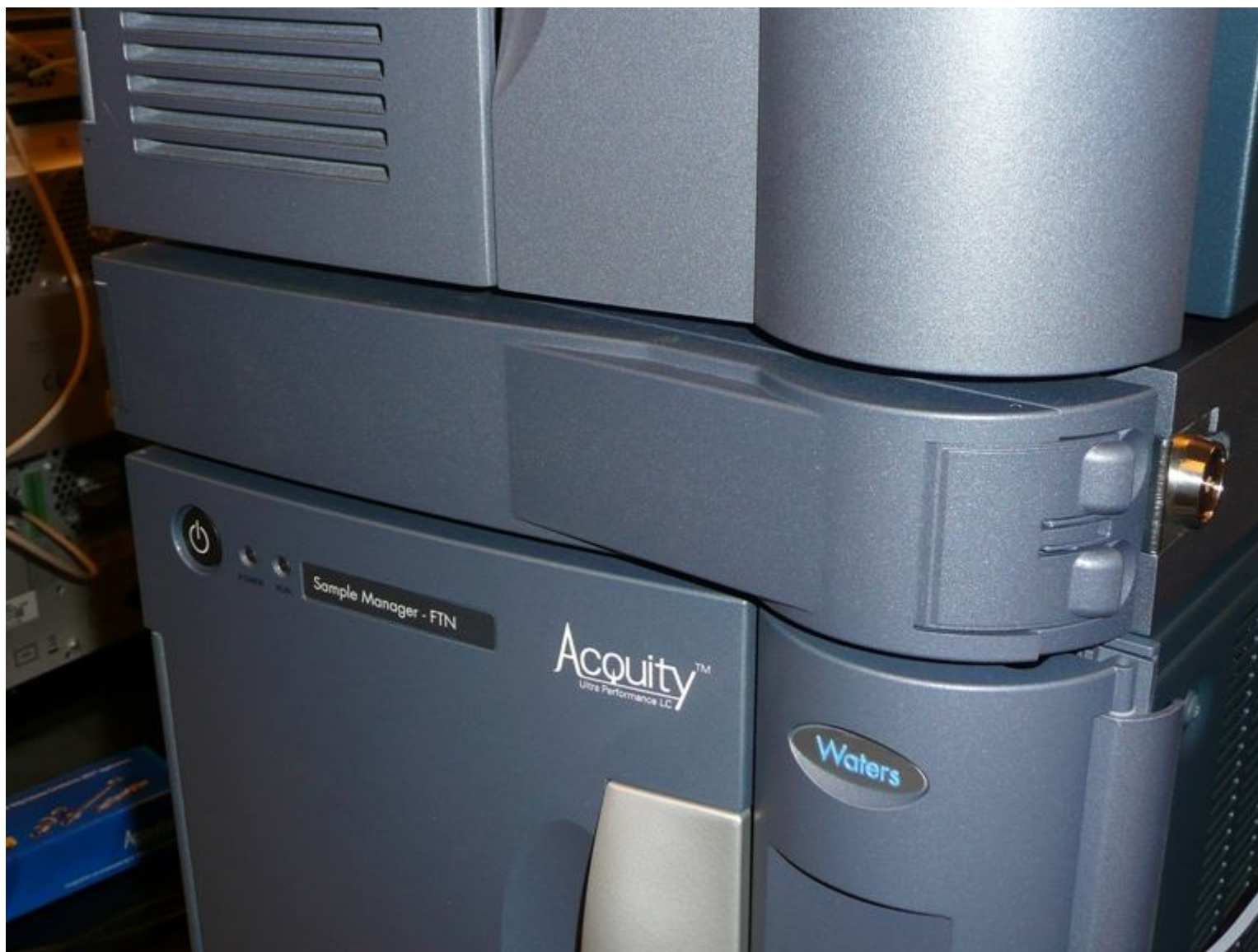
Column Heating and Cooling Options



CH-A



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CH-A Chassis



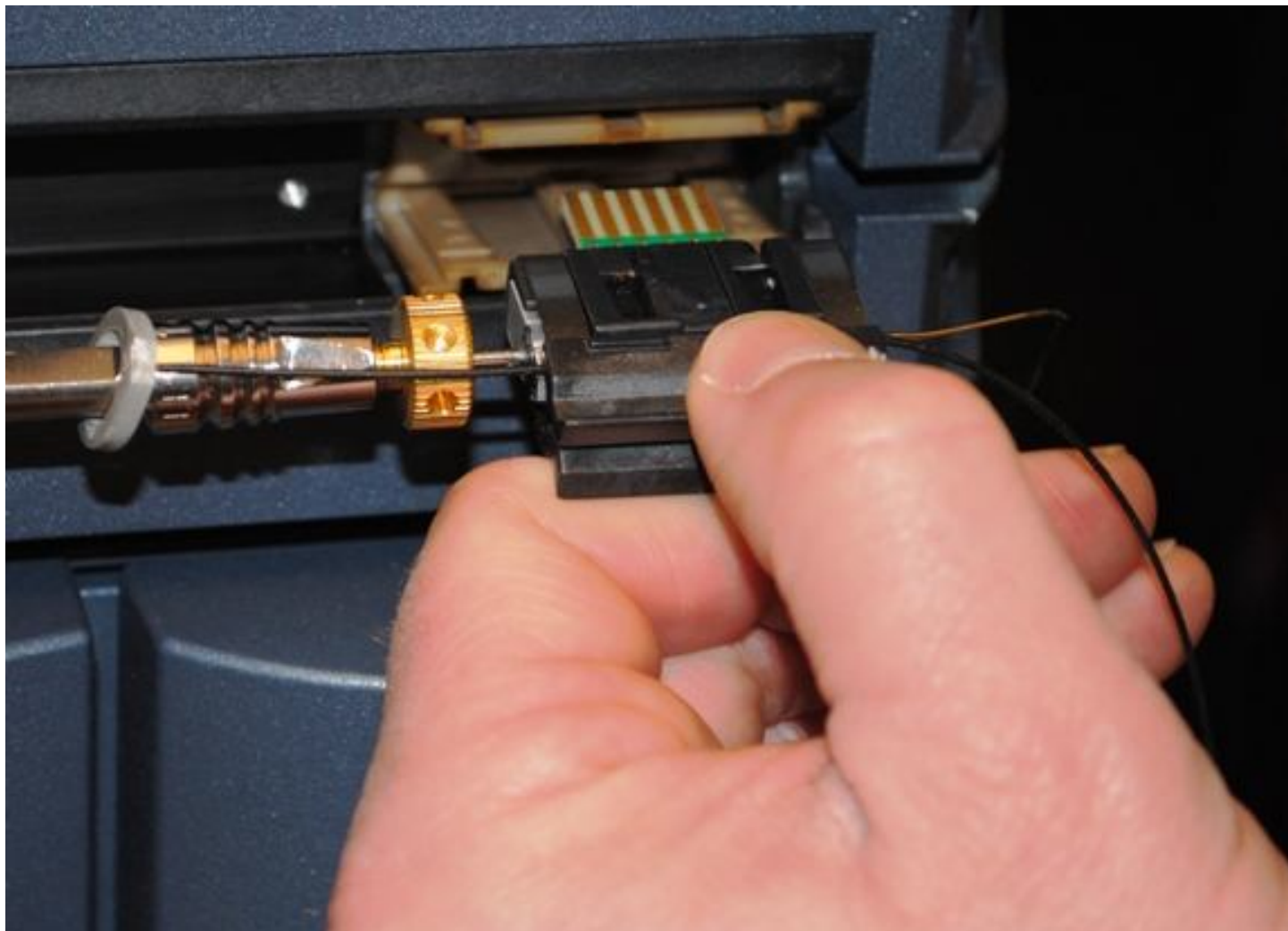
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Installing the Active Pre-Heater



