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Thermo

Multichannel LC

Maintenance Guide

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ThermoFisher SCIENTIFIC

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General Laboratory Equipment. Not intended for use in diagnostic procedures.

Regulatory Compliance

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2012/19/EU

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- Number of product pieces, and the estimated total weight and volume
- Pick-up address and contact person (include contact information)
- Appropriate pick-up time
- Declaration of decontamination, stating that all hazardous fluids or material have been removed from the product

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IMPORTANT This recycling program is **not** for biological hazard products or for products that have been medically contaminated. You must treat these types of products as biohazard waste and dispose of them in accordance with your local regulations.

Contents

Preface

The Thermo Scientific™ Transcend™ and Prelude SPLC™ are LC system configurations that have been optimized to run TurboFlow or laminar flow methods on single or multiple channels. They use Aria MX software, interfaced with your detector applications, to control the LC system pumps, valves, and autosamplers.

Contents

Document Overview

This guide provides information on the various Aria MX-based software and hardware maintenance procedures necessary to keep your Transcend or Prelude SPLC system configuration operating at peak performance. For details about operating your configuration, refer to its user guide.

For details on how to create methods and run samples with your mass spectrometer (MS), refer to the *Aria MX User Guide* or the *Prelude SPLC System User Guide*.

There are two general categories of procedures described in this guide:

- Software-based maintenance procedures—Performed directly through the Aria MX software. Some of these procedures might require access to the hardware for certain operations. See "Aria MX Software-based Maintenance" on page 7.
- Hardware maintenance procedures—Performed by working directly on the hardware, which in certain cases might also require using some Aria MX software controls to complete. See "Autosampler Maintenance" on page 29 or "General LC System Maintenance" on page 59.

Supported Hardware System Configurations

The Aria MX software controls various configurations of HPLC/UHPLC hardware.

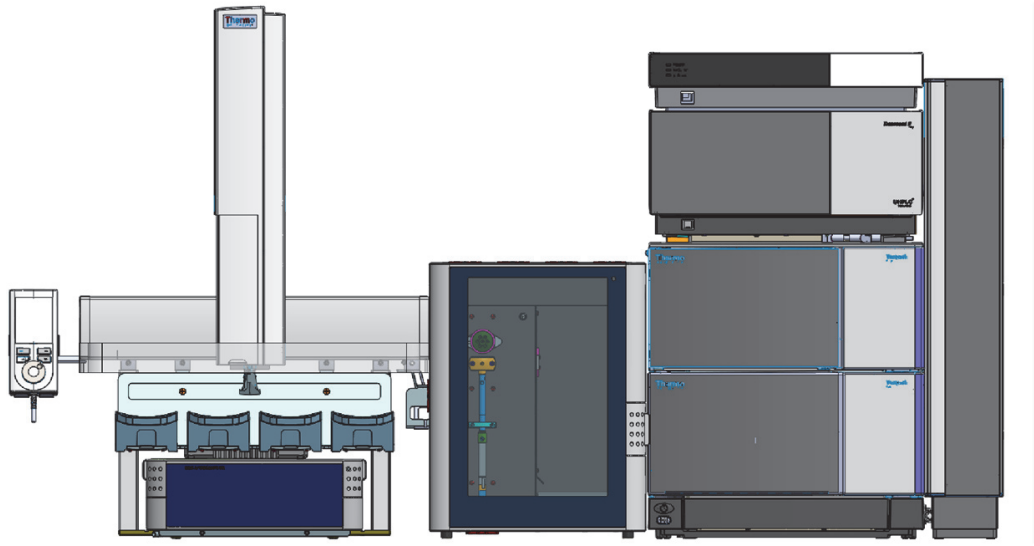
- Transcend configurations:
  - TriPlus autosamplers with UltiMate pumps (referred to as Transcend II)
  - TriPlus autosamplers with Vanquish Flex binary or quaternary pumps (referred to as Transcend)
  - DSX-1 configuration single channel TurboFlow LC system including the Dried Sample Module (DSM) with Vanquish Flex quaternary and binary pumps
  - Vanquish Dual Split Samplers with Vanquish Horizon or Vanquish Flex pumps (referred to as the Vanquish Duo LX-2 configuration)
  - (Optional) Vanquish Charger module that extends Vanquish Dual Split Sampler sample rack/tray capacity
  - Accela Open autosamplers with UltiMate pumps (referred to as Transcend II)
- Prelude SPLC
- Aria

Figure 1. Transcend/Transcend II HPLC system

Figure 2. Vanquish Dual Split Sampler, showing Charger module, Horizon pumps, and TCC module

Note For Vanquish hardware specifications and detailed maintenance information, refer to the Thermo Fisher Scientific manuals provided in hard copy with each Vanquish shipment. The manuals are also in electronic (PDF) format on the Aria MX DVD. See "System Documentation" on page xiv for a complete list of Vanquish hardware manuals.

Figure 3. Transcend DSX-1 with the Dried Sample Module (DSM), Vanquish Flex pumps with TCC module



Note For DSX-1 hardware specifications and detailed maintenance information, refer to the Thermo Fisher Scientific manuals provided in (PDF) format on the Aria MX DVD. See "System Documentation" on page xiv for a complete list of DSX-1 hardware manuals.

Figure 4. Prelude SPLC system

Note With the exception of system consumables, the Prelude SPLC system is intended to be serviced by qualified Thermo Fisher Scientific field service engineers.

The Aria MX software works together with the following applications that acquire and process data, and generate various reports:

- Thermo TraceFinder™
- Thermo Xcalibur™

Refer to the documentation for the above applications for details.

System Documentation

Your LC system ships with the Aria MX DVD, which includes technical documentation for the applications that run in your environment.

In addition to this guide, Thermo Fisher Scientific provides the following documentation for the LC system:

- *Aria MX User Guide* as a PDF file and Help (for the supported Transcend configurations, Aria, and Prelude SPLC systems)
- *Transcend DSX-1 Quick Start Guide* as a PDF file (for the Transcend DSX-1 configuration with the Dried Spot Module and Vanquish hardware)
- Aria MX Help (from the Aria MX software window)
- The following Vanquish hardware documents, which are provided in hard copy with each Vanquish shipment or in PDF format on the Aria MX DVD:
  - *Vanquish Column Compartments VH-C10 Operating Manual*

  - *Vanquish Split Samplers VH-A10, VF-A10, VH-A40, VF-A40 Operating Manual*
  - *Vanquish Pumps VF-P10, VF-P20 Operating Manual*
  - *Vanquish Pumps VH-P10 Operating Manual*
  - *Vanquish Charger Operator Manual*
- *Prelude SPLC System User Guide*
- Spark Holland hardware documentation for the Transcend DSX-1 configuration with the Dried Sample Module hardware, which are provided on the Aria MX DVD:
  - *DBS-A™ Manual*
  - *HPD 737 User Manual*
- TraceFinder manuals as PDF files (when TraceFinder application is installed on your data system computer)
- TraceFinder Help (from the TraceFinder application window)
- Xcalibur manuals as PDF files
- Xcalibur Help (from the Xcalibur application window)
- Pump user documentation
- Autosampler user documentation (for the supported autosamplers)

❖ **To view the *Aria MX User Guide***

Choose **Start > All Apps > Thermo Aria MX**.

❖ **To view TraceFinder manuals if available on your system**

Choose **Start > All Apps > Thermo TraceFinder > Manuals**.

❖ **To view TraceFinder Help if available on your system**

Click the **Help** icon in the upper right corner of any TraceFinder window.

❖ **To view the Xcalibur user documentation**

Choose **Start > All Apps >Thermo Scientific Xcalibur**.

❖ **To view the Xcalibur Help**

Choose a command from the Help menu or click **?** in the upper left corner of any Xcalibur window.

❖ **To view instructions on navigating the Xcalibur Help**

1. Click the expand icon (+) beside the Welcome to Xcalibur Help book to view the topics.
2. Select **Using This Help**.

Navigation instructions appear on the topic page.

❖ **To view the Aria MX Help**

1. Open the Aria MX Direct Control window.
2. Choose **Help > Help**, or press F1.

❖ **To view other manuals that might be available on your computer**

Choose **Start > All Apps > Thermo *product name***.

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes.

CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

CAUTION Highlights electric shock hazards to humans. Each electric shock notice is accompanied by the international high voltage symbol.

CAUTION Highlights chemical hazards to humans, property, or the environment. Each chemical notice is accompanied by the chemical caution symbol.

IMPORTANT Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

Note Highlights information of general interest.

Tip Highlights helpful information that can make a task easier.

Safety Information

Observe the precautions listed in this section to ensure personal safety and the safe operation and longevity of the instrument.

CAUTION Follow all safety precautions described in the appropriate autosampler, pump, mass spectrometer, and valve interface module (VIM) manuals.

CAUTION When you use the system, follow the generally accepted procedures for quality control and method development. If you observe a change in retention time of a particular compound, in the resolution between two compounds, or in peak shape, immediately determine the reason for the changes. Until you determine the cause of the change, do not rely on separation results.

CAUTION Use equipment only in the manner specified by its manufacturer, or risk impairing the protection provided by the equipment.

CAUTION Do not service any part when operating the Prelude SPLC instrument. Do not remove or open the instrument front panels when the instrument is running.

CAUTION Place only safety-certified equipment, such as the Transcend solvent rack and Transcend pumps, on top of the Transcend (or Transcend II) VIM. Fluid-carrying components, such as baking trays, lab ware, and flasks, are not permissible, and might damage the system.

CAUTION The instrument contains voltage lines. Switch off the power and disconnect the power cable prior to servicing any component on the system. There is no need to open the pump or VIM enclosure, as all user serviceable components are outside of the instruments.

CAUTION Follow the maintenance procedures in this manual when replacing or repairing serviceable components. Never try to repair or replace components not described in this manual without the assistance of a Thermo Fisher Scientific representative.

CAUTION Observe safe laboratory practices and procedures when handling chemicals. Only work with volatile chemicals under a fume or exhaust hood. Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of waste oil and when handling wetted parts of the instrument. Consult the pertinent safety data sheets (SDSs) for the solvents you use for HPLC analysis.

CAUTION Do not run the Prelude SPLC system with the autosampler door open. The autosampler contains a sharp moving part, which can cause injury if the door is opened during operation.

CAUTION For instruments that use biological reagents or samples, ensure that all operators are trained to safely work with biological hazards and that they wear protective clothing, including gloves and masks.

CAUTION Allow any heated components to cool before touching them.

CAUTION Do not use a damaged or expired TurboFlow or HPLC column on the system. Run a preview batch at regular intervals to evaluate the quality of the TurboFlow and HPLC columns.

CAUTION Inaccurate data can result from samples that are placed in the wrong tray position. Verify that the sample vial position matches the assigned position in the batch or sequence file and that the sample trays are placed correctly into the sample drawers.

Follow these safety precautions for TLX and LX systems.

CAUTION The TLX-4 and LX-4 systems use two (2) power cords. Before servicing the instrument, unplug both power cords from line power. To safely connect and disconnect the system from line power, place the system as close as possible to the laboratory AC power outlet.

CAUTION When working with solvents, follow the guidelines in the solvent's safety data sheet (SDS). Never refill one of the system's solvent containers without first removing the container from the system.

Environmental Conditions

Refer to the system component manuals for information on environmental conditions and specifications.

Good Laboratory Practices

To obtain optimal performance from your LC system and to prevent personal injury or harm to the environment, do the following:

- Keep good records.
- Read the manufacturers' SDSs for the chemicals you use in your laboratory.
- Remove particulate matter from your samples before injecting them into the liquid chromatograph.
- Use LC/MS-grade solvents or better.
- Connect the drainage tubes from the pump, autosampler, and detector to an appropriate waste receptacle. Dispose of solvents as specified by local regulations.

Keeping Good Records

To help identify and isolate problems with either your equipment or your methodology, keep good records of all system conditions (for example, %RSDs on retention times and peak areas, peak shape, and resolution). At a minimum, thoroughly document a chromatogram of a typical sample and standard mixture, with system conditions, for future reference. Careful comparison of retention times, peak shapes, peak sensitivity, and baseline noise can provide valuable clues to identifying and solving future problems.

Chemical Toxicity

Although the large volume of toxic and flammable solvents used and stored in laboratories can be quite dangerous, do not ignore the potential hazards posed by your samples. Take special care to read and follow all precautions that ensure proper ventilation, storage, handling, and disposal of both solvents and samples. Become familiar with the toxicity data and potential hazards associated with all chemicals by referring to the manufacturers' safety data sheets (SDSs).

Solvent Requirements

Use LC/MS-grade solvents that are free of particulates. Choose a mobile phase that is compatible with the sample and column you have selected for your separation. Be aware that some solvents are corrosive to stainless steel.

CAUTION Do not use solvents containing Freon™ and perfluorinated solvents, such as Fluorinert™ and Fomblin™ perfluoro polyether solvents. They adversely affect the Teflon™ AF degassing membrane.

Solvent Disposal

Make sure you have a solvent waste container or other kind of drain system available at or below the bench top level. Most solvents have special disposal requirements prohibiting disposal directly down a drain. Follow all governmental regulations when disposing of any chemical.

High-Pressure Systems and Leaks

LC systems operate at high pressures. There is little immediate danger from the high pressures in an LC system. However, if a leak occurs, correct it as soon as possible. Always wear eye and skin protection when operating or maintaining an LC system. Always shut down the system and return it to atmospheric pressure before attempting any maintenance.

CAUTION Thermo Fisher Scientific recommends wearing safety glasses and lab coats when operating an LC system.

Contacting Us

Contact	Email	Telephone	QR Code
U.S. Technical Support	us.techsupport.analyze@thermofisher.com	(U.S.) 1 (800) 532-4752	
U.S. Customer Service and Sales	us.customer-support.analyze@thermofisher.com	(U.S.) 1 (800) 532-4752	
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1

Maintenance Schedule

The use of this maintenance guide assumes the following:

- One of the LC systems listed in the Preface is running samples in a Research Use Only (RUO) environment.
- The installed Aria MX software is controlling LC sample processing and passing samples to a mass spectrometer system.
- The installed data system software is the appropriate version and is running properly.

Adhering to the recommended maintenance schedule is an important part of keeping your system operating at peak efficiency and reliability. Table 1 summarizes important maintenance tasks and breaks them down to their corresponding recommended frequency.

IMPORTANT Schedule preventive maintenance with your Thermo Fisher Scientific field service engineer every 10 000 to 15 000 injections per LC channel.

Note

- Refer to the Thermo Fisher Scientific Vanquish hardware operating manuals, maintenance or service chapters, for specific and detailed Vanquish hardware maintenance information. These are provided in hard copy with the Vanquish hardware and are also located on the Aria MX DVD in PDF format.
- Refer to the Spark Holland hardware guides located on the Aria MX DVD for the recommended DSX-1 component maintenance procedures.

See "System Documentation" on page xiv for a complete list of hardware documentation.

Table 1. Maintenance schedule

Frequency	Procedure
Daily	Accessing the Direct Control Window
	Tracking the Number of Injections
	Managing the LC Pumps
	Preparing the Mobile Phase Solvents
	Prime Supported Hardware
	Priming the TriPlus LCMS-P Tool Wash Pumps
	Refreshing (Purging) the Vanquish AS Needle Wash
	Rinsing the Needle on Systems with a Dynamic Load Wash (DLW)
Weekly	Preparing Solutions
Every 300 to 1000 injections	Replace the TurboFlow Column (Non-Viper Fittings)
Every 2000 injections	Replace the Analytical Column (Non-Viper Fittings)
Every 10 000 to 15 000 injections	Preventive maintenance performed by a qualified field service engineer

Preparing Solutions

Your system requires various solutions that you must prepare properly for optimal performance and effective maintenance.

Contents

Preparing the TurboFlow Column Wash Solvent

The column wash solvent is generally placed in mobile phase position C (or D) for the TurboFlow loading pump. It is used to wash a TurboFlow column while analytes are eluting from the analytical column to the MS. At a minimum, prepare the column wash solvent weekly.

Note You can use column wash solvent as the autosampler's organic wash solution when carryover is an issue.

Prepare a 45/45/10 acetonitrile/isopropanol/acetone solution in a clean 2-liter bottle by mixing the following:

- 900 mL of LC/MS-grade acetonitrile
- 900 mL of LC/MS-grade isopropanol
- 200 mL of LC/MS-grade acetone

Use this solution to fill the column wash solvent reservoir. The solution is stable for 30 days at room temperature.

Preparing the Mobile Phase Solvents

Prepare aqueous mobile phases according to these guidelines:

- Use LC/MS-grade solvents or better.
- Prepare fresh aqueous mobile phases daily (weekly as a minimum) in clean bottles. Do not refill or top off standing bottles.
- Make aqueous mobile phases in quantities that will be used daily.
- Do not use a thermoplastic sealing film, such as Parafilm™, as a mobile phase reservoir cover.
  - Use an appropriate bottle cap that accommodates the solvent lines. If caps are not available, use aluminum foil to secure the solvent lines in the bottle and protect the solvent from dust.
  - Make sure that the mobile phase line with attached solvent filter reaches the bottom of its intended reservoir.
- Wherever possible, include 2% acetonitrile or 0.1% formic acid in aqueous mobile phases to inhibit microbial growth.
- Do not use any mobile phases that have visible particulates or appear foggy.
  - Before each batch, vigorously swirl the mobile phase bottles and look for particulates that might be floating or moving in the liquid.
  - Check the fluid lines and filters for particulates or slime. If you find particulates or foggy mobile phases, replace the bottles.
  - Replace the solvent filters and purge the lines fully with new, clean, LC/MS-grade mobile phase.

Preparing the Rear Seal Wash Solution

Rear seal wash systems vary depending on the pump type your configuration uses:

- UltiMate™ and Vanquish Flex LC pumps are equipped with an active rear seal wash system.
- Transcend Duo LX-2 systems (Vanquish Dual Split Sampler autosampler with Vanquish Horizon pumps) use a seal wash system flow path that passes through both metering device heads in the autosampler and the Horizon pump heads.

Thermo Fisher Scientific recommends rinsing the back of the piston seal to prolong the life of the seal. For reverse-phase applications on UltiMate or Vanquish Flex pumps, standard HPLC-grade water with 10% methanol is appropriate. Refer to the UltiMate pump or Vanquish Flex pump documentation for additional workflow recommendations.

Prepare a 10% solution of methanol in water in a clean 2 liter bottle by mixing the following:

- 1800 mL of HPLC-grade water
- 200 mL of HPLC-grade methanol

For the Transcend Duo LX-2 system, use 75% of HPLC-grade isopropanol in HPLC-grade water and 0.1% formic acid, preparation by volume (for example, 75 mL isopropanol + 25 mL water + 0.1 mL formic acid).

Preparing the Autosampler Wash Solutions

Proper maintenance of the wash solutions is essential to obtain good results. Use the following guidelines for wash solution preparation and maintenance.

- Prepare the autosampler wash solutions according to your laboratory's standard operating procedure.
- Follow the same general recommendations as described in Preparing the Mobile Phase Solvents.
- Replace the old wash solution with freshly prepared solution.

  IMPORTANT Make sure that you place the wash solution bottles for the TriPlus and Accela Open autosamplers in the appropriate locations. Improper locations of Wash 1 and Wash 2 can affect data quality.

- Prime (or purge) the AS wash pumps. For more information on priming or purging the types of AS wash pumps used in your system, see Chapter 3, "Aria MX Software-based Maintenance."

  IMPORTANT Thermo Fisher Scientific recommends that you properly revalidate LCMS methods when making any changes to AS wash solvents within an existing assay.

- The Vanquish Dual Split Sampler AS uses a needle wash, which removes residual sample from the *outside* of the needle.Thermo Fisher Scientific recommends using a 100% water needle wash solution. Replace and/or refresh the needle wash liquid daily.

3

Aria MX Software-based Maintenance

The Transcend and Prelude SPLC systems rely on the Aria MX software to control and manage the system components—autosamplers, injectors, pumps, and so on.

The Aria MX software is also used to develop the instrument method instructions for the system components to run samples. Refer to the *Aria MX User Guide* and Help for details.

This chapter describes LC system maintenance procedures that are performed by using Aria MX software controls.

Contents

Accessing the Direct Control Window

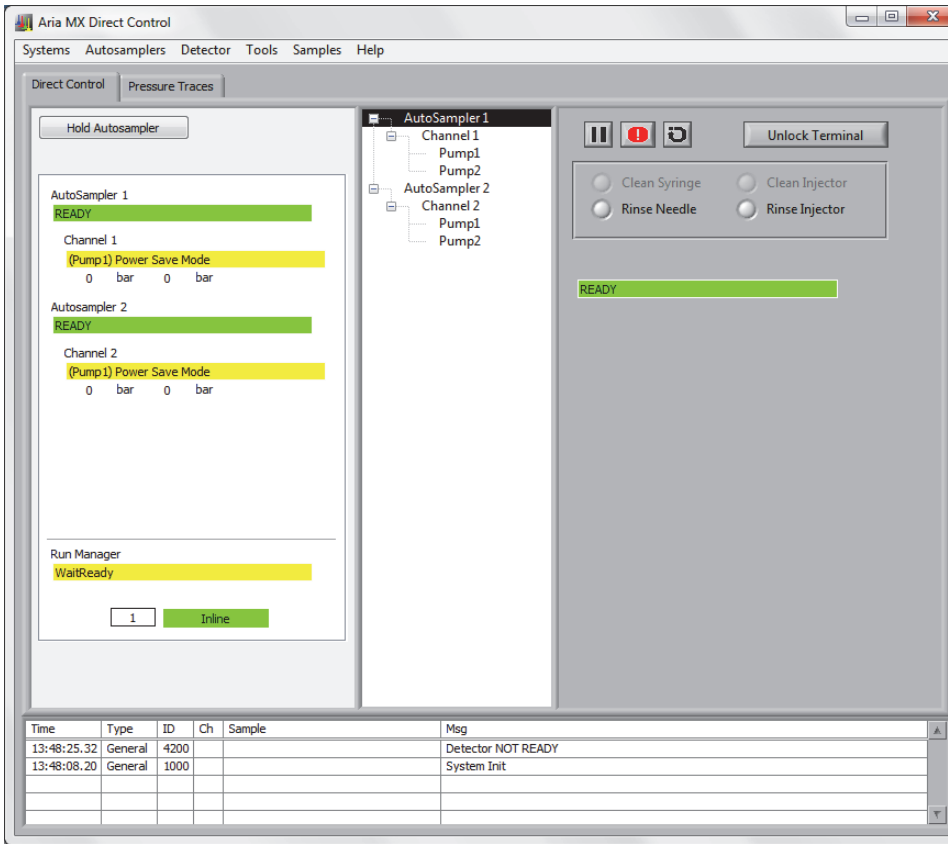
Use the Aria MX Direct Control window to perform many important maintenance tasks on the LC system. Depending on your system type—either Transcend/Aria or Prelude—the Aria MX Direct Control window will have different visual elements and controls.

❖ **To access the Direct Control window**

Choose **Start > All Apps > Thermo Instruments > Aria MX > Direct Control**.

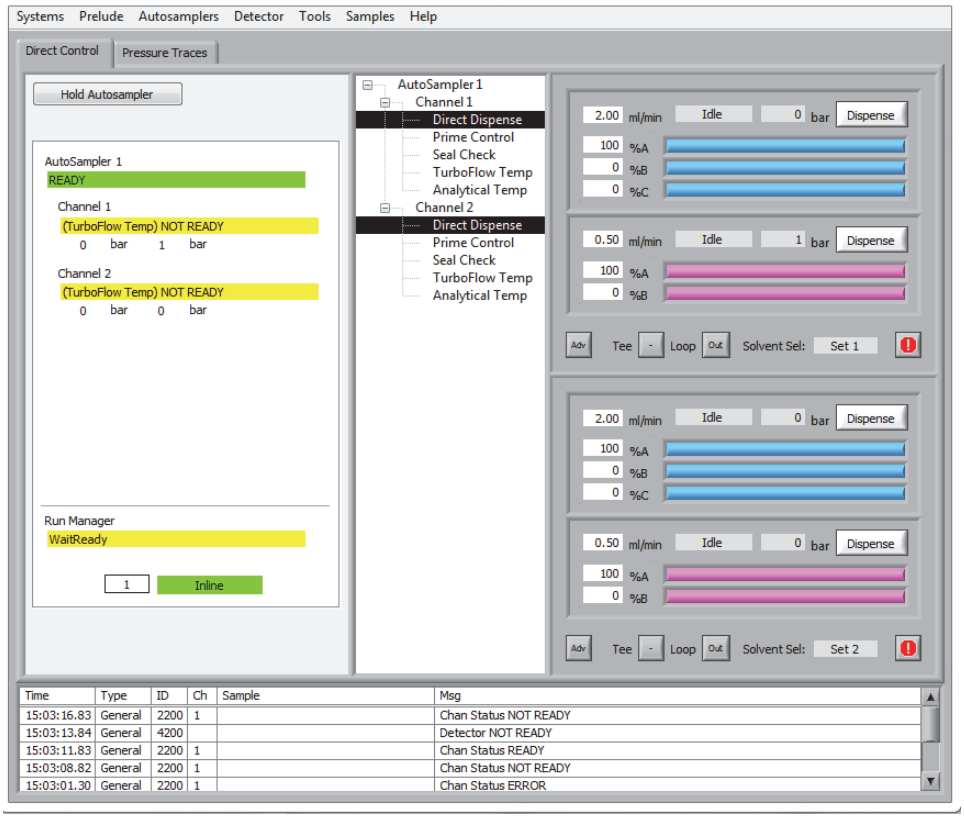
The Direct Control window appears. See Figure 5 for Transcend and Aria systems. See Figure 6 for Prelude SPLC systems.

Figure 5. Aria MX Direct Control window, showing window for Transcend and Aria systems



Note Depending on the make and model of the pumps on your system, the appearance of this window might be different.

Figure 6. Aria MX Direct Control window for the Prelude SPLC system



Tracking the Number of Injections

It is important to keep good records and track the usage of syringes and other system components. The Aria MX Maintenance dialog box helps you optimize instrument performance by tracking the number of injections made by each probe or system.

❖ **To view the total number of injections on a probe, system, or detector**

1. Open the Direct Control window.
2. Choose **Tools > Maintenance**.

   The Maintenance dialog box appears (see Figure 7).

Figure 7. Maintenance dialog box

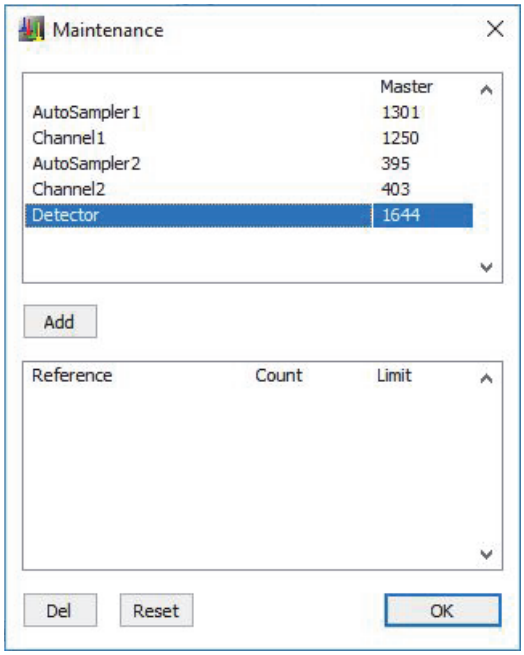


Table 2 describes the columns in the Maintenance dialog box.

Table 2. Maintenance dialog box columns

Column	Description
Master	The total, cumulative number of injections for each component.
Reference	A user-defined interval of injections for tracking the number of injections for a system component. For example, define a reference named "TurboFlow column," and install a new column. At the start of the reference, the count shows 0. Reset the count to zero each time you change the TurboFlow column. You can use this reference to determine the number of injections since the column was changed (see To create a reference for tracking injections).
Count	The number of injections that have elapsed since the reference was created or reset to 0.
Limit	The number of injections that must elapse before the system alerts you with a message.

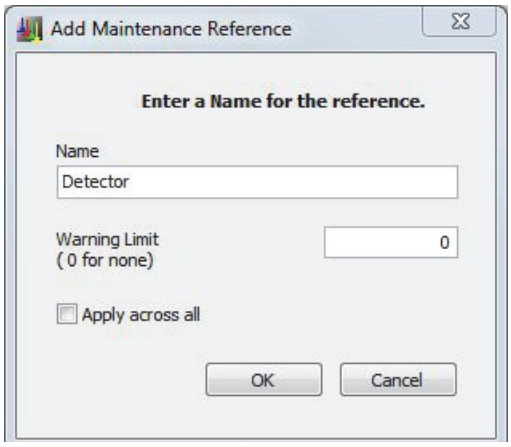
A reference is the component or group of components that you want to track.

❖ To create a reference for tracking injections

1. Select the system component that you want to track in the upper portion of the Maintenance dialog box.
2. Click **Add**.

   The Add Maintenance Reference dialog box appears.

   Figure 8. Add Maintenance Reference dialog box



3. Type a name for the reference. Enter a name that reflects the component you are tracking, such as **Detector**.
4. In the Warning Limit box, do one of the following:
   - To have the system notify you when a specific number of injections that involve the selected component has elapsed, type the number of injections.
   - To not have the system notify you when a number of injections have elapsed using the component, leave the box value set to **0**.
5. To apply the setting across all channels for similar components, select the **Apply Across All** check box.

   With this check box selected, an injection on any of the channels updates the count for this reference.
6. Click **OK**.

❖ To reset a reference count to zero

1. In the Maintenance dialog box, select the reference name at the bottom of the window.
2. Click **Reset**.

3. To confirm the change, click **Yes**.

   The count value for the selected reference resets to 0.

Managing the LC Pumps

Proper management of the system LC pumps requires basic daily maintenance checks. The following sections provide maintenance best practices and procedures.

Purging the LC Pumps for Transcend Systems

For best results, use Aria MX Direct Control to perform a daily purge of the Thermo Scientific pumps.

IMPORTANT

- The Vanquish Flex and UltiMate pump purge procedure requires that you physically open the purge valve on each pump being purged.
- The Vanquish Horizon pump purge valve operates automatically during the purge procedure.

Key aspects of the purge function include the following:

- Running the Purge command primes the solvents and removes air from the system lines.
- The solvent is dispensed to waste.
- Pump purges can be canceled at any time.

Note The solvent to be purged should deliver 100% of the volume. Check and adapt the solvent composition percent setting in the pump Channel view—"Comp (%)"—from the Aria MX Direct Control window.

Purging the pumps is a process that flows fluid from the solvent bottle to the pump and then to waste for Transcend system LC pumps. The fluids do not reach the columns during the purging procedure.

Purge the loading and/or eluting pumps if any of the following conditions occur:

- A pump solvent reservoir has emptied
- You have refreshed the solvents
- A pump has been idle overnight or for more than 1 day
- You observe fluctuations in pump pressure

Purge the pumps using the mobile phases that you use for sample analysis, unless you are instructed to use a cleaning solvent or water during a troubleshooting or maintenance procedure.

❖ To purge the LC pumps for Transcend systems

1. (Vanquish Flex or UltiMate pumps) Open the pump purge valve on the pump hardware.

   Note Vanquish Horizon pumps use an automatic internal purge valve that does not require the user to manually operate.

   Tip You can change and/or view the purge flow and purge time settings for the pump type in your system as follows.

   - For UltiMate pumps (Defaults: 3 mL/min for Flow; 5 minutes for Time):
     - Open the Preferences menu from the UltiMate pump front panel display, and then make your changes.
   - For Vanquish pumps (Defaults: 3 mL/min for Flow for the Vanquish Flex pump; 5 mL/min for Flow for the Vanquish Horizon pump; 5 minutes for Time):
     a. From Aria MX Direct Control, click the channel and pump that you want to change or view, and then click the **Options** button from the pump controls (right pane).

        The Pump Options dialog box appears (see Figure 23 on page 27), and the current purge settings are displayed in the Purge area.

     b. Click **Close**, or continue with Step c if you want to change a purge setting.

     c. From the Purge area, choose the parameter you want to change—Flow (mL/min) or Time (min)—then select the box and type the new value.

     d. Click **Close**.

   For more information, refer to the UltiMate pump or the Vanquish pump documentation provided with the respective hardware. See "System Documentation" on page xiv for a documentation list.

2. If the pump purge valve is not already connected to a waste reservoir, connect one end of the tubing to the waste outlet on the purge valve of the target pump. Place the other end of the tubing in the waste reservoir.

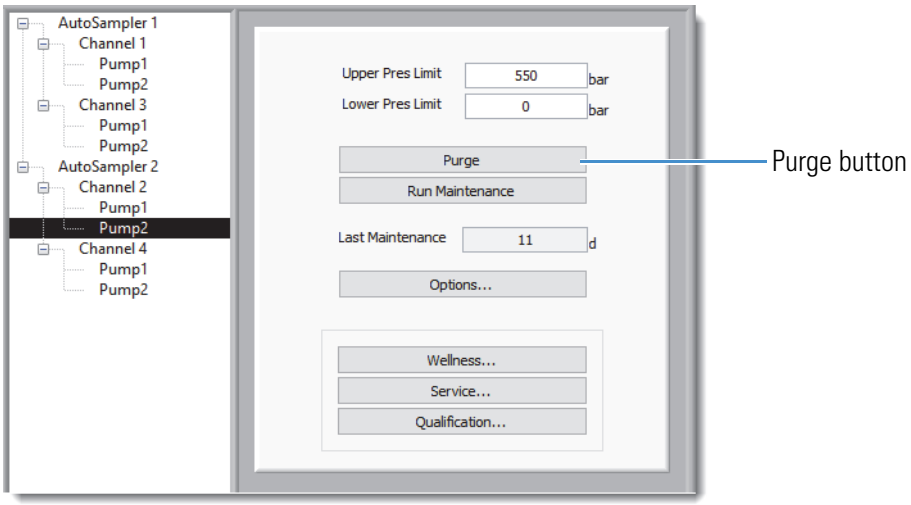
3. Open the Direct Control window. See "Accessing the Direct Control Window" on page 7.

4. In the middle pane, select the channel and pump that you want to purge.

   The pump controls for the selected pump appear in the right pane of the Direct Control Window (Figure 9).

Note Depending on the make and model of the pumps on your system, the appearance of this window might be different.

Figure 9. Aria MX Direct Control pump controls (Transcend TLX-4 with Vanquish Flex pumps)



5. Click the **Purge** button.

   A window appears warning to open the purge valve on the pump (Vanquish Flex and UltiMate pumps) and to set the solvent composition.

6. Click **Continue**.

   The purge cycle starts, indicated by the dimmed pump control window (right pane). The left pane (Active) window shows the pump purge progress bar. The right pane (pump controls) becomes active again once the purge cycle is complete.

   Note Because the purge valve is open, pump pressure is lower than when you run methods and should be close to zero.

   Tip If you want to stop purging the pumps before the purge cycle is complete, from the left pane, right-click inside the purge progress bar and select **Off**.