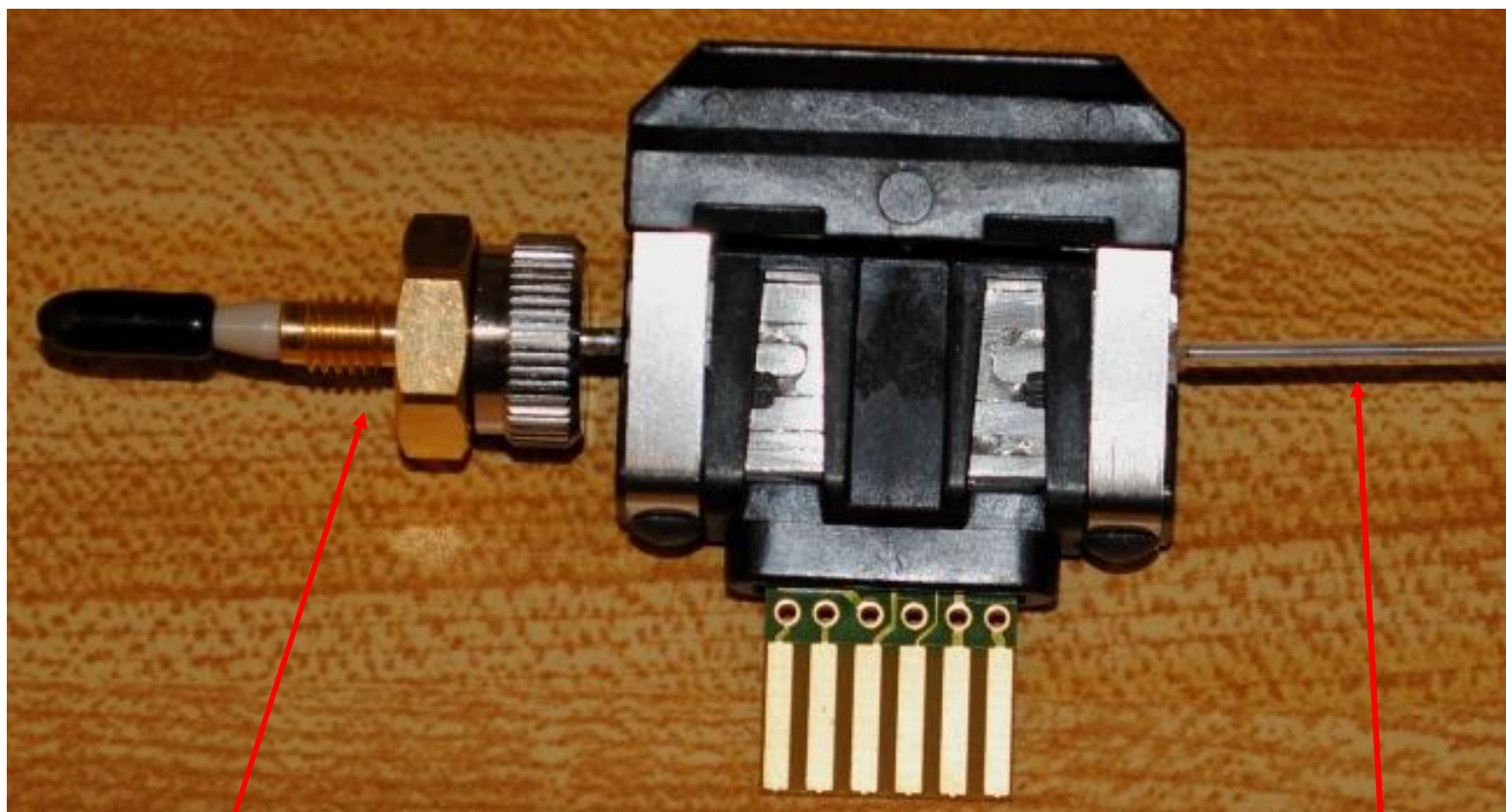
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I-Class Active Pre-Heater