7. Repeat step 4 through step 6 for each pump in the system.

8. (Vanquish Flex and UltiMate pumps) Close the purge valves.

   Note Do not overtighten the Vanquish Flex or UltiMate purge valves.

   The purge cycle is complete and the right pane pump controls for that pump are available.

Priming the LC Pumps for Prelude SPLC

If you observe fluctuations in pump pressure, change the solvent bottles, and then prime the pumps. If the instrument has been idle for more than 24 hours, prime the loading and eluting pumps.

This procedure flows fluid from the solvent bottle to the pump, and then to waste. The fluids do not reach the columns.

Prime the pumps using the mobile phases you use for sample analysis, unless a service engineer instructs you to use a cleaning solvent or water during a troubleshooting or maintenance procedure.

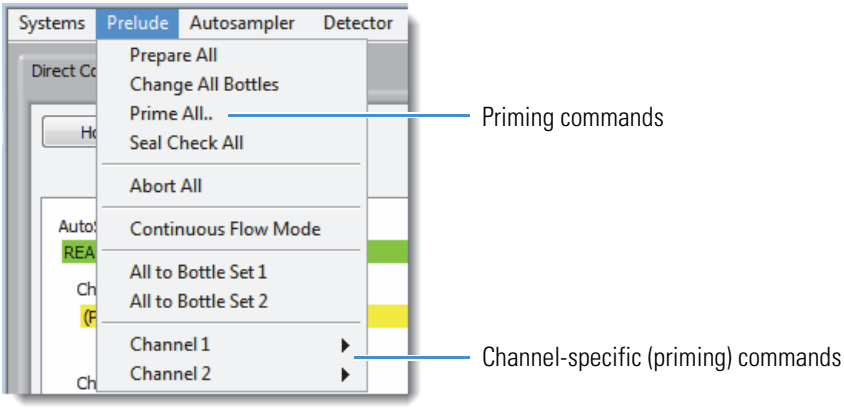
Note For Prelude SPLC systems, Thermo Fisher Scientific recommends that you prime both channels at least six times using Bottle Set 1, and both channels at least six times using Bottle Set 2.

❖ To prime the pumps using the controls in the Direct Control window

1. Open the Direct Control window.
2. Open the Prelude menu.

   The Prelude menu shows the available priming commands and options.

   Figure 10. Prelude menu options



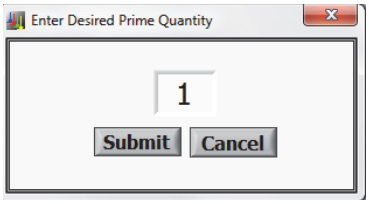
   Use one of the following options to initiate the priming operation.

❖ (Option 1) To prime all the pumps at the same rate by using the controls in the Direct Control window

1. Open the Direct Control window.
2. Choose **Prelude > Prime All**.

   The Enter Desired Prime Quantity dialog box opens (see Figure 11).

Figure 11. Enter Desired Prime Quantity dialog box



3. Type the number of prime cycles that you want to perform, and then click **Submit**.

   All of the system pumps begin the priming operation for the number of times that you specified.

Note The priming function uses the mobile phase bottles that are already assigned to a channel.

❖ **(Option 2) To prime individual pumps in the Direct Control window**

1. Open the Direct Control window.
2. In the middle pane, select **Prime Control** for any available channel.

   The Direct Control priming options appear to the right.

3. Determine which pump you want to prime, and then click in the box directly below the P button.
4. Type the number of prime cycles that you want to perform on the pump specified, and then click the **P** button.

   The priming operation begins for the number of times that you specified.

Note The priming function uses the mobile phase bottles that are already assigned to a channel.

❖ **(Option 3) To prime both pumps for a specific channel in the Direct Control window**

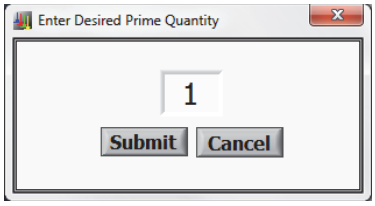
1. Open the Direct Control window.
2. In the middle pane, select **Prime Control** for any available channel.

   The Direct Control priming options appear to the right.

3. Determine the channel with the pumps that you want to prime, and then click **Prime All**.

   The Enter Desired Prime Quantity dialog box opens (see Figure 12).

Figure 12. Enter Desired Prime Quantity dialog box



4. Type the number of prime cycles that you want to perform, and then click **Submit**.

   The two pumps for that channel begin the priming operation for the number of times that you specified.

Note The priming function uses the mobile phase bottles that are already assigned to a channel.

Recording Pump Pressures

Take daily note of the pump pressure about 15 seconds after the sample injection. Keep a log of the pressures every day and every time a new column is installed. Record the pressures on each channel with the columns in place. Refer to the *Aria MX User Guide* for details regarding monitoring the pump pressure.

Do the following:

- View the pressure trace of a recently run sample and compare it with a baseline pressure trace.

  If you observe meaningfully higher pressure anywhere in the system, consider isolating the faulty component by process of elimination. Possible causes of a pressure increase include deteriorating or clogged columns, tubing, and rotor seals.

  Check all visible fittings for signs of leaking if you observe significantly lower pressure anywhere in the system. Additionally, verify that the column heaters are functioning correctly, if installed.

- Call Thermo Fisher Technical Support if you are unable to resolve the problem (see "Contacting Us" on page xxii).

Internal Pump Maintenance for Vanquish and UltiMate Pumps

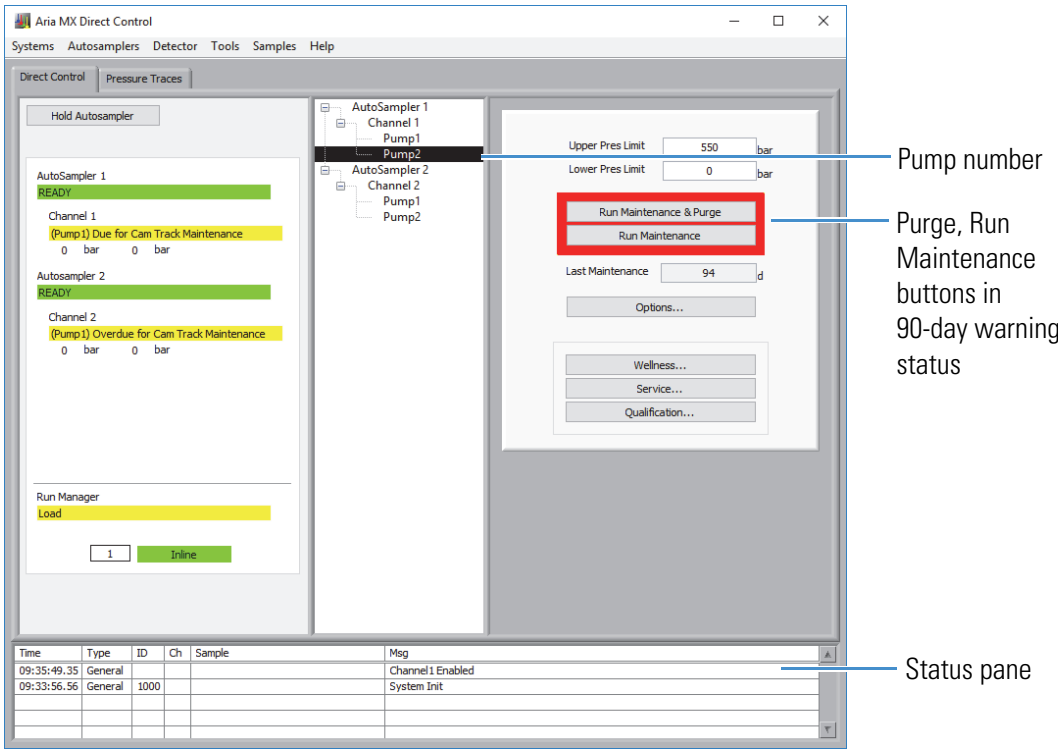
For best results, allow Thermo Scientific Vanquish Flex and UltiMate pumps to run an internal maintenance procedure every 45 days, which lubricates the internal pump mechanisms, including the pump cam tracks.

The Flex and UltiMate pumps provide specific messages if no maintenance operation has been initiated within 90 days, as follows:

- Flex and UltiMate pump maintenance warning messages and errors are displayed in Aria MX software (Figure 13), as follows:
  - Due for Cam Track Maintenance (warning message).
  - Flashing red outline of the Vanquish Flex maintenance controls (error message, see Figure 13).
- Additionally, UltiMate pump maintenance warning messages are displayed on the UltiMate pump front panel.

IMPORTANT The Vanquish Flex and UltiMate pump maintenance procedures require that you physically open the purge valves on each pump before you start the procedure.

Figure 13. Aria MX Direct Control window, pump view, Vanquish Flex pump showing Purge, Run Maintenance buttons, with 90-day maintenance warning



IMPORTANT The pumps indicate a persistent error state after 150 days until a maintenance procedure has been completed.

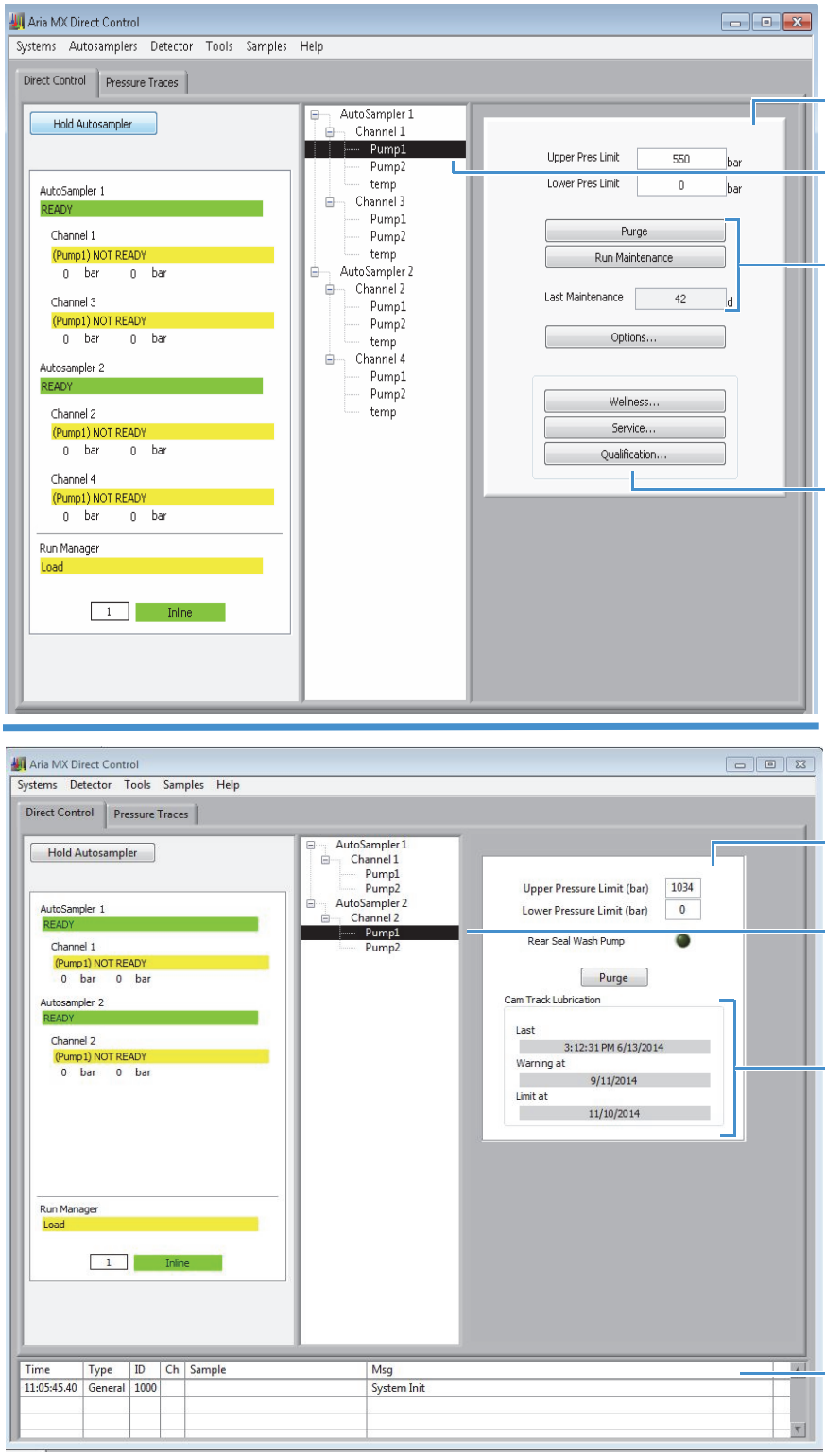
Key aspects of the maintenance feature for UltiMate and Flex pumps are as follows:

- Initially, the pump firmware automatically runs the maintenance procedure when the pump is being purged if it has been at least 45 days since the last cam lubrication.

- The pump firmware tracks the date of the last cam track lubrication procedure for the Flex and UltiMate pumps, which is displayed in the Aria MX Direct Control window. Additionally, the UltiMate pumps also display the warning and the limit dates. See Figure 14.
- The cam track lubrication timer is set in the pump firmware and is reset whenever the pumps perform the maintenance procedure.
- Pump purge procedures performed *before* the 45-day time period has elapsed do not include the cam lubrication function.
- Pump purge procedures performed *after* the 45-day time period has elapsed also include the cam track lubrication function.
- Vanquish Flex pump maintenance can be performed at any time by clicking **Run Maintenance** from the Vanquish Flex (pump) controls window. See Figure 14, Vanquish Flex (pump) controls area.

Note The internal pump maintenance timer is reset to 0 days (“0 d”) each time you run the maintenance command. The Last Maintenance box displays the number of days since the maintenance procedure was run (see Figure 14).

Figure 14. Aria MX Direct Control windows, pump view, *before* required maintenance is due for Vanquish Flex (pictured at top) and UltiMate pumps (pictured at bottom)



The Vanquish and UltiMate pumps require periodical and routine maintenance. The pump firmware logs and tracks the maintenance schedule based on a 45-day cycle.

❖ To run maintenance and reset the maintenance schedule cycle

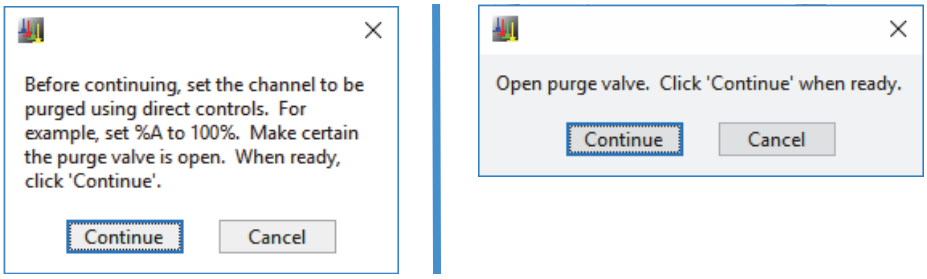
1. Open the Aria MX Direct Control window. See "Accessing the Direct Control Window" on page 7.
2. From the middle pane of the Aria MX Direct Control window, select the channel and pump on which you want to run the maintenance procedure.
3. (Vanquish Flex or UltiMate pumps) Open the pump purge valve(s) on the selected pump by rotating each valve counterclockwise one or two revolutions.
4. Do one of the following:
   - For Vanquish Flex pumps, from the right pane of the Aria MX Direct Control window, click the **Run Maintenance** button if you want to start a maintenance cycle, which you can perform at any time.

     –or–
   - Click the **Run Maintenance and Purge** button, which appears if maintenance is also due.

     A warning message appears regarding the pump settings and next user actions (Figure 15).
   - For UltiMate pumps, from the right pane of the Aria MX Direct Control window, click **Run Maintenance & Purge**.

     A warning message appears regarding the pump settings and next user actions (Figure 15).

     Figure 15. At left, run maintenance and purge warning message. At right, run maintenance (only) warning message



5. Click **Continue**.

   The maintenance operation begins.

Note

- A purge operation begins immediately after the pump maintenance is complete if the Run Maintenance and Purge button is displayed in the pump controls window and is clicked.
- The UltiMate pump displays a message on the pump front panel when maintenance is being performed.
- You can cancel the purge operation once maintenance is complete.

6. (Vanquish Flex or UltiMate pumps) Close the pump purge valves after the pump status indicator changes to NOT READY in the Aria MX Direct Control window status (left) pane.

   The pump maintenance is complete, and the 45-day maintenance clock is reset for that pump.

Seal Wash Systems

The Thermo Scientific Vanquish and UltiMate pump piston seal wash systems keep the pistons wet and rinse the piston seals automatically. This process helps to prevent unwanted crystallization and particle deposits from forming on the piston surfaces and seals.

In the Vanquish Dual Split Sampler autosampler equipped with Vanquish Horizon Pumps, the flow path of the seal wash system passes through both metering device heads in the autosampler and the pump heads in the pumps.

Thermo Fisher Scientific recommends that you always use a seal wash, which is turned on by default. You can also set this feature to “standby” (UltiMate pumps) or “disabled” (Vanquish pumps and Vanquish AS).

Note Refer to the UltiMate pump, Vanquish pump, and the Vanquish AS operating manuals located on the Aria MX DVD for more detailed information regarding the seal wash systems.

UltiMate Pump Seal Wash Pump Standby (Power Save Mode)

You can configure Thermo Scientific UltiMate pumps to go into standby mode when they are not actively running LC samples. Doing so has the added benefit of turning off the rear seal wash system, which helps to reduce wash solvent consumption and save power.

When placed in standby mode, the pumps, including the LED control screens, turn off. You can turn the pumps back on using the Aria MX software.

Set up the standby feature using the Thermo Foundation Instrument Configuration window.

Use the Foundation Instrument Configuration window to configure the rear seal wash standby mode for UltiMate pumps.

Note You must close all other Thermo Scientific data system applications before performing the following procedure.

❖ To set the rear seal wash standby mode

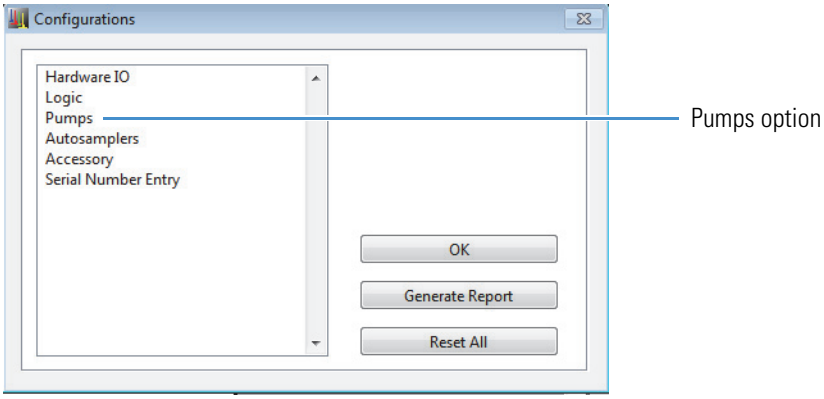
1. Choose **Start > All Apps > Thermo Foundation *x.x* > Instrument Configuration**.

   The Instrument Configuration window opens.

2. From the Configured Devices pane, select **Aria MX**, and then click **Configure**.

   The Configurations dialog box opens.

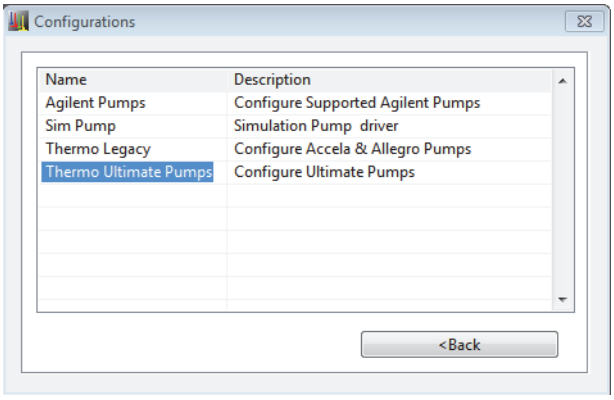
   Figure 16. Configurations dialog box, Pumps option



3. Click **Pumps**.

   The (pumps) Configurations dialog box appears (see Figure 17).

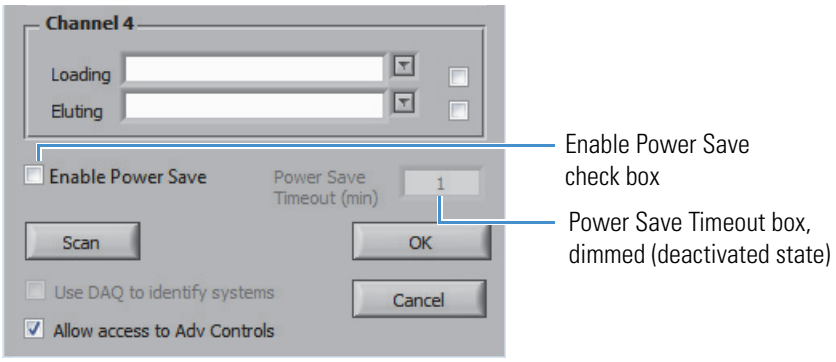
   Figure 17. Configurations dialog box, Thermo Ultimate Pumps option (selected)



4. Click **Thermo Ultimate Pumps**.

The Ultimate Pump configuration dialog box appears (Figure 18).

Figure 18. Bottom area of the Ultimate Pump configuration dialog box



5. Select the **Enable Power Save** check box.

   The Power Save Timeout (min) box is activated.

6. Type the number of minutes that you want to set as the timeout time in the Power Save Timeout box, and then click **OK**.

Note The Power Save Timeout timer starts after the LC timeout setting has been reached.

The Power Save configuration parameters for the UltiMate pumps are set in the Ultimate Pump Configuration dialog box using the Thermo Foundation Instrument Configuration window.

The Power Save Timeout feature has the following configuration options (see Table 3).

Table 3. Power Save configuration options

Item	State	Description
Enable Power Save check box	Check box clear	(Default) The Power Save feature is off.
	Check box selected	The Power Save feature is on.
Power Save Timeout (min) box	Dimmed	(Default) This option is unavailable because the Power Save feature is off.
	Available	This option is active. Type a positive integer (1, 2, 3, and so on) to indicate the number of minutes that the UltiMate LC pumps are inactive before the pumps are put into Power Save (standby) mode.

Configuring the Seal Wash for Vanquish Pumps

Use the Foundation Instrument Configuration window to configure the rear seal wash for Vanquish pumps. This feature is on by default.

Note

- You must first close all other Thermo Scientific data system applications.
- On Transcend Duo LX-2 configurations that use Vanquish Horizon pumps the seal wash system also flows solution through the metering device heads on the AS.

❖ To enable or disable the rear seal wash

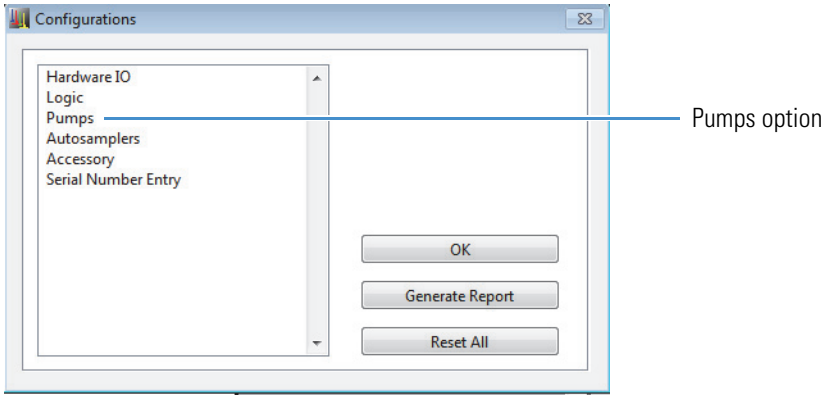
1. Close all Thermo Scientific applications.
2. From the Start menu, choose **Start > All Apps > Thermo Foundation *x.x* > Instrument Configuration**.

   The Thermo Foundation Instrument Configuration dialog box opens.
3. On the right side of the dialog box, select the **Aria MX** icon and click **Configure**.

   The Configurations dialog box appears.
4. From the Configured Devices pane, select **Aria MX**, and then click **Configure**.

   The Configurations dialog box opens.

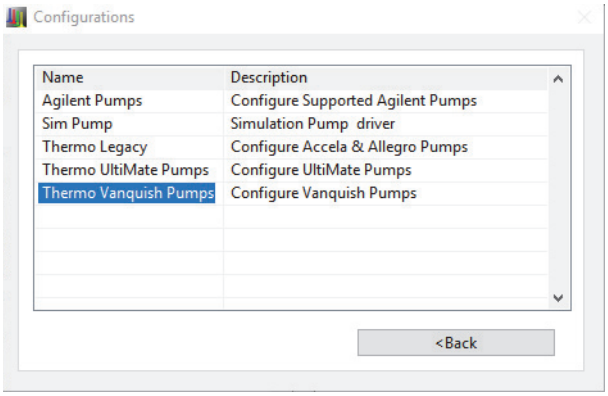
   Figure 19. Configurations dialog box, Pumps option



5. Click **Pumps**.

   The (pumps) Configurations dialog box appears (Figure 20).

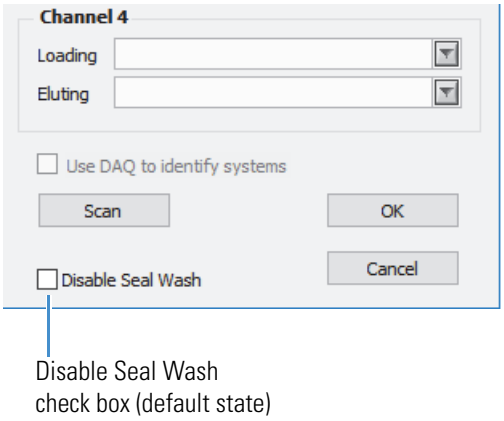
Figure 20. Configurations dialog box, Thermo Vanquish Pumps option (selected)



6. Click **Thermo Vanquish Pumps**.

   The Vanquish Pump configuration dialog box appears (Figure 21).

Figure 21. Bottom area of the Vanquish Pump configuration dialog box



Disable Seal Wash
check box (default state)

7. Clear the **Disable Seal Wash** check box (if selected).

   The Vanquish seal wash is enabled.

Note The piston seals will not be rinsed until this setting is changed.

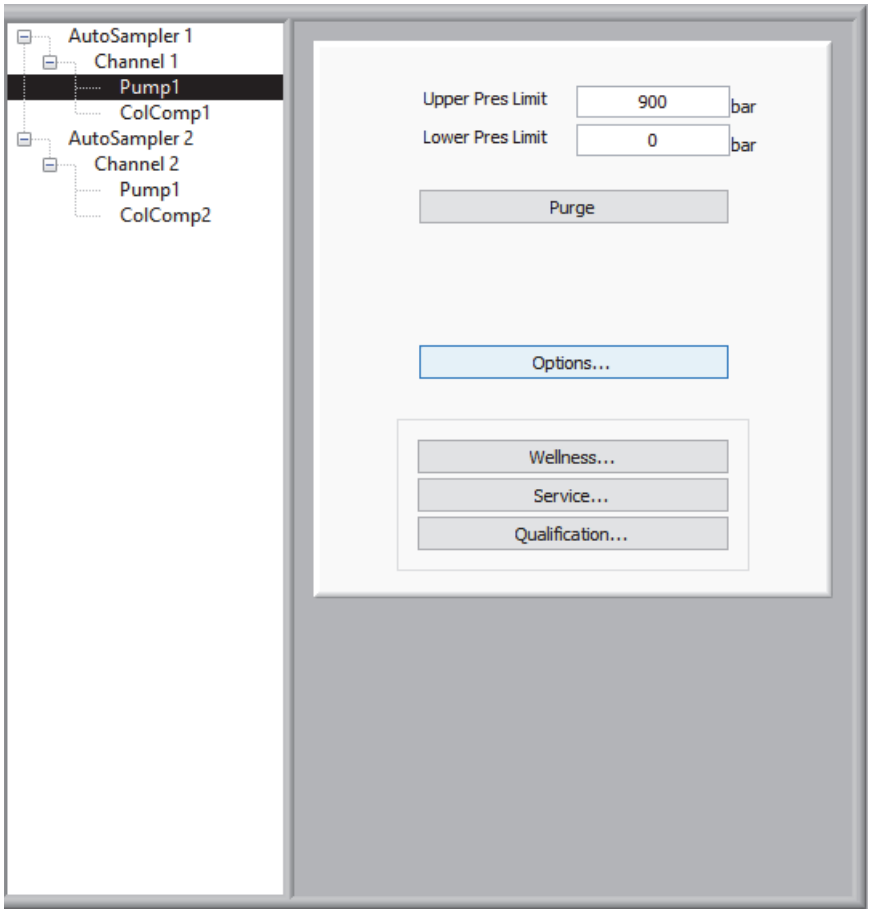
You can disable the drop counter (seal wash detector) functionality by turning off the rear seal wash monitoring from the Pump Options dialog box, Rear Seal Wash area. Disabling drop detection does not turn off the seal wash system; however, seal wash system messages or alerts will not appear (for example, if the system runs out of wash solvent).

❖ To monitor the seal wash

1. From Aria MX Direct Control, click the pump that you want to change.

   The pump controls and advanced pump features appear in the right pane of the Aria MX Direct Control.

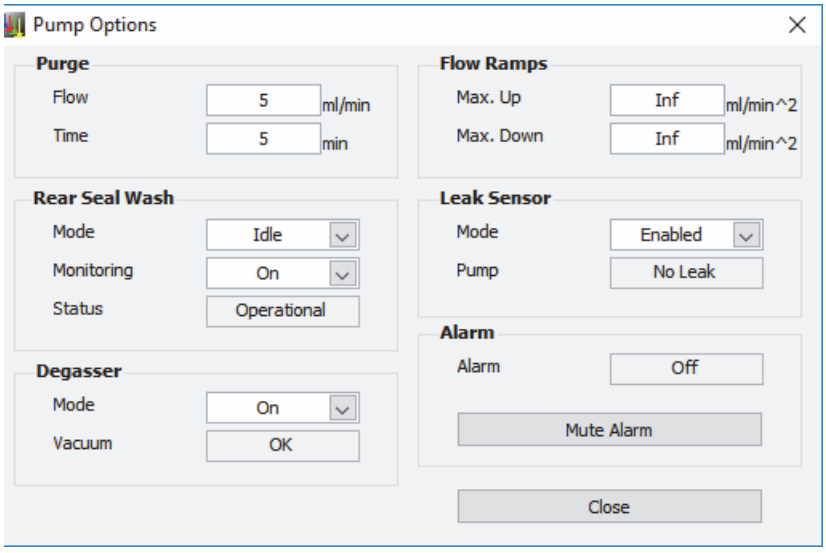
Figure 22. Aria MX Direct Control, right pane options (Horizon pump example)



2. Click **Options**.

The Pump Options dialog box opens.

Figure 23. Pump options dialog box



3. In the Rear Seal Wash area, click the Monitoring list and select **On**.
4. Click **Close** to save your changes.

   Repeat this procedure for the other pump, as needed.

You can also manually start—or stop—the seal wash operation when necessary.

❖ To manually start (or stop) the pump seal wash

1. Follow steps 1–2 in the above procedure, To monitor the seal wash, and then do one of the following for the Mode option of the Rear Seal Wash area (see Figure 23):
   - If the Mode option displays Idle, select **Active** from the list to start a wash cycle.
   - If the Mode option displays Active, select **Idle** from the list to stop the in-progress wash cycle.
2. Click **Close** to save your changes.

   Repeat this procedure for the other pump, as needed.

Reboot the DSM Camera

Use the Aria MX Reboot Camera command to restart the DSM camera. This might be necessary to resolve the following:

- A camera communication error
- Repeated camera error messages (for example, “Vision Job Not Executed”)
- To clear any other camera-related anomalies

❖ To reboot the DSM camera from Aria MX Direct Control

1. Open the Aria MX Direct Control window.
2. Click **Autosampler > Reboot Camera**.
   - The DSM camera disconnects, and then automatically restart.
   - Aria MX Direct Control Autosampler1 status reads back several messages during the reboot process.
   - The event is recorded in Aria MX event log.

Refer to the *DBS-A Manual*, located on the Aria MX DVD, for more information.

4

Autosampler Maintenance

This chapter describes maintenance guidelines, procedures, or reference information for the supported Thermo Scientific autosamplers.

Contents

Note There are some differences in the maintenance procedures for each model of autosampler. Follow the procedures that are specific to the autosampler model that you are using in your LC system.

- For detailed hardware maintenance information on the Vanquish AS and Vanquish Charger module, refer to the *Vanquish Split Samplers Operating Manual* or the *Vanquish Charger Operating Manual*, which are provided in hard copy with the Vanquish hardware or in PDF format on the Aria MX DVD.
- For detailed hardware maintenance information on the DSM hardware, refer to the Spark Holland *DBS-A Manual* or the *HPD 737 User Guide,* which are provided in PDF format on the Aria MX DVD.

Supported Autosampler Models

The Prelude instrument control software (version 1.3) supports two Prelude LX-4 MD models that use different autosamplers (AS), which are referred to as follows in this document:

- "Model A"—Prelude LX-4 MD systems that use a DLW (Dynamic Load-Wash) wash system and CStack temperature controlled sample drawer system running on instrument control software version 1.2 or earlier.
- "Model B"—Prelude LX-4 MD systems that use the LCMS-P wash system and Peltier Stack temperature controlled sample drawer system running on instrument control software version 1.3 or later.

Note Consult with your Thermo Fisher Scientific sales representative to confirm the specific model that you purchased.

For more information, browse the Autosamplers folder on the Aria MX DVD and refer to the documentation that is located inside the folder corresponding to your autosampler model.

Verifying Autosampler Wash Solutions

Verify the wash solutions used in the system to ensure their freshness and overall integrity. The following sections provide instructions on how to verify the wash solutions the supported autosamplers.

- Verifying Wash Solutions for the Accela Open Fast Wash Stations
- Verify Wash Solutions for the TriPlus
- Verify Wash Solutions for the DSM
- General Wash Solution Guidelines for the Vanquish Dual Split Samplers (AS)
- Refreshing (Purging) the Vanquish AS Needle Wash

IMPORTANT

- Make sure wash solution levels are full, and that any wash filters are properly located at the bottom of the wash solvent bottle.
- Running out of wash solutions on either a DLW or LCMS-P module during a run will affect data quality.
- Running out of wash solutions during a run can allow for organic solvent to mix with biological samples, which can cause precipitation and system clogs.

Verifying Wash Solutions for the Accela Open Fast Wash Stations

CAUTION Handle the glass nipple on the base of the autosampler wash bottles with care to avoid breakage and injury.