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Robust 18K
psi fitting

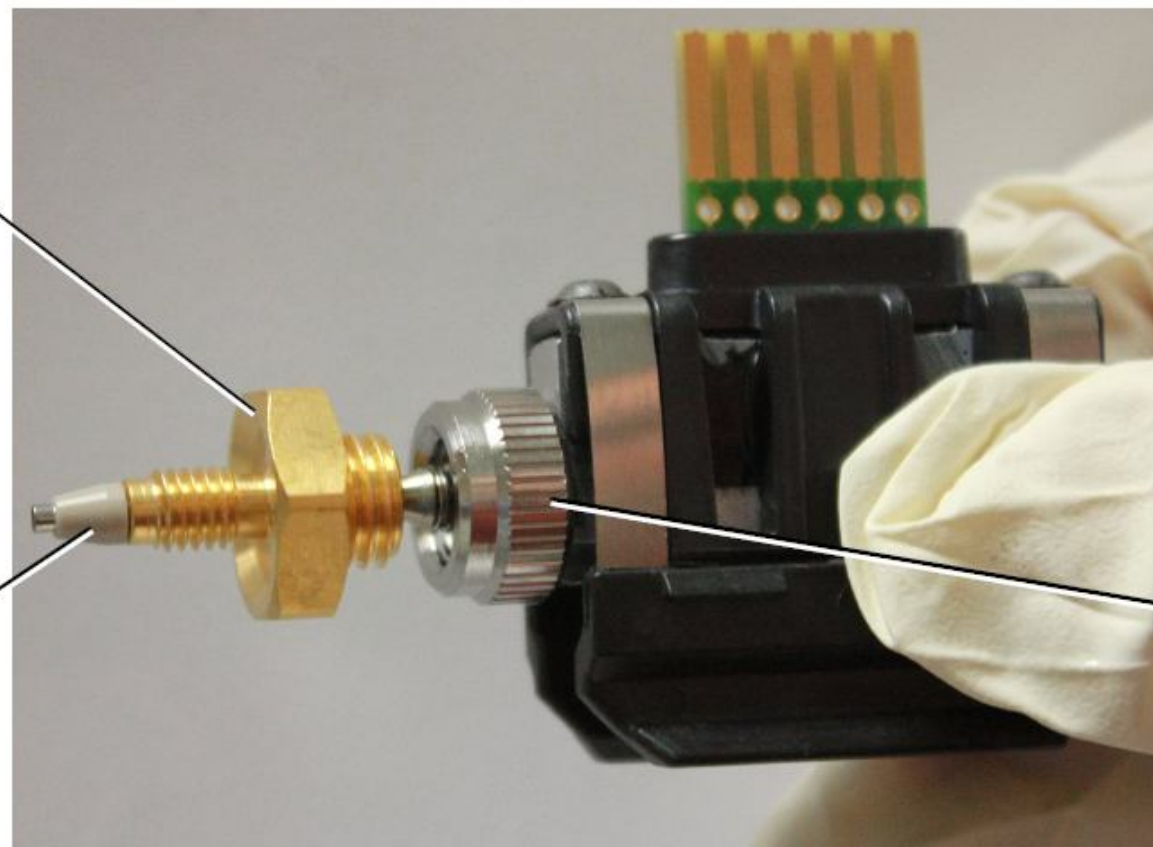
New 0.003" ID tubing

Finger-tight APH Fitting



Dual-threaded
finger-tight fitting

Ferrule



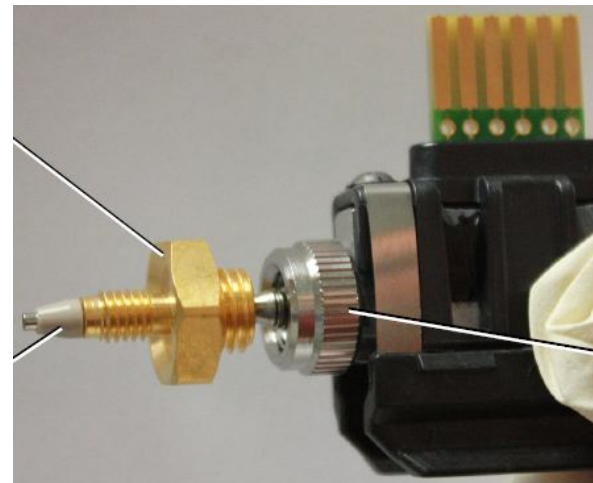
Stainless
cap nut

Figure 13 - Finger-tight APH fitting

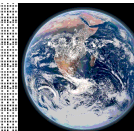
Finger-tight APH Fitting Procedure



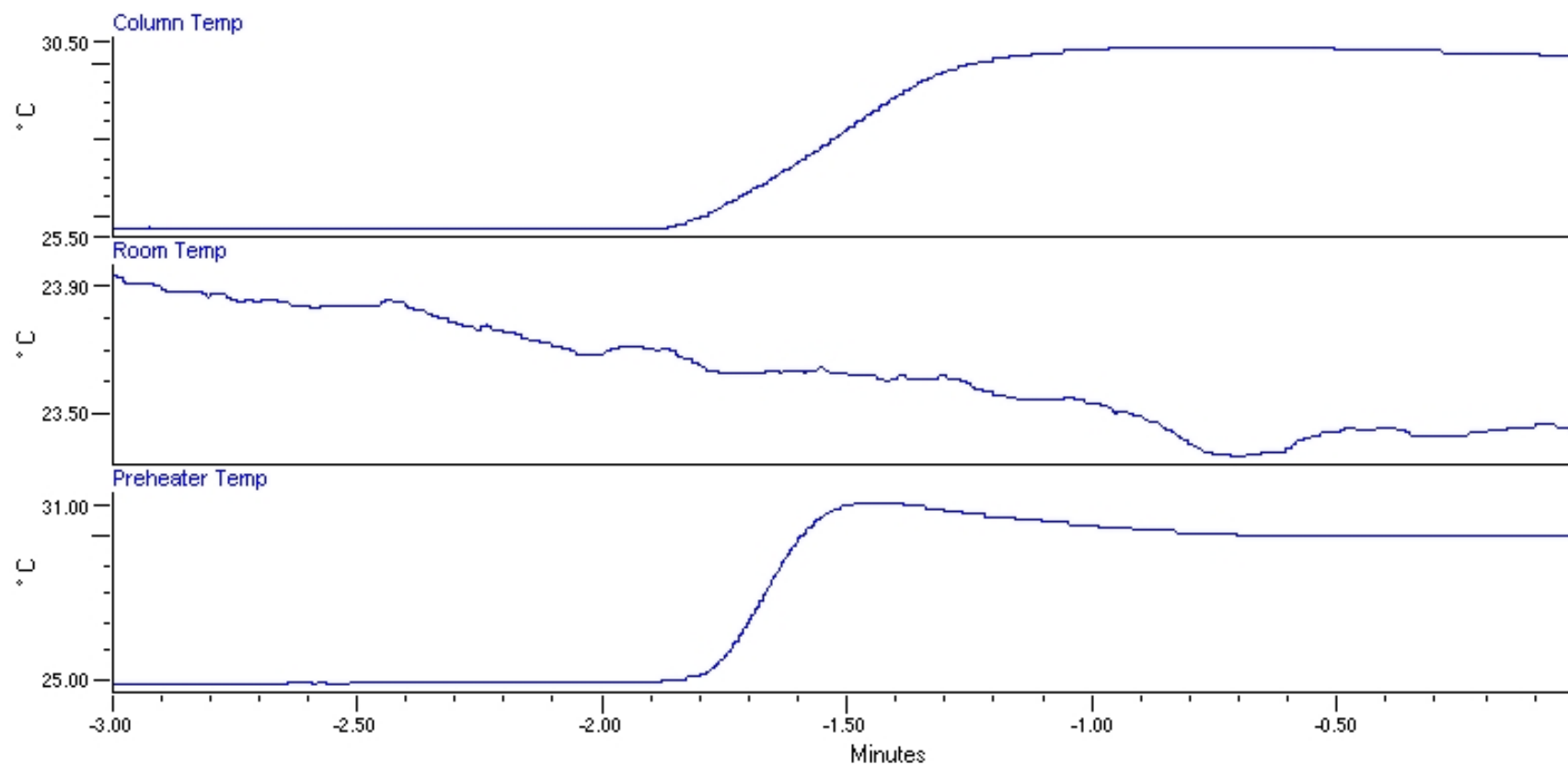
- Remove the APH assembly from the column compartment.
- Loosen stainless-steel cap nut from the finger-tight fitting.
- Insert the stainless-steel tubing with ferrule and fitting into the column.
 - Make sure the stainless-steel tubing protrudes beyond the ferrule.
- Seat the ferrule by securely finger-tightening the fitting into the column.
 - Do not engage the stainless-steel cap nut when seating the ferrule.
- Complete the connection by finger-tightening the stainless-steel cap nut onto the fitting.



CH-A Temperature Plots



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CM-A (2 or 4-Columns)



- CM-A
 - 2 x 150mm, or, 4 x 50mm* columns
 - 2 independent heat/cool zones
 - 2, 9-port switching valves
 - Movable active pre-heaters (APH) allow for either left or right inlet plumbing of the same module

Auxiliary Column Manager (optional)



- **Does not contain CSV's**
 - Plumbing through CSV's in the CM-A
- **Adds 2 additional Column Troughs**
 - Two 50 to 150-mm columns
 - Independently heated and cooled troughs
 - Same temperature range (4 to 90 °C)
- **External Communications**
 - CM-A acts as a master module
 - Two CM-Aux can be controlled
- **Power**
 - CM-Aux has own power supply
 - CM-A controls their power states



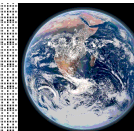
CM-A and CM-Aux (4-Columns)



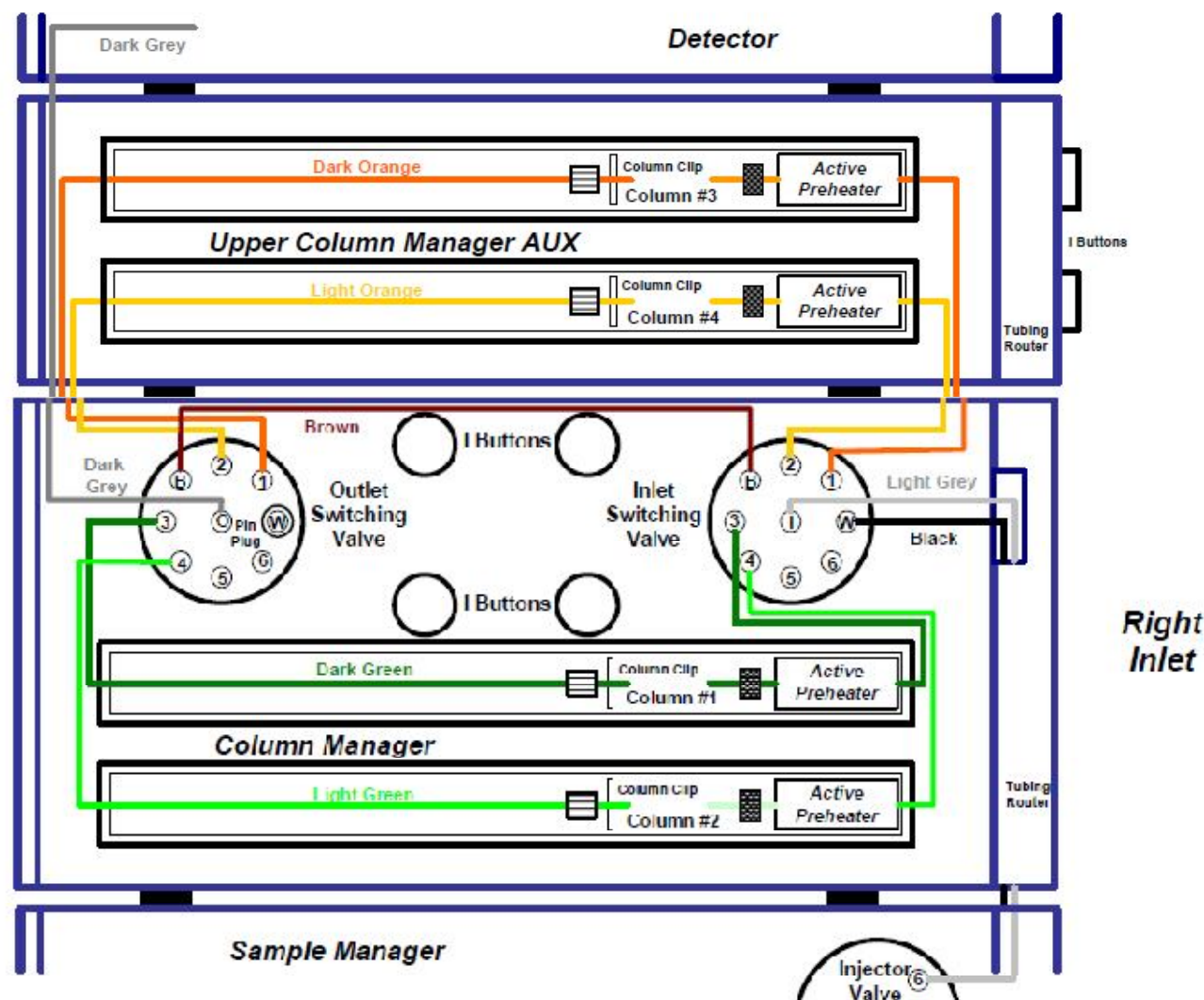
- CM-A and CM-Aux
 - 4 x 150mm columns
 - 4 independent heat/cool zones
 - Active pre-heaters (APH) as standard in all zones