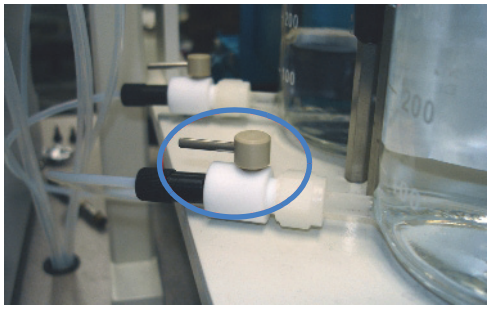
Legacy Accela Open autosamplers configured with a Fast Wash module use a solvent bottle that contains a valve located at the bottom of the bottle. Dynamic Load Wash (DLW) systems use solvent bottles that have top caps and filters.

The following procedure describes how to check the Accela Open autosampler fast wash solutions to verify correct placement.

❖ To verify the Accela Open autosampler wash solutions

1. Verify that all wash bottles on the autosampler wash stations are full.
2. Verify that the aqueous wash is in Bottle 1 and that it is connected to the port for Wash 1 on the wash station.
3. Verify that the organic wash is in Bottle 2 and that it is connected to the port for Wash 2 on the wash station.
4. Swirl the wash bottles and look for any particulates. Discard the liquid and wash the bottle if you see particulates or if the liquid appears cloudy.
5. Verify that the valves on the bottles are open and the cap is loose. If the valves are parallel with the tubing, they are open (see Figure 24).

Figure 24. Fast Wash bottle valves (open) for some Accela Open autosamplers



6. Loosen the valve fittings on the wash station by turning them counterclockwise (1-quarter turn) and verify that the liquid flows freely (see Figure 25).

Figure 25. Valve fittings on the Fast wash station for Accela Open autosamplers

7. Close the fittings.

Verify Wash Solutions for the TriPlus

This procedure describes how to check the TriPlus autosampler wash solutions to verify correct placement.

IMPORTANT

- Running out of wash solutions on either a DLW or LCMS-P module during a run will affect data quality.
- Make sure wash solution levels are full, and that any wash filters are properly located at the bottom of the wash solvent bottle.
- Running out of wash solutions during a run can allow for organic solvent to mix with biological samples, which can cause precipitation and system clogs.

❖ **To verify the TriPlus autosampler wash solutions**

1. Verify that all wash bottles on the autosampler wash stations are full.
2. Verify that the aqueous wash is in Bottle 1 and that it is connected to the port for Wash 1 on the wash station.
3. Verify that the organic wash is in Bottle 2 and that it is connected to the port for Wash 2 on the wash station.
4. Verify that the filter is properly attached to the tubing and that the bottle cap is closed correctly.
5. Swirl the wash bottles and look for any particulates. Discard the liquid and wash the bottle if you see particulates or if the liquid appears cloudy.

Verify Wash Solutions for the DSM

This procedure describes how to check the DSM wash solutions to verify correct placement.

IMPORTANT

- Running out of clamp wash solutions on the DSM module during a run will affect data quality.
- Make sure wash solution levels are full, and that the wash lines properly extend to the bottom of the wash solvent bottle.

❖ **To verify the DSM wash solutions**

1. Verify that the wash bottles located on tope of the HPD module of the DSM.
2. Verify through labeling that the solvent lines are inserted to the bottom of the appropriate wash bottle.
3. Swirl the wash bottles and look for any particulates. Discard the liquid and wash the bottle if you see particulates or if the liquid appears cloudy.

General Wash Solution Guidelines for the Vanquish Dual Split Samplers (AS)

Use the following general guidelines for the Vanquish AS:

- Use fresh seal wash liquid at regular intervals. Rinse the reservoir thoroughly before refilling it. Use a high-purity solvent for rinsing.

  Note The Vanquish AS uses the LC pump's rear seal wash to wash the autosampler metering device heads.

- Replace the needle wash liquid in the needle wash reservoir regularly, approximately every 1 or 2 weeks.

  Note If you are using 100% water as your wash liquid, replace daily.

- Check the liquid level of the needle wash reservoir. Fill the needle wash reservoir with fresh needle wash liquid if required.

  Note The Vanquish AS needle wash operation cleans only the outside of the needle.

- Check if particles, dust or algae are present in the needle wash liquid.
- In the Aria MX Direct Control needle wash area for the Vanquish AS (when selected), use the purge needle wash command to fill the wash port with the fresh needle wash liquid. During purging, the wash port is flushed continuously until the fresh needle wash liquid is present.

Note For detailed Vanquish autosampler maintenance information and system specifications, refer to the maintenance sections in the *Vanquish Split Samplers Operating Manual*, which is provided in hard copy with each Vanquish shipment or in PDF format located on the Aria MX DVD. See "System Documentation" on page xiv for a list of the Vanquish documentation.

Refreshing (Purging) the Vanquish AS Needle Wash

Thermo Fisher Scientific recommends that you periodically refresh and purge the Vanquish AS needle wash solvent. Performing this action helps ensure that the AS needle wash cycle is as effective as possible.

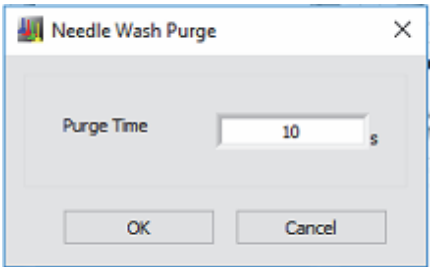
Note The Vanquish AS needle wash cleanses only the outside surface of the autosampler needle.

❖ **To refresh (purge) the wash solvent in the Vanquish autosampler needle wash cup**

1. Open Direct Control window.
2. Select the **Purge Needle Wash** option.

   The Needle Wash Purge dialog box opens (Figure 26).

   Figure 26. Vanquish Needle Wash Purge dialog box

3. In the Purge Time box, type the number of seconds that you want to run the purge, and then click **OK**.

   The needle wash purge function starts immediately, and the progress is displayed in the Direct Control window.

Syringe and Needle Maintenance (Accela Open and TriPlus)

The following sections provide information on how to maintain syringes and needles for systems that use the Accela Open or TriPlus autosamplers.

Note For Transcend Duo LX-2 configurations, refer to the maintenance section on replacing the needle unit and the needle seat in the *Vanquish Split Samplers Operating Manual*, which is provided in hard copy with each Vanquish shipment or in PDF format located on the Aria MX DVD. See "System Documentation" on page xiv for a list of the Vanquish documentation.

Related Topics

- Accela Open Syringe and Needle Replacement
- TriPlus Syringe and Needle Replacement

Accela Open Syringe and Needle Replacement

The following sections provide details on how to properly maintain the system syringes and needles in the Accela Open autosampler.

Replacing the Standard or X-Type Syringes

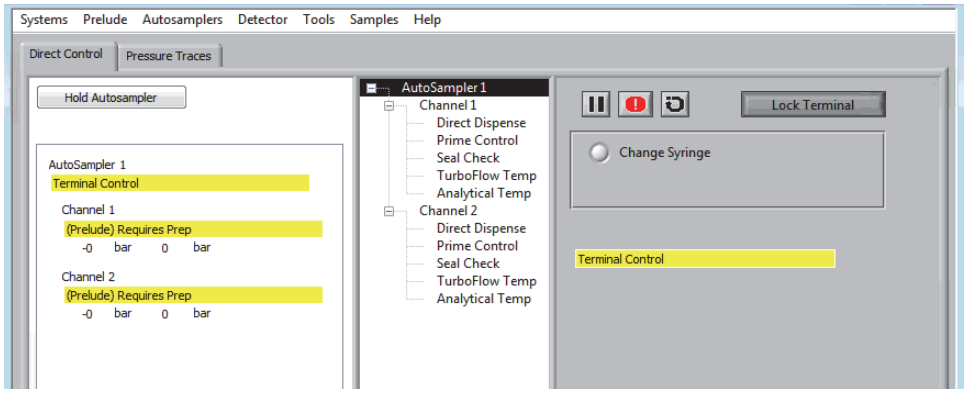
Perform this procedure to replace a standard or X-type syringe every 15 000 injections. If your system uses the DLW, see "Replacing the Dynamic Load Wash (DLW) Needle on the Accela Open Autosampler" on page 38.

❖ **To replace a standard or X-type syringe**

1. Verify that the system has stopped sampling, and open the Direct Control window (see Figure 27).
2. Select the appropriate autosampler and click **Unlock Terminal**.

   The Change Syringe option appears.

Figure 27. Direct Control window showing the Change Syringe option (Accela Open)



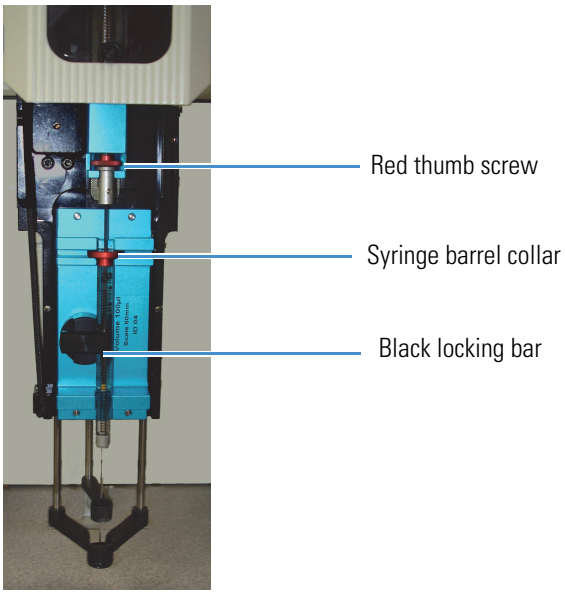
3. Select the **Change Syringe** option.

   The autosampler arm moves to a default position so that the syringe can be changed.

4. Lift the clear door to gain access to the syringe and syringe holder.

5. Loosen the red thumb screw that holds the syringe plunger in place (see Figure 28).

   Figure 28. Accela Open autosampler syringe



6. Turn the black locking bar that holds the syringe barrel in place.

7. Pull the syringe out and up to remove it. Discard it appropriately.

8. Carefully place the new syringe into the arm. Place the flat side of the syringe barrel collar against the syringe holder.

9. Verify the syringe plunger is seated in the plunger holder where the red thumb screw is located.

10. Turn the black locking bar to hold the syringe barrel in the holder.

11. Tighten the red thumb screw to secure the plunger in the holder.

12. Click **OK**.

    The probe moves to the home position. The autosampler senses the new syringe size and updates the Aria MX software.

Continue by setting the Needle Penetration level. See Setting the Needle Penetration Level.

Replacing the Syringe Plunger

Replace the syringe plunger every 1500 injections. See "Replacing the Standard or X-Type Syringes" on page 35.

Setting the Needle Penetration Level

Set the needle penetration level whenever you change the syringe needle or if instructed to do so by a Thermo Fisher Scientific service engineer as part of a troubleshooting process.

If your system uses a DLW, see "Setting the Needle Penetration Value for the DLW on the Accela Open Autosampler" on page 38.

❖ To set the Accela Open autosampler needle penetration level

1. Open the Direct Control window.
2. Select the appropriate autosampler and click **Unlock Terminal**.
3. Locate the handheld keypad that controls the autosampler of the syringe you replaced.
4. From the main menu of the keypad, press F1 (**Menu**).
5. Rotate the dial to highlight **Utilities**. Press the dial button located at the center of the dial.
6. Rotate the dial to highlight **Injector**. Press the dial button.
7. Rotate the dial to highlight the injector that you want to calibrate, and then press the dial button.
8. Press F3 (**Movto Inj**).

   The autosampler moves from the home position to the selected injector valve.
9. Press the dial button.

   The needle moves down into the valve.

   Note If you hear a clunk when the needle moves into the valve, the needle might have reached the bottom of the valve. Turn the dial (counterclockwise) to move the needle up until you see the syringe move up about 0.6 cm. Press the dial button to accept the value and then continue from step 5.
10. Rotate the knob clockwise until you hear a clunk.

    The needle lowers into the valve as you rotate the dial.

    Note If you do not hear a clunk when you lower the needle and the penetration value does not change, contact Thermo Fisher Scientific Technical Support.
11. Make a note of the needle penetration value indicated on the CTC keypad.
12. Rotate the knob counterclockwise two clicks.

    The needle moves up 0.2 mm.
13. Verify that the needle penetration value on the CTC keypad is 0.2 mm less than the value you noted in step 9.

For example, if the needle penetration value was 24.6 mm when you heard the clunk, dial the needle up until the needle penetration value is 24.4 mm.

14. Press the dial button to accept the value.
15. Repeat step 6 through step 12 to confirm the needle penetration value.
16. Repeat step 3 through step 13 for each valve that is serviced by the replacement syringe.
17. Repeat step 1 through step 14 for each syringe that you replaced.
18. When the needle penetration value is acceptable for all autosampler injector valves, press F4 (**Home**) to return to the main screen of the keypad.
19. Update the Aria MX software with the new objects from the autosampler. See "To download objects to the Aria MX application" on page 52, and then lock the terminal.

Replacing the Dynamic Load Wash (DLW) Needle on the Accela Open Autosampler

Use this procedure to replace the needle on the Accela Open autosampler if your system uses the DLW.

❖ To replace a DLW needle on systems equipped with an Accela Open autosampler

1. From the Direct Control window, select the appropriate autosampler. See "Accessing the Direct Control Window" on page 7.
2. Click **Unlock Terminal**.

   The Change Syringe option appears. See Figure 27 on page 35.
3. Select the **Change Syringe** option.

   The autosampler arm moves to a default position so that the syringe can be changed.
4. To change the syringe, refer to the documentation and instructions for changing a DLW needle provided with the autosampler.
5. In the confirmation box, click **OK**.

   The probe moves to the home position. The autosampler senses the new syringe size and updates the Aria MX software.

Continue by setting the needle penetration level. See Setting the Needle Penetration Value for the DLW on the Accela Open Autosampler.

Setting the Needle Penetration Value for the DLW on the Accela Open Autosampler

Set the needle penetration level whenever you change the DLW needle or if instructed to do so by a Thermo Fisher Scientific service engineer as part of a troubleshooting process.

CAUTION Calibrating the autosampler requires removal of the slide plate and visual inspection of the autosampler needle holder. Because the autosampler compartments contain moving parts and sharp needles, make sure to keep hands clear when operating the autosampler during calibration.

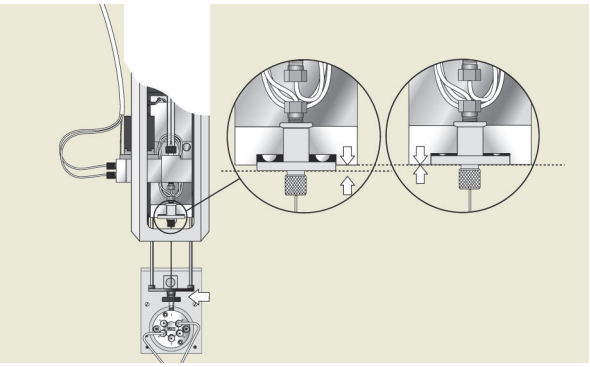
❖ To set the needle penetration value for the DLW (Accela Open)

1. Open the Direct Control window.
2. Select the appropriate autosampler and click **Unlock Terminal**.
3. Locate the handheld keypad that controls the autosampler of the syringe you replaced.
4. From the main menu of the keypad, press F1 (**Menu**).
5. Rotate the dial to highlight **Utilities**. Press the dial button located at the center of the dial.
6. Rotate the dial to highlight **Injector**. Press the dial button.
7. Rotate the dial to highlight the injector that you want to calibrate. Press the dial button.
8. Press F3 (**Movto Inj**).

   The autosampler moves from the home position to the selected injector valve.
9. Press the dial button.

   The needle moves down into the valve.
10. Rotate the dial clockwise or counterclockwise until the bottom of the cross bar of the DLW needle holder assembly is flush with the lower line of the DLW needle adapter block. Verify that both sides of the cross bar are flush with the DLW needle adapter block. See Figure 29.

    Figure 29. DLW needle holder assembly cross bar and needle adapter block

    
11. Press the dial button to accept the value.
12. Press ESC.

The needle moves to the home position.

13. Repeat step 7 through step 12 to verify the value.
14. Repeat step 7 through step 13 for each valve that the DLW services.
15. Repeat step 1 through step 14 for each syringe that you replaced.
16. When the needle penetration value is acceptable for all autosampler injector valves, press F4 (**Home**) to return to the main screen of the keypad.
17. Update the Aria MX software with the new objects from the autosampler, and then lock the terminal. See "Downloading Autosampler Objects to Aria MX (Accela Open)" on page 51.

Replacing the DLW Syringe on Systems Equipped with the Accela Open Autosampler

Replace the DLW syringe on systems that are equipped with the Accela Open autosampler when a Thermo Fisher Scientific service engineer recommends it as part of a troubleshooting procedure.

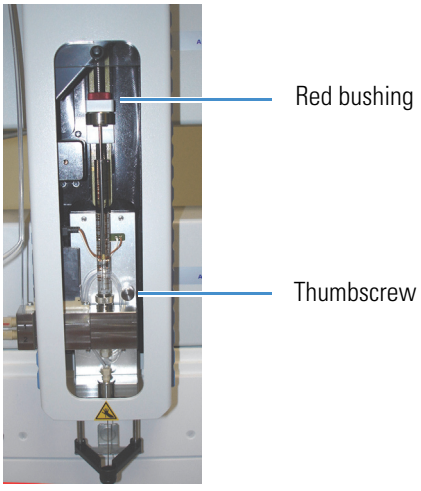
❖ To replace the DLW syringe (Accela Open)

1. From the Direct Control window, select the appropriate autosampler. See "Accessing the Direct Control Window" on page 7.
2. Click **Unlock Terminal**.

   The Change Syringe option appears. See Figure 27 on page 35.
3. Select the **Change Syringe** option.

   The autosampler arm moves to a default position so that you can change the syringe.
4. Unscrew the red bushing on the plunger carriage until the plunger cap is no longer engaged.

   Figure 30. DLW syringe showing the red bushing and thumbscrew

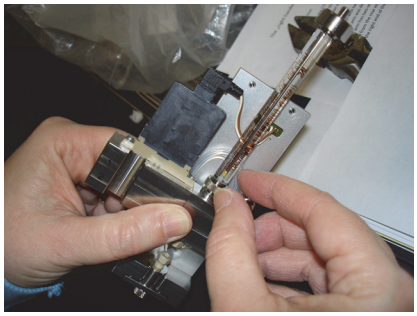


5. Unscrew the thumbscrew on front of the syringe holder. See Figure 30.
6. Tip the syringe holder forward at the top to disengage the magnets, and then slide the holder up so that the needle clears the needle guide.

> **Tip** Perform the following steps with the assembly placed in front of or to the left of the probe so that you do not put tension on the wire or tubing.

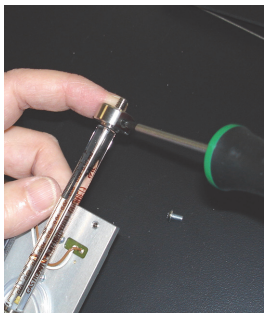
7. If you are replacing the syringe barrel, unscrew the knurled collar at the bottom of the syringe barrel to remove the barrel from the assembly (see Figure 31). If you are not replacing the syringe barrel, continue with step 8.

Figure 31. DLW syringe showing the knurled collar



8. Pull the plunger out of the barrel. This can be done with or without the barrel in the assembly.
9. Using a T6 torx driver, loosen the set screw and remove the plunger cap (Figure 32).

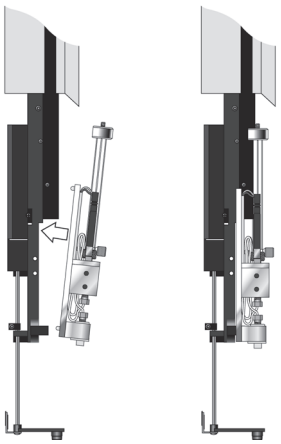
Figure 32. DLW syringe showing the location of the plunger cap



10. Insert the new plunger, with the yellow tip first, into the barrel and push it all the way to the stop.
11. Pull back the plunger a fraction of a millimeter to release pressure on the tip.
12. Place the plunger cap over the plunger, flush against the top of the barrel, and tighten the plunger cap set screw with the T6 torx driver.
13. If you removed the barrel from the assembly, replace it now by threading the barrel into the assembly and tightening the knurled collar at the bottom of the barrel.
14. Slant the assembly in at the bottom and thread the needle through the lower needle guide.

15. Push the top of the assembly back and engage the magnets to snap the assembly into the probe (see Figure 33).

Figure 33. Placing the needle assembly into the probe



16. Move the lower needle guide up and down to confirm that it is not catching on the needle tip.
17. Tighten the thumbscrew. See Figure 30.
18. Click **OK** when prompted.
    - The probe moves to the home position.
    - The autosampler senses the new syringe size and updates the Aria MX software.
19. Calibrate the needle penetration for the probe in all valves that are accessed by the affected needle. See "Setting the Needle Penetration Value for the DLW on the Accela Open Autosampler" on page 38.

Setting the Tray Type Needle Penetration Level (Accela Open)

The tray type needle penetration level is the level in the vial or well at which the autosampler aspirates the sample. This level is set for each tray type and applies to all tray positions that use the tray type. You might want to change this value if you have varying sample amounts or settlement in the bottom of the vial or well.

Note If you want to set the tray type needle penetration level for a system that uses a DLW, see "Setting the Needle Penetration Value for the DLW on the Accela Open Autosampler" on page 38.

❖ To set the tray type needle penetration level (Accela Open)

1. From the Direct Control window, select the appropriate autosampler. See "Accessing the Direct Control Window" on page 7.
2. Click **Unlock Terminal** to activate the handheld controller.

3. Verify that the autosampler is on and the keypad shows the main screen with "Job Queue" at the top.
4. Press F1 (**Menu**).

   The menu screen appears.
5. Rotate the dial on the keypad to highlight **Utilities**. Press the dial button located at the center of the dial.
6. Rotate the dial to highlight **Tray** and then press the button at the center of the dial.

   A list of trays appears, for example, "Tray03."
7. Rotate the dial to show the tray number for the tray type whose needle penetration level you want to adjust, and press the dial button.
8. Pull out the tray drawer you selected in step 6 until it is completely open.
9. Install a tray in the tray type drawer where you want to set the needle penetration level. If you are using vials, install a vial in position 001.

   Note You might need to modify vials or 96-well plates so that the needle level is visible. You can also fill the vial or well with water or methanol as a sample level reference.
10. Verify that the type of tray in the drawer matches the tray type indicated on the keypad screen.

    Note If you want to change the tray type for the selected tray, rotate the dial to show Tray Type and press the dial button. Rotate the dial again to show the tray type that you want and press the dial button. Continue with step 9.
11. Rotate the dial to highlight **Needle Penetr**.
12. Press F3 (move to **001**).

    The autosampler moves to position 001.
13. Press the dial button.

    The needle moves down into the well to the level where the sample is aspirated.
14. To aspirate the sample at the appropriate needle level, do the following:

    - To raise (↑) the needle, rotate the dial counterclockwise until the needle is at the appropriate level. The needle penetration value on the keypad decreases.

- To lower (↓) the needle, rotate the dial clockwise until the needle is at the appropriate level. The needle penetration value on the keypad increases.

Note Set the tray type needle penetration at a level where the needle does not contact the bottom of the vial or well during aspiration.

If the needle stops moving downward as you continue to rotate the dial clockwise, the needle might have reached its maximum penetration limit. If you want to move the needle further, contact Customer Support (see "Contacting Us" on page xxii).

15. Press the dial button to accept the new needle penetration value for all wells in the selected tray type and all drawers that use the same tray type.
16. Press F4 (**Home**) to return to the main menu.

    The needle penetration level is saved for all drawers that use the same tray type.
17. Start the Aria MX software.
18. Update the Aria MX software with the new objects from the autosampler, and then lock the terminal. See "Downloading Autosampler Objects to Aria MX (Accela Open)" on page 51.

Resetting the XYZ Positions (Accela Open)

Reset the XYZ positions if the autosampler arm is accidentally bumped.

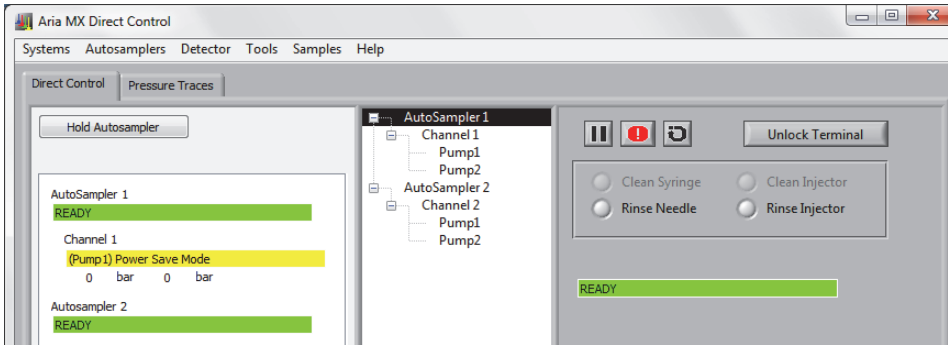
CAUTION Do not perform this procedure while the autosampler is moving.

❖ To reset the XYZ Positions

1. Open the Direct Control window.
2. From the middle pane, select the autosampler arm that you want to reset.

   The autosampler options appear on the right.

Figure 34. Direct Control window with autosampler options



3. Click the **Reset** icon,  .

   One of the following occurs:

   - If the instrument is idle, the system resets positions, injectors, and the syringe. The autosampler then goes to the Home position.
   - If the system is running a batch, the autosampler pauses the method, performs only the position reset, and then continues with the method. Thermo Fisher Scientific recommends pausing the autosampler before resetting it.

Note When an instrument component resets a position, it moves to the zero position, which is a fixed reference point that the instrument recognizes as the zero position. Then, it resets the X, Y, and Z coordinates to 0.

Cleaning the Syringe (Fast Wash Systems) for the Accela Open Autosampler

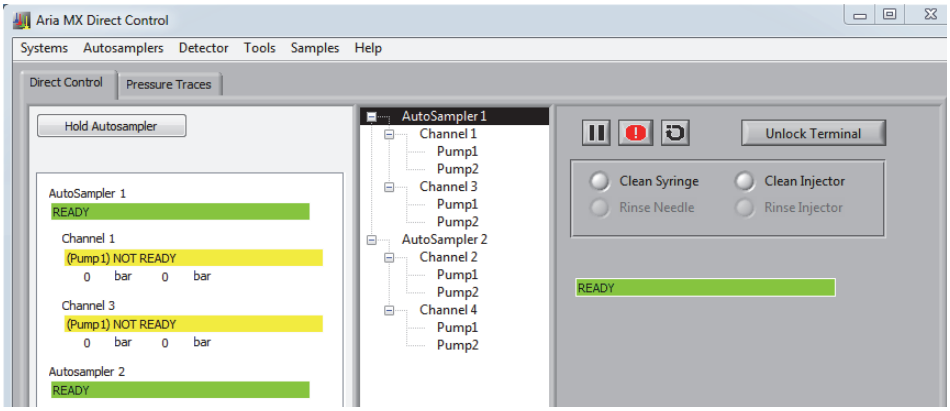
This procedure fills the syringe at the wash station and flushes the injector.

❖ To clean the syringe for systems using Fast Wash

1. Open the Direct Control window. See "Accessing the Direct Control Window" on page 7.
2. Select the appropriate autosampler arm.

   The autosampler options appear.

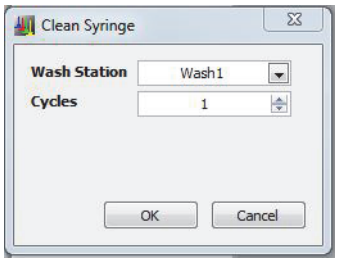
   Figure 35. Direct Control window with autosampler options (Transcend system)



3. Select the **Clean Syringe** option.

   The Clean Syringe dialog box appears (Figure 36).

Figure 36. Clean Syringe dialog box



4. In the Wash Station list, select the wash solution to use.
5. In the Cycles box, select the number of times that you want the syringe cleaned, and then click **OK**.

Tip Use the Fast Wash system for at least three cycles.

The autosampler cleans the syringe.

Cleaning the Injector (Fast Wash Systems)

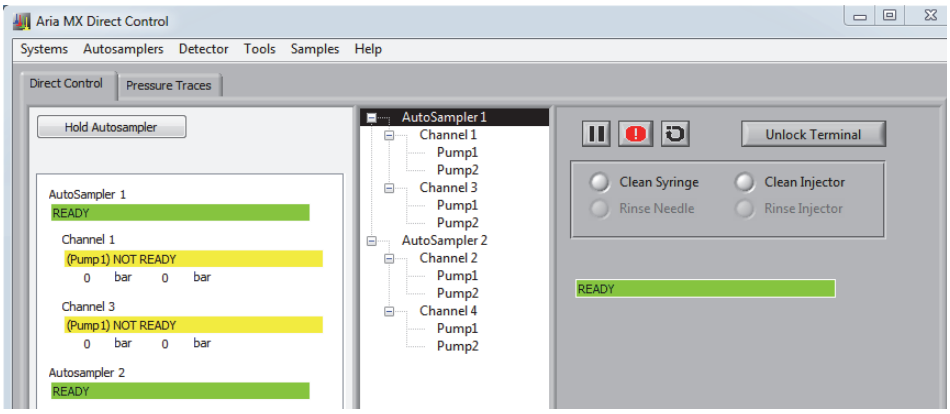
This procedure fills the injector at the wash station and flushes the injector.

❖ To clean the injector for systems using Fast Wash

1. Open the Direct Control window. See "Accessing the Direct Control Window" on page 7.
2. Select the appropriate autosampler arm.

   The autosampler options appear.

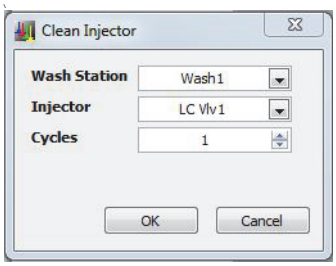
   Figure 37. Direct Control window with autosampler options



3. Select the **Clean Injector** option.

   The Clean Injector dialog box appears (Figure 38).

Figure 38. Clean Injector dialog box



4. From the Wash Station list, select the wash solution to use.
5. From the Injector list, select the injector you want to clean.
6. In the Cycles box, select the number of times that you want to wash the injector, and click **OK**. Select at least three cycles.

   The window closes and the autosampler cleans the injector.

Rinsing the Needle on Systems with a Dynamic Load Wash (DLW)

Use the following procedures to rinse the needle or syringe at the wash station for the specified autosampler model.

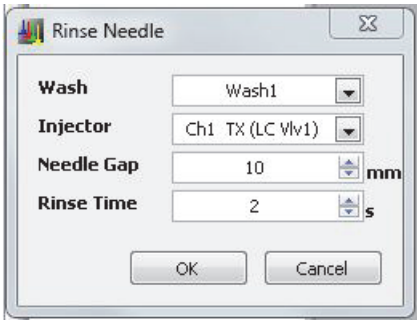
❖ To rinse the needle on systems equipped with the Accela Open autosampler

1. Open the Direct Control window. See "Accessing the Direct Control Window" on page 7.
2. Select the appropriate autosampler arm.

   The autosampler options appear.
3. Select the **Rinse Needle** option.

   The Rinse Needle dialog box opens.

Figure 39. Rinse Needle dialog box (Accela Open autosampler)



4. In the Wash list, select the wash solution to use.
5. In the Injector list, select the injector that will rinse the needle.

6. In the Needle Gap box, leave the value at the default setting, unless a service engineer instructs you to change it.
7. In the Rinse Time box, select the duration of time in seconds to rinse the needle, and then click **OK**.

> **Tip** For optimal cleaning, set the rinse time to a minimum of **10** seconds.

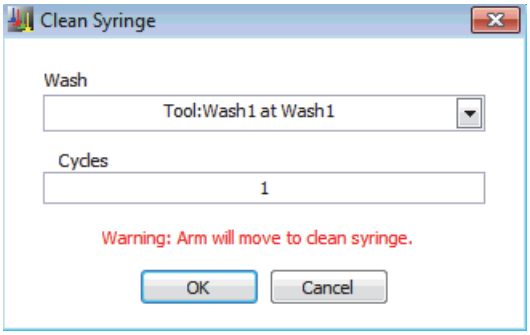
❖ To rinse the syringe or needle on systems equipped with the TriPlus autosampler

1. Open the Direct Control window. See "Accessing the Direct Control Window" on page 7.
2. Select the appropriate autosampler arm.

   The autosampler options appear.
3. Select the **Clean Syringe** option.

   The Clean Syringe dialog box opens.

   Figure 40. Clean Syringe dialog box (TriPlus autosampler)



4. In the Wash list, select the wash solution to use.
5. In the Cycles box, type the number of rinse cycles that you want, and then click **OK**.

   The TriPlus autosampler arm moves and starts the clean cycle.

> **Tip** For optimal cleaning, set the rinse cycles to a minimum of **3** cycles.

Rinsing the Injector on Systems with a DLW or LCMS-P tool

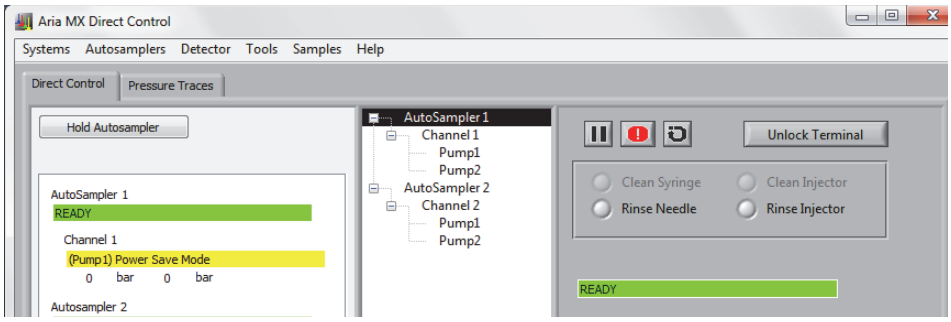
Use the following procedures to rinse an injector at the wash station for the specified autosampler model for systems that are configured with a DLW.

❖ To rinse the injector on systems with a DLW (Accela Open)

1. Open the Direct Control window. See "Accessing the Direct Control Window" on page 7.
2. Select the appropriate autosampler arm.

The autosampler options appear.

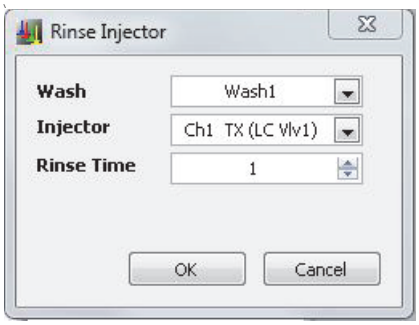
Figure 41. Direct Control window with autosampler options (Accela Open)



3. Select the **Rinse Injector** option.

   The Rinse Injector dialog box appears.