4 x 150mm Configuration



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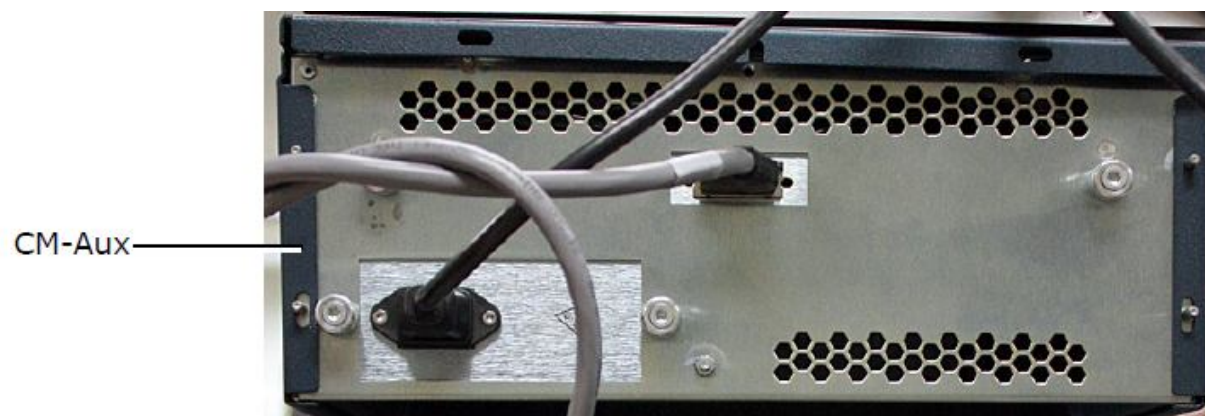
CM-A and CM-Aux (6-Columns)



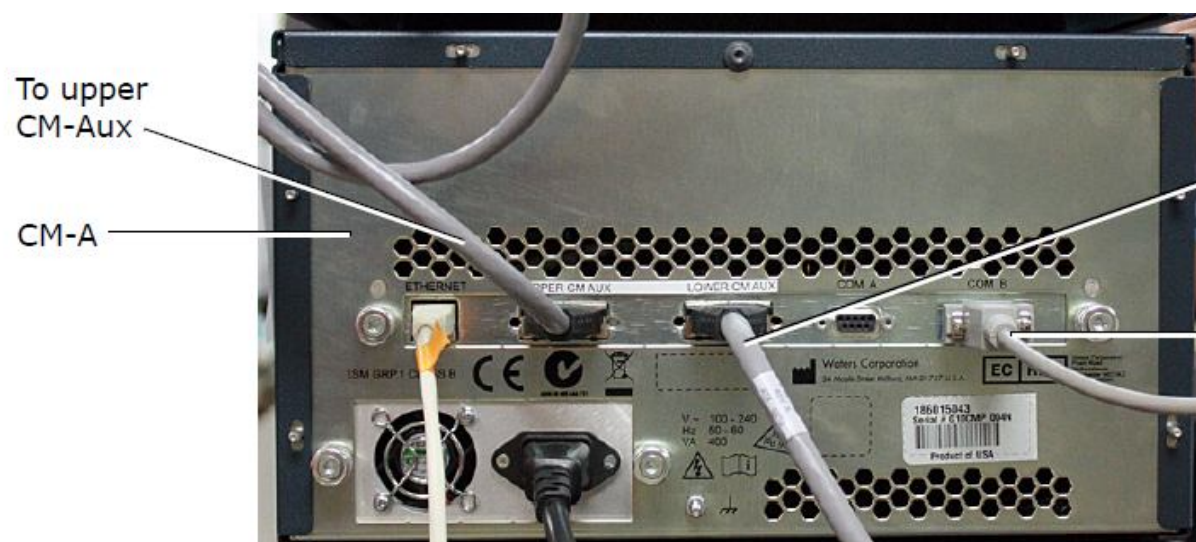
- CM-A and 2 CM-Aux
 - 6 x 150mm columns
 - 6 independent heat/cool zones
 - Active pre-heaters (APH) as standard in all zones
 - Note: APHs are located to the left in this configuration



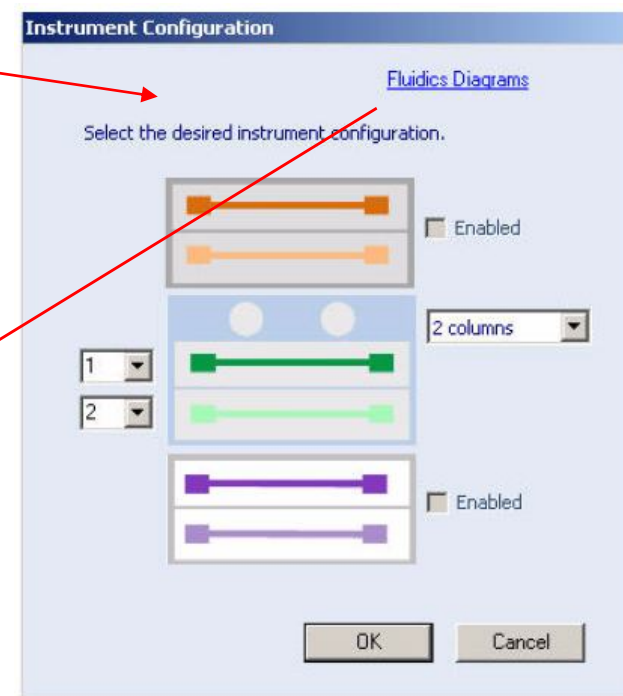
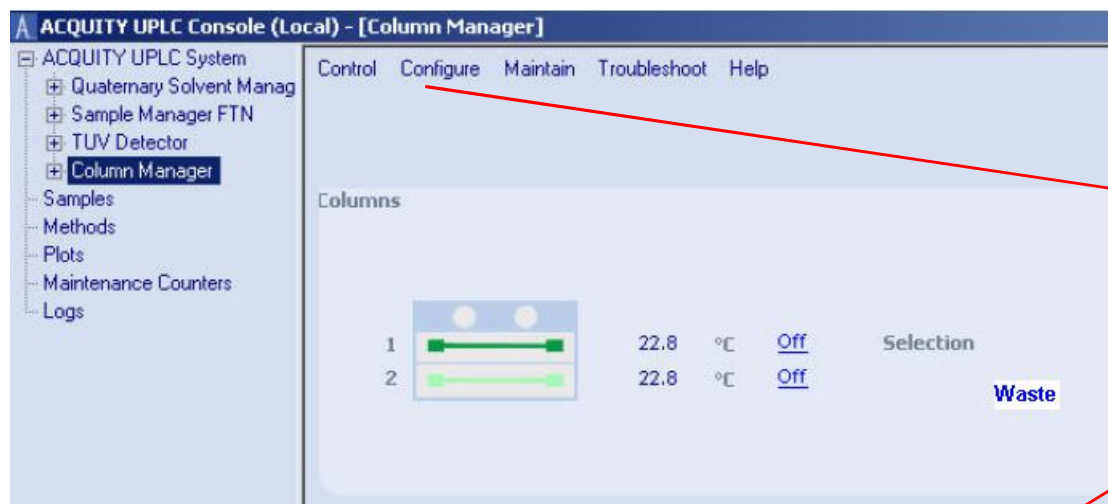
Rear Panel Cable Connections