Figure 42. Rinse Injector dialog box (Accela Open)



4. From the Wash list, select the wash that will clean the injector.
5. From the Injector list, select the injector to clean.
6. In the Rinse Time box, select the duration of time in seconds to rinse the needle, and then click **OK**.

Tip For optimal cleaning, set the rinse time to a minimum of **5** seconds.

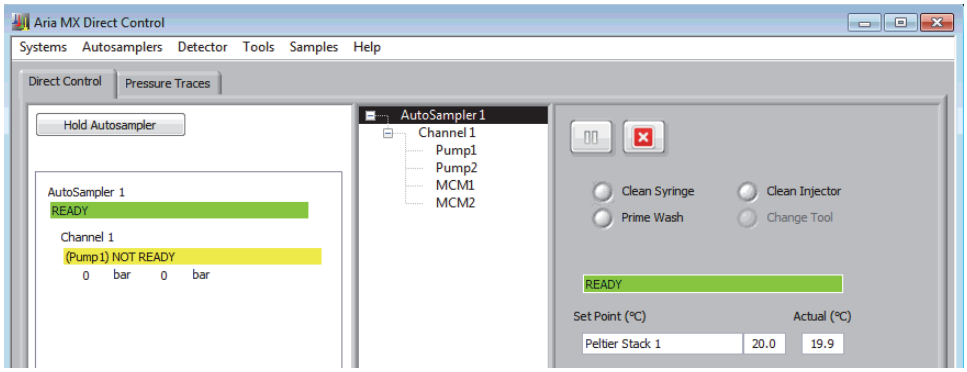
The window closes and the autosampler cleans the injector.

❖ To clean the injector on systems with an LCMS-P tool (TriPlus)

1. Open the Direct Control window. See "Accessing the Direct Control Window" on page 7.
2. Choose the appropriate autosampler arm.

   The autosampler options appear.

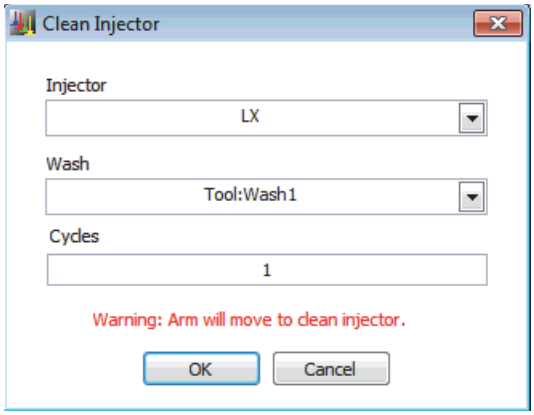
Figure 43. Direct Control window with autosampler options (TriPlus)



3. In the right pane, select the **Clean Injector** option.

   The Clean Injector dialog box appears.

Figure 44. Clean Injector dialog box (TriPlus)



4. From the Injector list, select the injector to clean.
5. From the Wash list, select the wash that will clean the injector.
6. In the Cycles box, type the number of cycles to rinse the needle, and then click **OK**.

   Tip For optimal cleaning, set the rinse cycles to a minimum of **3** cycles.

   The window closes and the autosampler starts to clean the injector.

TriPlus Syringe and Needle Replacement

Use the Change Tool command to change a Model B autosampler LCP tool, syringe barrel, or needle. When you run the Change Tool command, the Syringe Exchange wizard appears and takes you through the step-by-step procedure (see Figure 39).

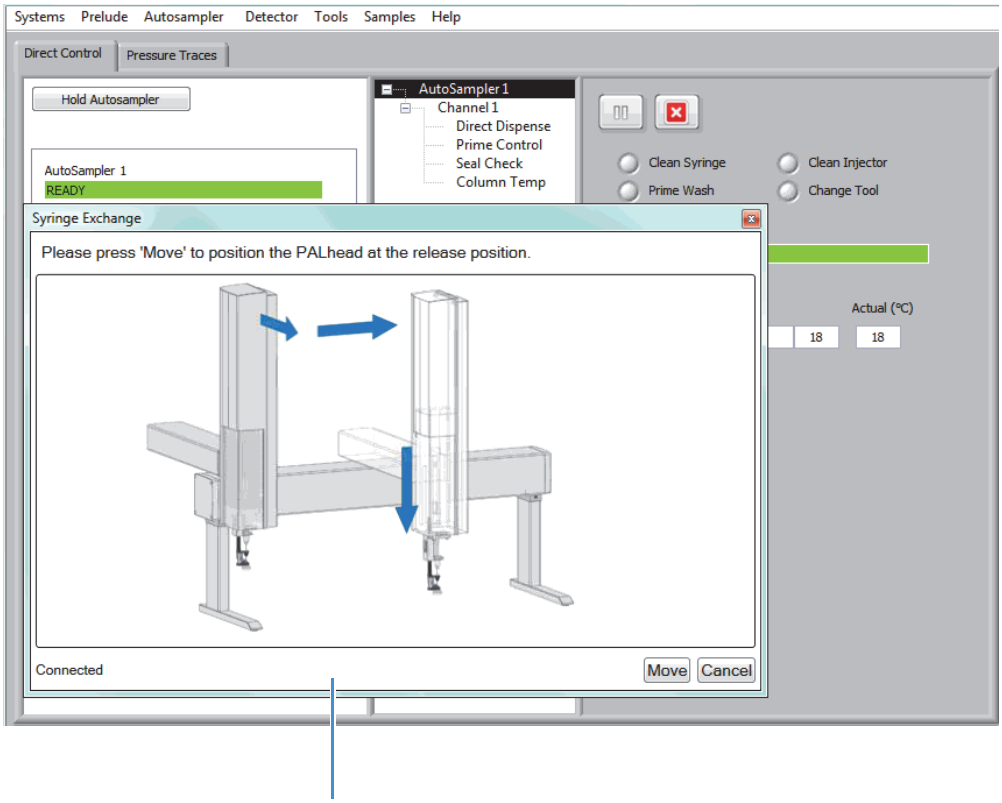
❖ To change an LCP tool, syringe barrel, or needle

CAUTION The autosampler arm moves to perform the following operation. To prevent personal injury, make sure that you wait until the autosampler arm stops moving before you open the autosampler door. Carefully follow the on-screen Syringe Exchange wizard instructions. Always wait until the autosampler arm stops moving before opening the autosampler compartment door.

1. Open the Direct Control Window.
2. From the middle pane, click **Autosampler1**, and then open the autosampler compartment door.
3. In the right pane, select the **Change Tool** option.

   The Syringe Exchange wizard appears (Figure 45).

Figure 45. Syringe Exchange wizard from the Direct Control window



Syringe Exchange wizard

Follow the on-screen wizard instructions to change the LCP tool, syringe barrel, or needle.

Downloading Autosampler Objects to Aria MX (Accela Open)

This procedure sends information from the autosampler firmware to the Aria MX software. Perform this procedure if you have changed any Accela Open autosampler components.

❖ **To download objects to the Aria MX application**

1. From the Aria MX Direct Control window, choose **Autosamplers > AS Object Viewer**.

   The Autosampler Data Object Viewer window appears.

2. Select **Refresh**.

   The autosampler downloads the information.

3. Close the window.

Updating Autosampler Configuration Data in Aria MX (TriPlus AS)

The following procedure sends information from the TriPlus AS firmware to the Aria MX software. Perform this procedure if you have changed or added any TriPlus autosampler components.

❖ **To update TriPlus objects to the Aria MX application**

1. From the Aria MX Direct Control window, choose **Autosamplers**.
2. Select **Update Configuration Data**

   The configuration data is updated.

Prime Supported Hardware

The following topics provide information on priming various hardware that is supported by Aria MX.

Follow these procedures for your system:

- Priming the Transcend DSX-1 Dried Spot Module (DSM)
- Priming the Dynamic Load Wash (DLW) Wash System
- Priming the TriPlus LCMS-P Tool Wash Pumps

Priming the Transcend DSX-1 Dried Spot Module (DSM)

The DSM delivers wash solvents to clean the autosampler card clamp heads. It can also introduce the Internal Standard (IS) solution into the LC flow path.

Prime the DSM wash solvents and IS solution if the DSM has been idle for 24 hours or more before you run samples.

❖ To prime the clamp wash pumps

1. Open the Aria MX Direct Control window.
2. From the middle pane, click **Autosampler 1**.

   The right-pane user interface changes to the DSM autosampler options.
3. In the right-pane, click **Prime Wash**

   The Prime Wash dialog box appears.

   Figure 46. Prime Wash pump dialog box

4. In the Prime list, select the solvent that you want to prime (numbered 1 to 4).
5. In the Volume (µl) box, type the volume (in microliters) that you want, and then click **OK**.

   The DMS starts the priming operation using the solvents selected and the dialog box closes.
6. Repeat step 3 through step 5 to prime additional solvents, as applicable.

Note Thermo Fisher Scientific recommends setting the prime volume at 2000 µl when replenishing a wash bottle or if the system has been inactive for a long period of time. For short periods of inactivity—overnight, for example—500 µl are sufficient.

❖ To prime the IS solution

1. Open the Aria MX Direct Control window.
2. From the middle pane, click **Autosampler 1**.

   The right-pane user interface changes to the DSM autosampler options.
3. In the right-pane, click **Prime IS**.

   The IS solution primes and the Aria MX status bar changes from Ready (green) to Operating (purple).

   Note Priming once is sufficient to refresh or replace IS solution.

IMPORTANT Thermo Fisher Scientific recommends that you perform multiple primes of an appropriate cleaning solution before changing to an alternative internal standard. For example, use both an aqueous and an organic flush.

Priming the Dynamic Load Wash (DLW) Wash System

Prime the DLW according to your laboratory's maintenance schedule by using the Rinse Needle option in the Direct Control window.

❖ To prime the DLW

Note The maximum rinse time that you can set is 60 seconds.

1. Open the Aria MX Direct Control window (see "Accessing the Direct Control Window" on page 7).
2. Perform the Rinse Needle procedure using Wash 2 and with a rinse time of 10 seconds. See "Rinsing the Needle on Systems with a Dynamic Load Wash (DLW)" on page 47.
3. Perform the procedure using Wash 1 and with a minimum rinse time of 10 seconds. Continue to rinse until there are no visible air bubbles in the wash line.
4. Repeat steps 2 and 3 for the second DLW if you have one installed on your system.

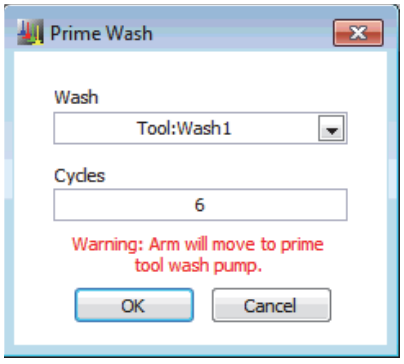
Priming the TriPlus LCMS-P Tool Wash Pumps

❖ To prime the wash pumps

1. Select the **Prime Wash** option.

   The Prime Wash Pump dialog box appears.

   Figure 47. Prime Wash pump dialog box

2. In the Wash list, select the wash pump solution (1 or 2) that you want to prime.

3. In the Cycles box, type the number of priming cycles that you want, and then click **OK**.

   Note Thermo Fisher Scientific recommends setting the prime cycle count to 15 to 20 cycles if the system has been inactive for a long period of time. For short periods of inactivity—overnight, for example—3 to 5 prime cycles are sufficient.

   The dialog box closes. The selected wash pump starts the priming operation.

Using the TriPlus Handheld Controller

❖ **To use the autosampler handheld controller**

Note The autosampler handheld controller is intended for advanced users. Thermo Fisher Scientific recommends that you use the Aria MX interface to perform most of the general and daily tasks.

Make sure that the autosampler is in standby (or inactive) mode and that no samples are pending in the queue.

You can now use the handheld controller.

Note If the handheld controller indicates that the autosampler is "Busy" without any apparent activity, do the following:

1. Select **Autosampler** from the Direct Control window's middle pane.
2. Click the **Abort** icon,  .
3. Perform any necessary changes with the handheld controller, and then return to the Direct Control window for any further operations.

Exchange DSM Clamp Head

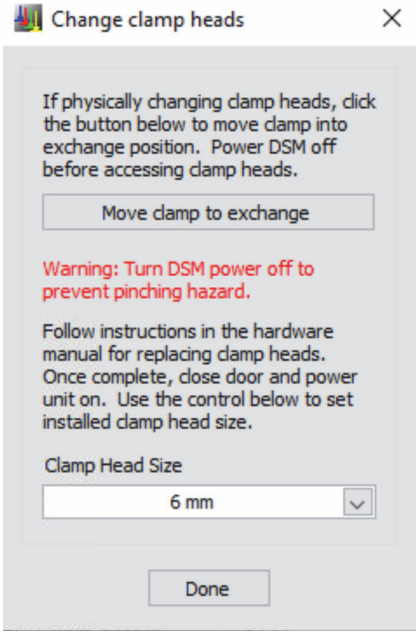
The following instructions provide details on how to replace or exchange the DSM clamp heads.

Use the Aria MX Change Clamp Head command to change the clamp heads on the DSM.

❖ **To exchange the clamp heads from Aria MX Direct Control**

1. Open the Aria MX Direct Control window.
2. Click **Autosampler > Change Clamp Heads**.

The Change Clamp Heads dialog box opens.



3. Click **Move Clamp to Exchange**.

   The DSM clamp heads move to the exchange position.

4. Power off the DBS-A hardware component of the DSM from the On/Off switch at the rear of the autosampler (refer to the *DBS-A Manual*, located on the Aria MX DVD for more information).

CAUTION To prevent injury, unplug the power cord to the DSM *after* turning off the power from the On/Off switch.

Refer to the *DBS-A Manual* located on the Aria MX DVD for detailed safety information and instructions on changing DSM clamp heads.

5. Replace the clamp heads according to the *DBS-A Manual* procedures located on the Aria MX DVD disk in PDF format.
6. Replace the DSM power cord.
7. From the Aria MX Change Clamps dialog box, Clamp Head Size list, set the new clamp size by choosing the same clamp size from the list.

8. Click **Done**.
9. Close the DBS-A door, and then power on the DSM.

   The DSM is ready to process samples with the new clamp size.

IMPORTANT Thermo Fisher Scientific recommends that only qualified field service engineers exchange the DSM clamp heads.

5

General LC System Maintenance

This chapter provides maintenance guidelines and procedures for general system hardware and the data system computer.

Contents

Replacing the Rotor Seals

Replace the rotor seal every 15 000 injections.

Note The Transcend Duo LX-2 valves do not use rotor seals.

❖ **To replace the rotor seals**

1. Determine which rotor seal type to install.

   The following table lists the appropriate rotor seal type for each valve type. Part numbers vary by system type.

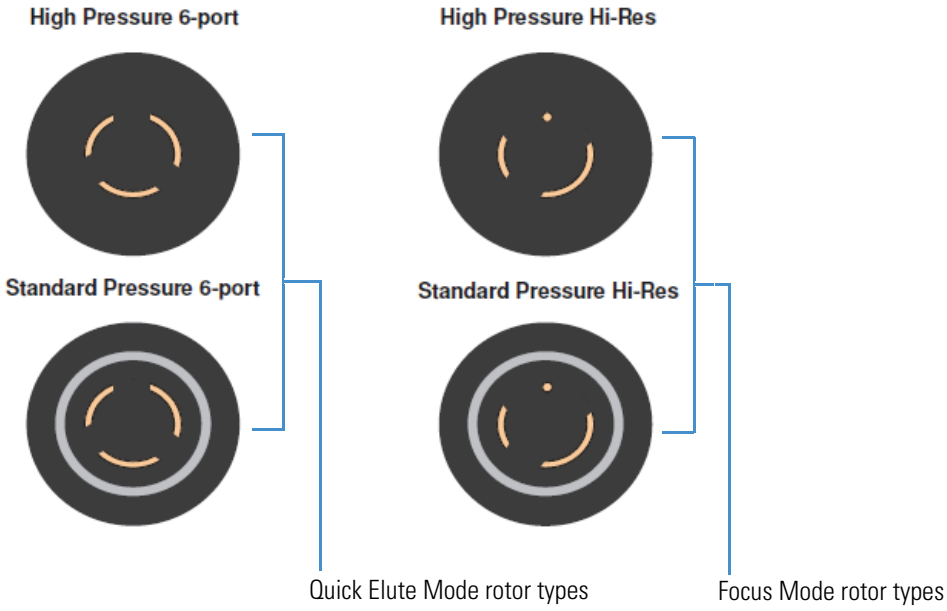
   Table 4. VIM valve and AS injector valve associated rotor seal types (Sheet 1 of 2)

Valve	Rotor seal type
VIM Valve A	Standard rotor seal
VIM Valve B on systems that are plumbed for Quick Elute Mode (Figure 48)	Standard rotor seal

Table 4. VIM valve and AS injector valve associated rotor seal types (Sheet 2 of 2)

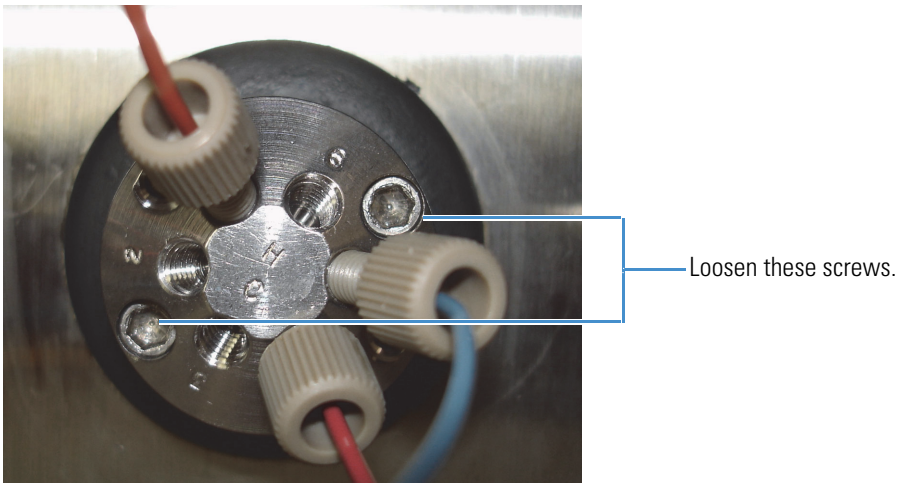
Valve	Rotor seal type
VIM Valve B on systems that are plumbed for Focus Mode (Figure 48)	Hi-Res rotor seal
Autosampler injector and selector valves	See "Aria Spare Parts" on page 72 and "Transcend UHPLC Spare Parts" on page 73.