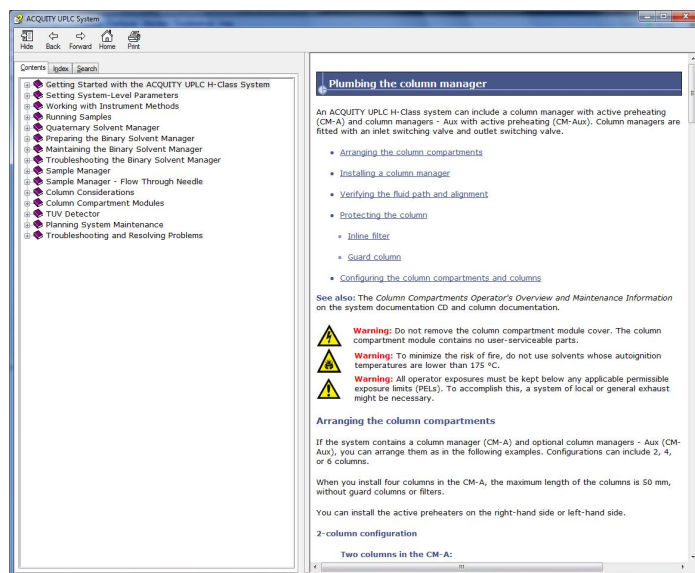
SDL Cable
(external control)



Instrument Control and Console



Instrument Configuration dialog box (2 col configuration)

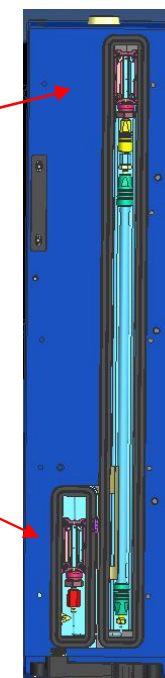


H-Class 30cm Column Compartments



- New 30cm Column Heater (CH-30A) - 176015046
 - Single column heater
 - Heats to 90°C
 - Supports up to 4.6mm ID
 - 2 APH locations
 - Enables optimum tubing configuration for both HPLC and UPLC applications (comes standard with HPLC length APH)
 - Requires v. 1.45 ICS or later

- Existing ACQUITY 30cm CHC - 186015011
 - For HPLC legacy support for >4.6mm ID columns
 - Requires H-Class compatibility kit (205000761)
 - Requires v. 1.46 ICS (June 2010 Driver Pack)





Common Platform Sample Organizer

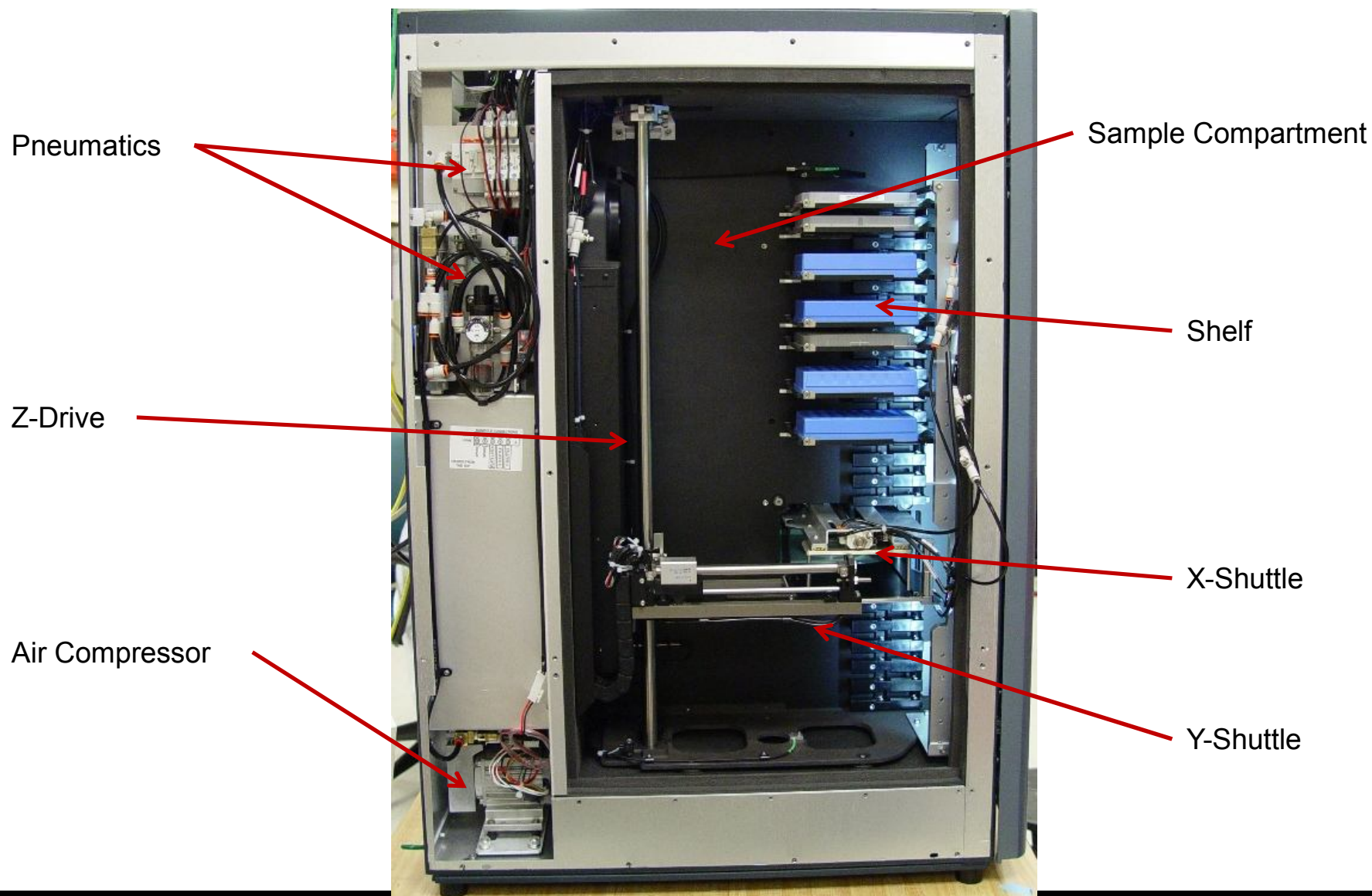


Introduction

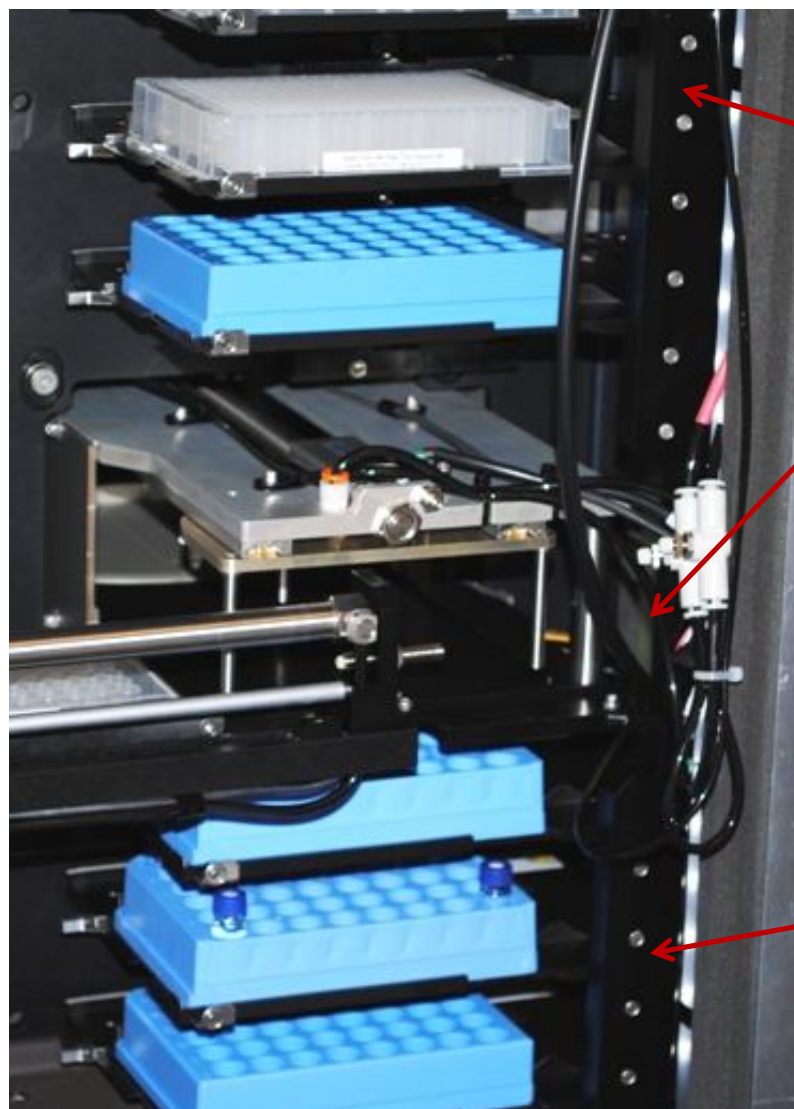


- The new ACQUITY UPLC Sample Organizer has been designed for use with the ACQUITY UPLC H-Class and H-Class Bio systems
 - The X-Shuttle mechanism has been changed to accommodate transfer of plates into a newly designed Rotary Tray for the SM-FTN
- The design is based largely on the current Sample Organizer
- Significant enhancements have been made to the original design
 - To adapt it for use with the SM-FTN
 - To improve functionality and robustness
- Because the new ACQUITY UPLC Sample Organizer is specifically adapted for use with the SM-FTN **it is not compatible** with the original ACQUITY Sample Manager

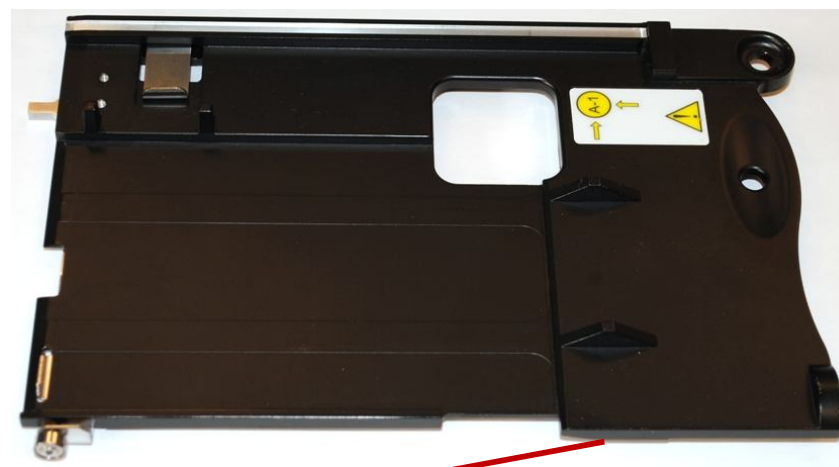
Major Functional Assemblies



Shelf Stability Bracket

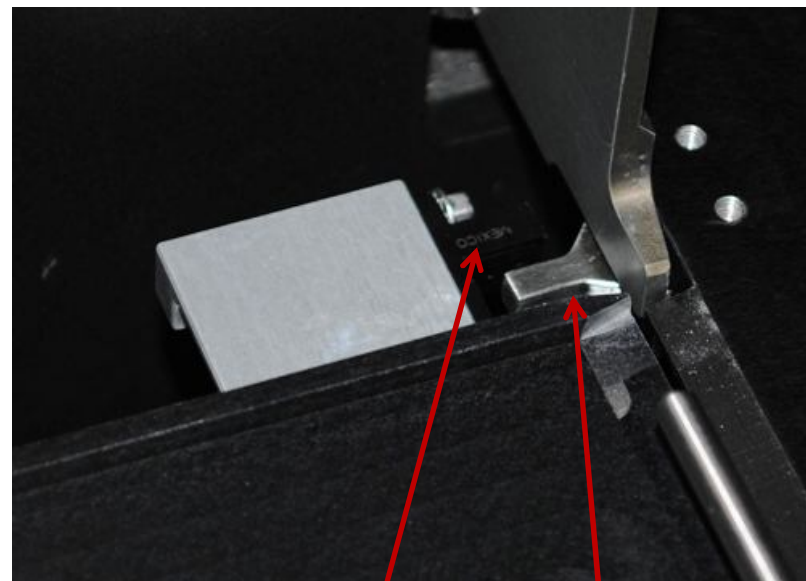
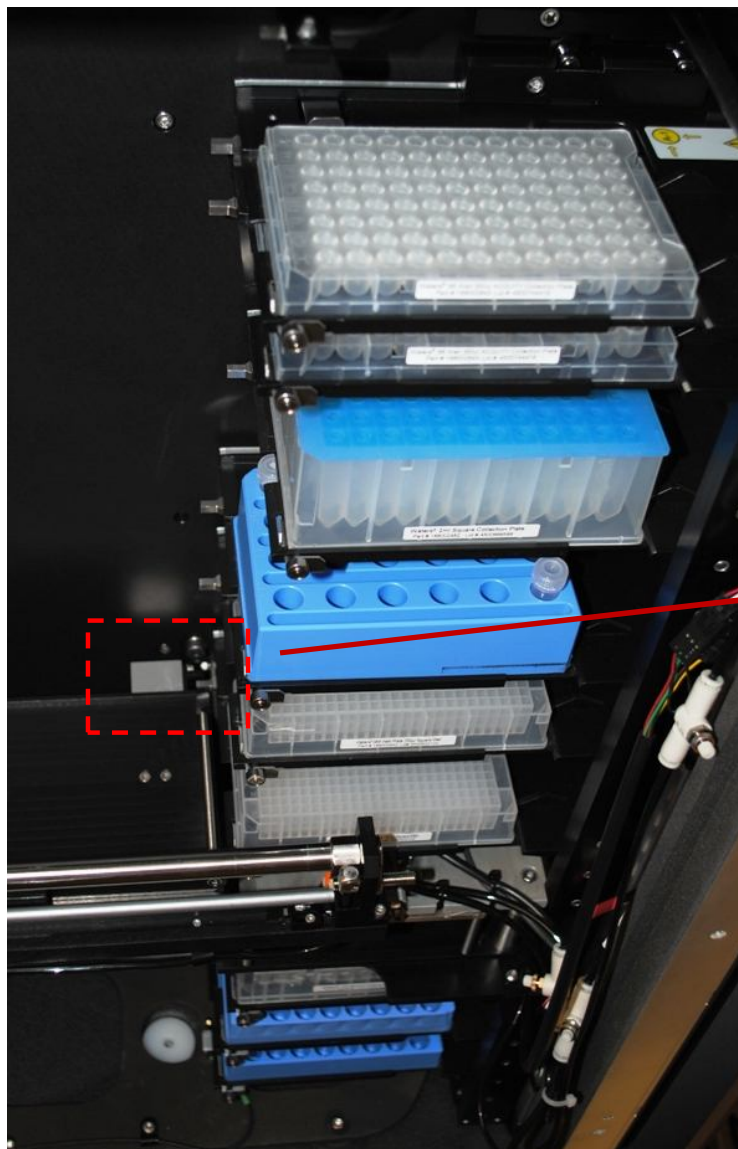


Shelf Stability Bracket



New wider Shelf

Shelf Position Sensor and Flag



Shelf Sensor and Flag

X-Shuttle Assembly



X-Shuttle Transfer Pneumatics

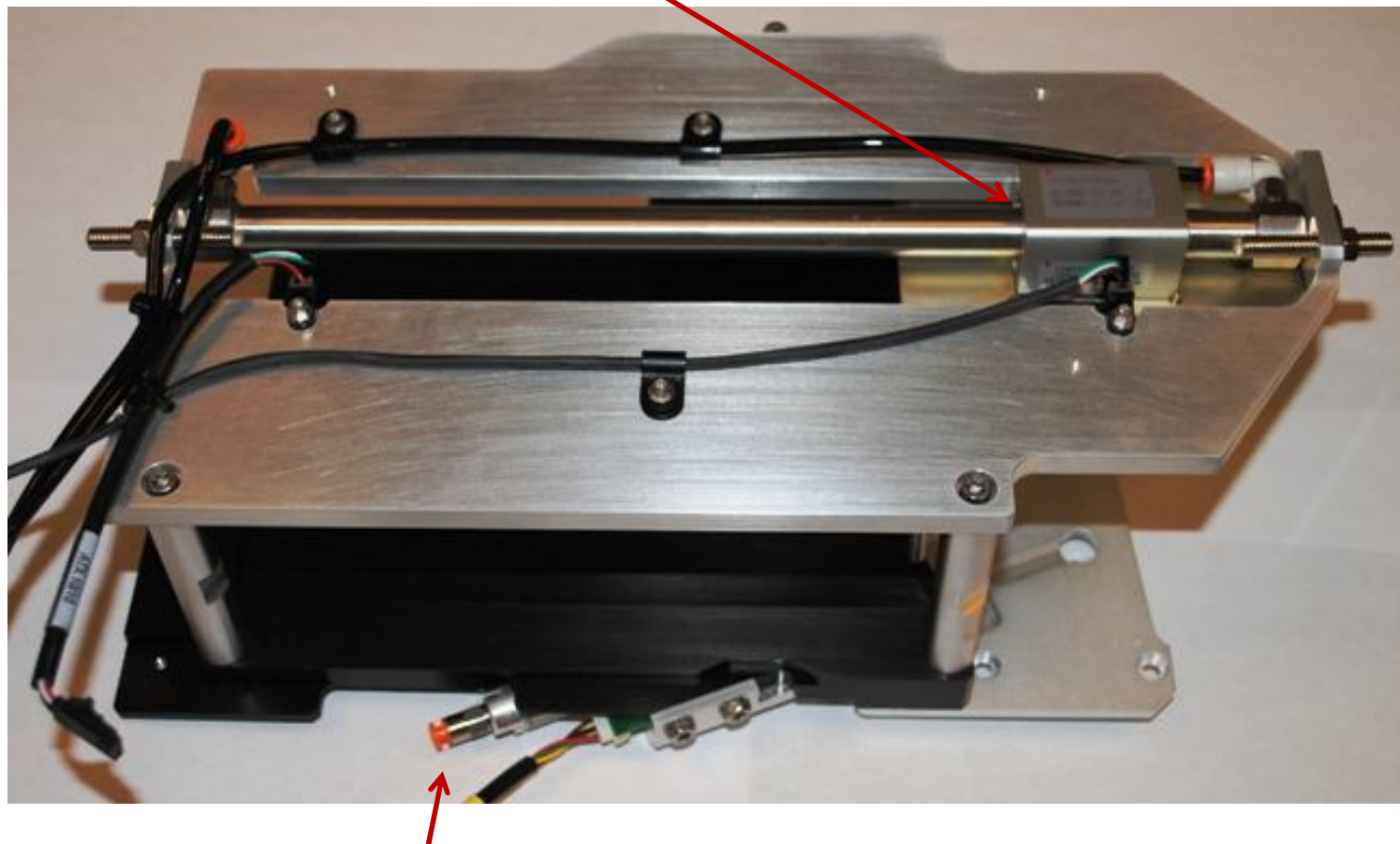
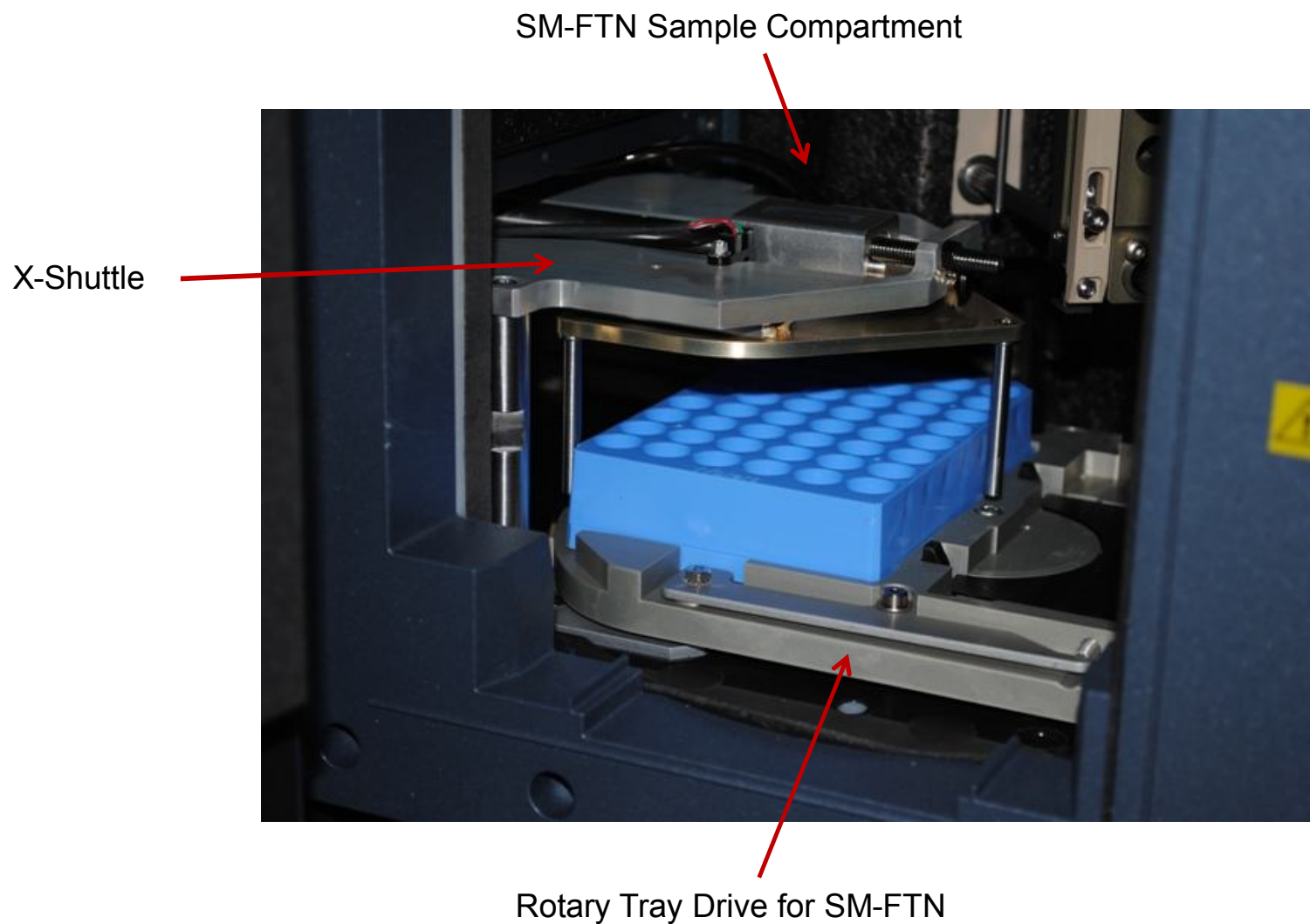


Plate Latch Pneumatic Actuator

X-Shuttle Assembly Installed



Rotary Tray Drive for Sample Organizer



X-Shuttle

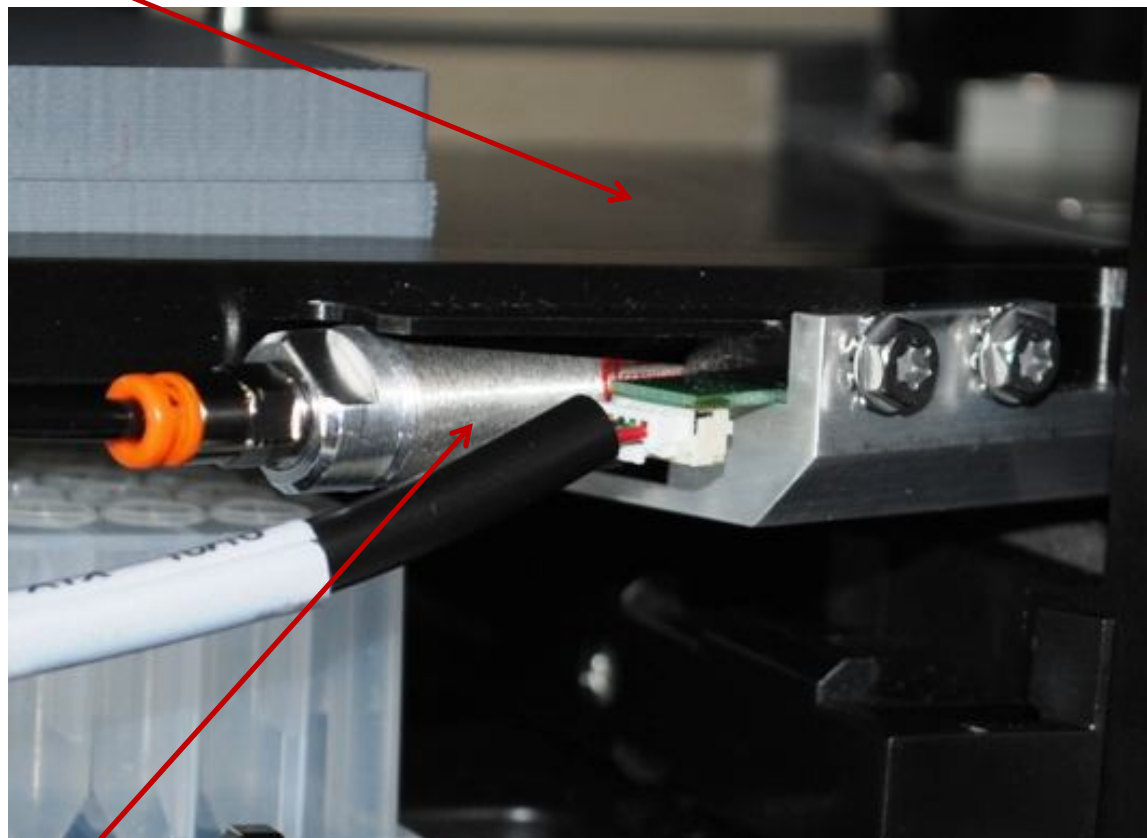
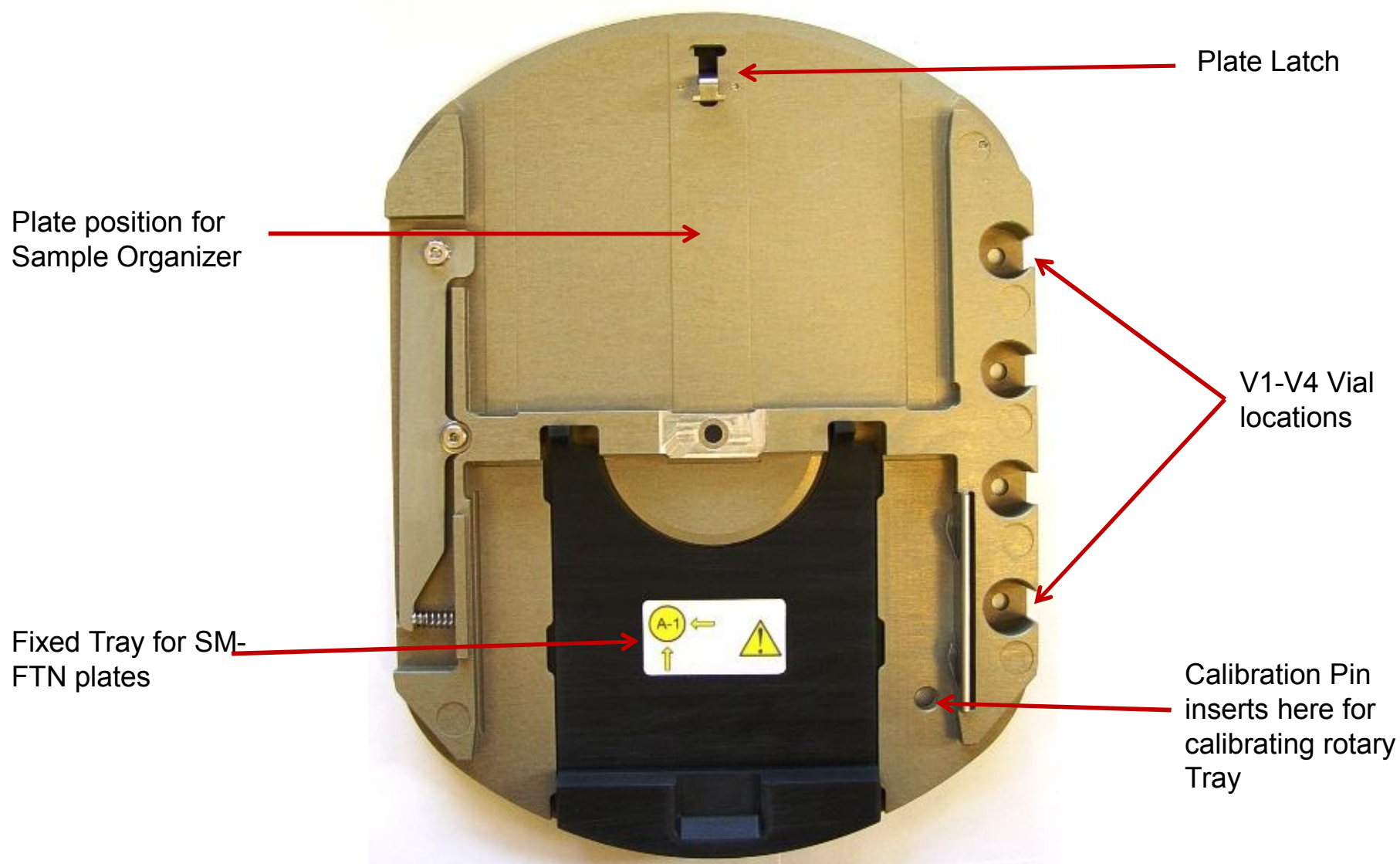


Plate Latch
Pneumatic Actuator

Rotary Tray Drive for Sample Organizer

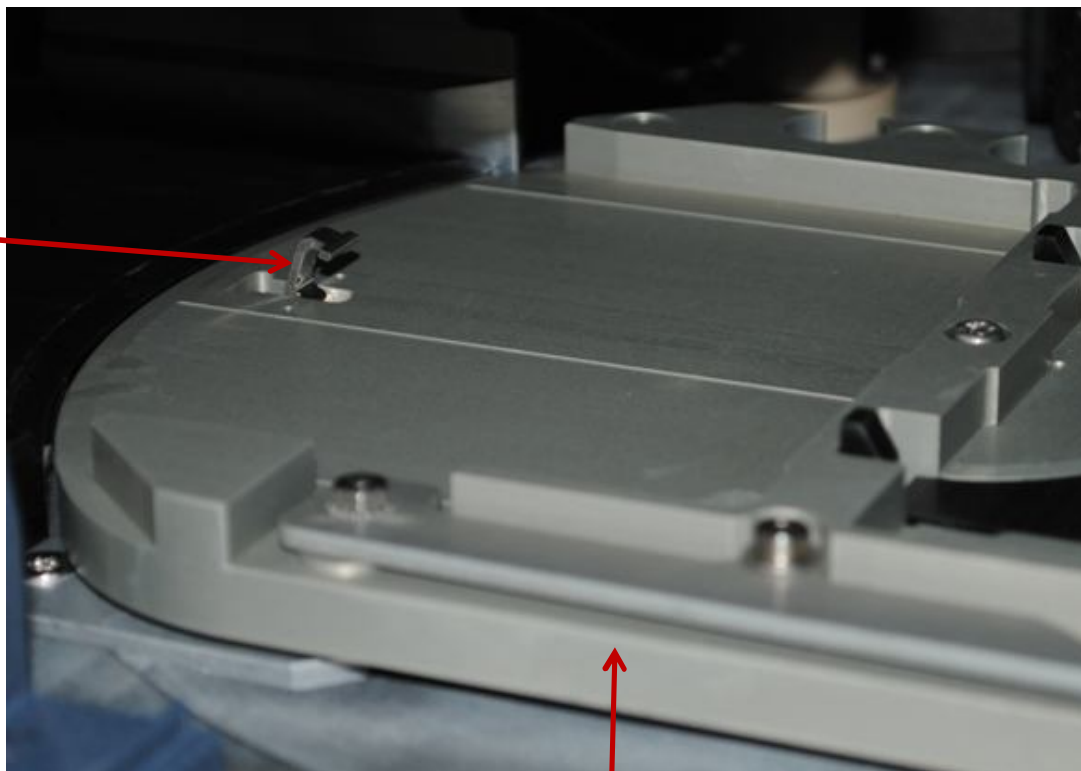


Rotary Tray Drive for Sample Organizer



Plate Latch-

Adjust Plate latch time to approximately 1 sec (3/4 counter clockwise on pneumatic hose)



Rotary Tray Drive for Sample Organizer