Figure 48. Quick Elute Mode and Focus Mode rotor seal type differences (standard and high pressure—UHPLC—types)



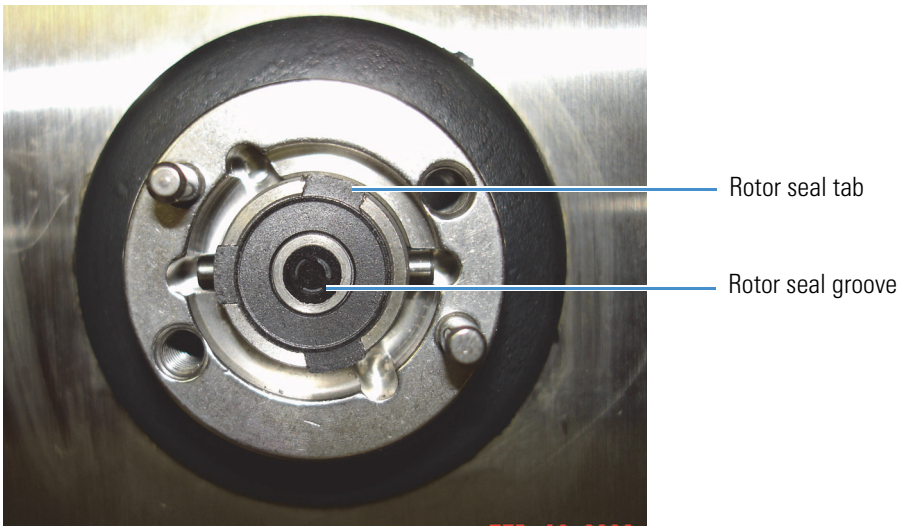
2. Use a 9/64 Allen wrench to loosen the two screws on the face of the valve. Loosen the screws evenly (Figure 49).

Figure 49. Valve face screws



3. Remove the screws and set them aside.
4. Grasp the valve face and pull it toward you to remove it.
5. Lift the rotor seal by lifting one of the tabs (Figure 50). Remove the rotor seal and set it aside.

Figure 50. Rotor seal



6. Line up the new rotor seal tabs to the slots on the valve and with the rotor seal grooves facing toward you. The slots are aligned so that the seal can only be installed at the proper orientation.
7. Press the rotor seal into place.
8. Reinstall the valve face so that ports 6 and 1 appear at the top.

9. Partially tighten one screw and then the other. Alternately tighten the screws until both are fully tightened.
10. Prior to running samples, make at least one blank (water) injection on the system.

Replacing the Valve Needle Seal

Replace the needle seal every 5000 injections.

Note The Vanquish Dual Split Sampler injectors do not use valve needle seals.

❖ **To replace the needle seal**

1. Unscrew the needle guide from the valve (Figure 51).

   Figure 51. Injector valve and needle guide

2. Remove the needle seal from inside the needle guide (Figure 52).

   Figure 52. Needle guide and needle seat

3. Install a new needle seat into the needle guide with the metal ferrule pointing away from the needle guide (Figure 52).
4. Screw the needle guide into the valve.

For a standard or DLW syringe, set the needle penetration level. See "Setting the Needle Penetration Level" on page 37.

Analytical Column Replacement

The following topics describe the basic replacement procedures for analytical columns by fitting type and general best practices. For best results, change your system analytical and TurboFlow columns at regular intervals. See Table 1 on page 2 for information on the recommend system hardware maintenance schedule.

CAUTION Thermo Fisher Scientific recommends wearing safety glasses, chemically-resistant gloves, and laboratory coats when operating or servicing LC systems.

IMPORTANT LC systems operate at high pressures. Turn off all LC pumps before replacing analytical columns.

Related Topics

- Replacing Analytical Columns Equipped with Viper™ Fittings
- Replacing Analytical or TurboFlow Columns (Non-Viper fittings)

Replacing Analytical Columns Equipped with Viper™ Fittings

It is important to replace analytical columns in a Vanquish TCC module within the recommended interval. See for information on the recommended system hardware maintenance schedule.

❖ **To replace the analytical columns on a with a TCC module Viper fittings and capillaries**

CAUTION To prevent burns, before replacing a column, turn off the TCC module heater and allow the column and tubing to cool to below 50 °C —about 15 minutes—before handling the column, tubing, and other system components that are near the heater.

- Loosen Viper capillaries with your fingers only. Do not use tools other than the knurl supplied with the capillary.
- Tighten and loosen the Viper connections only when the system pressure is at zero to prevent damage to the capillary and its connection.

Replacing Analytical or TurboFlow Columns (Non-Viper fittings)

It is important to replace analytical or TurboFlow columns within the recommended interval for each type. See Table 1 on page 2 for information on the recommend system hardware maintenance schedule.

In general, consider replacing the two types of columns as follows:

- Replace a TurboFlow column every 300 to 1000 injections. You can replace the column at shorter or longer intervals depending on the samples and methods you run. Follow the recommended installation procedure on the column product insert.
- Replace an analytical column every 2000 injections. You can replace the column at shorter or longer intervals depending on the samples and methods you run. Follow the recommended installation procedure on the column product insert.

Additionally, view the data from the system pressure traces to determine column conditions. Refer to the *Aria MX User Guide* for details regarding monitoring the pump pressure.

For more information on replacing each type of column for systems that do not use Viper fittings, see the following sections:

- Replace the TurboFlow Column (Non-Viper Fittings)
- Replace the Analytical Column (Non-Viper Fittings)

Replace the TurboFlow Column (Non-Viper Fittings)

Replace the TurboFlow column every 300 to 1000 injections. Use the Maintenance dialog box to track injection numbers. See "Tracking the Number of Injections" on page 9.

CAUTION Replace the column with the column type and size specified in your laboratory's standard operating procedures. Column types and sizes must be compatible with the method you are running.

CAUTION To keep the new column from drying out, do not remove the end caps from a new column until you are ready to install it onto the system.

CAUTION Column heaters can become extremely hot and, therefore, unsafe to handle. To prevent burns, allow the column and tubing to cool to below 50 °C —about 15 minutes—before handling the column, tubing, and other system components that are near the heater.

CAUTION If you use solvents that emit hazardous vapors, take appropriate chemical and hazardous vapor precautions when you remove the TurboFlow or analytical column from the system. Wear gloves, protective clothing, and eye wear as indicated in your laboratory's chemical safety operating procedures.

❖ **To replace the TurboFlow column**

1. Turn off the column heater and allow the column heater to cool to room temperature.
   a. Open the Aria MX Direct Control window.
   b. Click a column heater that appears under the appropriate channel name.
   c. To turn off the column heater, click the **Enable** button so that it shows dark green.
   d. Repeat step b and step c to turn off the second column heater.
2. When the column heater has cooled, unwrap the column heater from the column.
3. Replace the column as directed in Replace the Analytical Column (Non-Viper Fittings).

Note Use only your fingers to manipulate the tubing fittings on Prelude systems. Transcend systems require tools, depending on the procedure.

Replace the Analytical Column (Non-Viper Fittings)

Replace the analytical column every 2000 injections. Use the Maintenance dialog box to track injection numbers. See "Tracking the Number of Injections" on page 9.

CAUTION Replace the column with the column type and size specified in your laboratory's standard operating procedures. Column types and sizes must be compatible with the method you are running.

CAUTION To keep the new column from drying out, do not remove the end caps from a new column until you are ready to install it onto the system.

CAUTION Column heaters can become extremely hot and, therefore, become unsafe to handle. To prevent burns, allow the column and tubing to cool to below 50 °C—about 15 minutes— before handling the column, tubing, and other system components that are near the heater.

CAUTION If you use solvents that emit hazardous vapors, take appropriate chemical and hazardous vapor precautions when you remove the TurboFlow or analytical column from the system. Wear gloves, protective clothing, and eye wear as indicated in your laboratory's chemical safety operating procedures.

❖ **To replace the analytical column**

1. Turn off the column heater as follows and allow the column heater to cool to room temperature:
   a. Open the Direct Control window.

b. Click a column heater for the appropriate channel. The Direct Control view will appear different depending on your hardware configuration (MultiSLEEVE or TCC module heater. See Figure 53 and Figure 54).

Figure 53. Direct Control window showing MultiSLEEVE module controls (Off state)

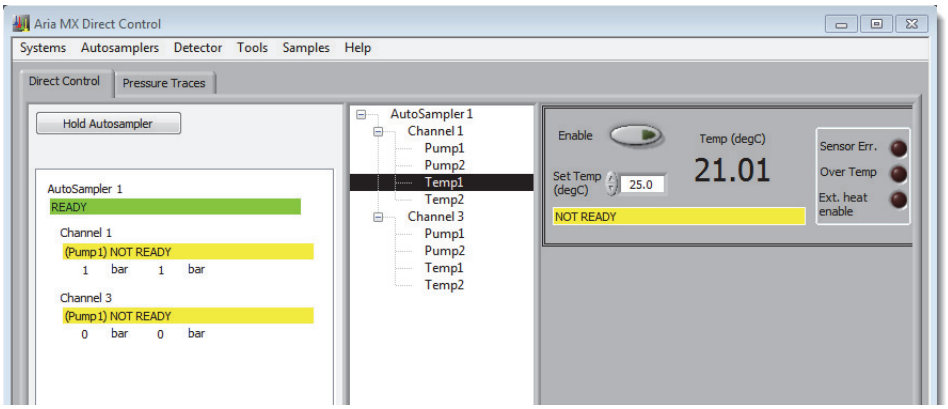
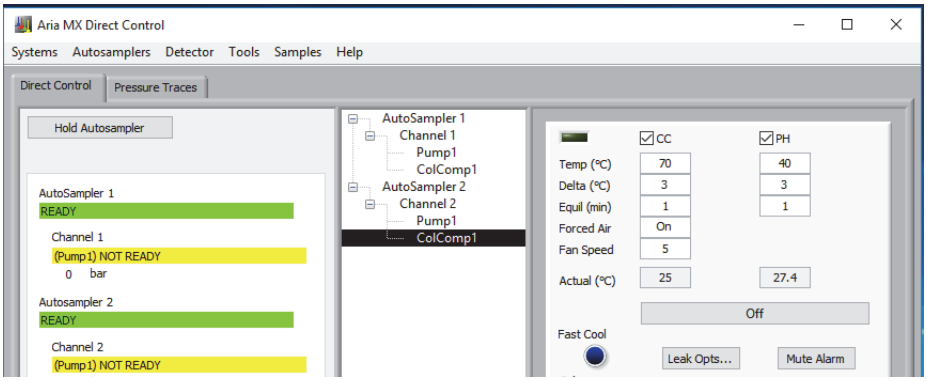


Figure 54. Direct Control window showing TCC module controls (Off state)



c. Do one of the following for your column heater type:

- (MultiSLEEVE) Click the **Enable** button in the upper-left of the right pane so that it shows dark green.
- (TCC module) Click the **On** button so that the On/Off indicator in the upper-left of the right pane turns dark green and the On button changes to the Off button.

The column heater is turned off.

d. Repeat step b and step c for the second column heater if applicable.

2. When the column heater has cooled, do one of the following:

a. (MultiSLEEVE) Unwrap the column heater from the column.

b. (TCC module) Open the TCC door.

3. Replace the column as follows:

Note Use only your fingers to manipulate the tubing fittings on Prelude systems. Transcend systems require tools, depending on the procedure.

a. Loosen the knob on one end of the column until the fitting disengages from the column. Do not use tools on the fittings.

b. Loosen the fitting on the other end of the column while holding onto the column.

c. Remove the column and dispose of the column according to your laboratory's standard operating procedure.

d. Remove the end cap from one end of the new column and insert the column fitting.

e. Tighten the screw. Avoid overtightening.

f. Remove the end cap from the other end of the column and insert the column fitting.

Cleaning System Components

The following sections provide details on cleaning various Transcend configuration components.

- Cleaning the Solvent Lines, Pumps, and Valves
- Vanquish Hardware Maintenance
- Dried Spot Module (DSM) Hardware Maintenance

Cleaning the Solvent Lines, Pumps, and Valves

If you use buffers with high salt concentrations, the following procedure cleans the lines, pumps, and valves, and helps prevent a salt buildup.

Note Thermo Fisher Scientific recommends that you do not use buffers with high salt concentrations on an LC system connected to a mass spectrometer.

❖ To clean the solvent lines, pumps, and valves

1. Remove all the columns from the system and cap them with plugs.
2. Put low dead volume unions on the system in place of the columns.
3. Remove all the lines from the mobile phase bottles, place them into LC/MS grade deionized water, and do the following:

a. Purge the pumps with water for 5 minutes. See "Purging the LC Pumps for Transcend Systems" on page 12.

b. Verify that the purge valves are closed, if applicable.

c. Precondition the pumps with water for 10 minutes. Refer to the *Aria MX User Guide* for details.

d. Create and submit a batch that runs five blanks (water) from the same vial.

e. Load a vial of water into the appropriate position on the autosampler and perform the run.

4. Place all the lines into cleaning solvent. See "Preparing the TurboFlow Column Wash Solvent" on page 3. Then do the following:

   a. Purge the system for 5 minutes.

   b. Precondition the pumps for 10 minutes. Refer to the *Aria MX User Guide* for details.

   c. Run five water blanks from the same vial.

5. Place all the lines into deionized water and do the following:

   a. Purge the system for 5 minutes.

   b. Precondition the pumps for 10 minutes. Refer to the *Aria MX User Guide* for details.

   c. Create and submit a batch that runs five blanks from the same vial. Then, load a vial of water into the appropriate position on the autosampler and perform the run.

6. Place all the lines into fresh mobile phase solutions and do the following:

   a. Purge the system for 5 minutes.

   b. Precondition the pumps for 10 minutes. Refer to the *Aria MX User Guide* for details.

   c. Create and submit a batch that runs five blanks (water) from the same vial.

   d. Load a vial of water into the appropriate position on the autosampler and perform the run.

7. Remove the low dead volume unions and install the appropriate columns.

8. Precondition the pumps with mobile phases for 10 minutes to precondition the columns you installed in step 7. Refer to the *Aria MX User Guide* for details.

Vanquish Hardware Maintenance

Each Vanquish hardware component includes a printed operator manual that provides detailed maintenance information. Transcend configurations support the following Vanquish hardware components:

- Vanquish Dual Split Sampler, in the Transcend Duo LX-2 configuration
- Vanquish Column Compartment, VH-C10, in the Transcend Duo LX-2 or Transcend DSX-1 configuration
- Vanquish Horizon pumps, VH-P10, in the Transcend Duo LX-2 configuration

- Vanquish Flex binary and quaternary pumps, VF-P10 and VF-P20, in a single or multi-channel TLX, DSX-1, or LX configuration

Additionally, the operator manuals are in electronic (PDF) format on the Aria MX DVD. Refer to the applicable Vanquish manual for maintenance procedures. See "System Documentation" on page xiv for a list of the Vanquish documentation.

Dried Spot Module (DSM) Hardware Maintenance

Each Transcend DSX-1 Dried Spot Module (DSM) component factory manuals that provide detailed maintenance information on the Spark Holland DBS-A and HPD hardware components. For more information and the available documents, see "System Documentation" on page xiv).

Note The DSM system is configured and verified by a Thermo Fisher Scientific service engineer when it is installed in the laboratory. Contact Thermo Fisher Technical Support if there is any reason to change the configuration settings of the DSM system hardware. See "Contacting Us" on page xxii.

All supporting documents for each Transcend DSX-1 hardware component are in electronic (PDF) format on the Aria MX DVD. Refer to the applicable component factory hardware manual for maintenance procedures. See "System Documentation" on page xiv for a list of the factory documentation.

Computer (Data System) Maintenance

The following sections provide recommendations on maintaining your data system to ensure peak performance and uptime.

Periodic Computer System Updates

The Aria MX software runs on the Microsoft™ Windows™ 10 and Windows 7 operating systems. You might need to restart the system periodically to initiate operating system updates and so on. Consider updating your settings when running the LC system. Follow your IT department guidelines regarding any required service and security updates.

Suspending Computer Sleep Mode When Running Aria MX

The Aria MX software will prevent the data system computer from entering sleep mode when it is a configured device in Foundation platform.

A

Replaceable Parts and Consumables

Transcend, Prelude SPLC, and Aria system configurations occasionally require the replacement of certain parts and consumables. This appendix provides part number lists for common spare parts and system consumables.

Contents

General Consumables

Table 5 contains part numbers and descriptions of consumable parts for the LC instruments described in this guide. To ensure proper results in servicing the instrument, order only the parts that are listed or their equivalent. Contact your Thermo Fisher service engineer if you have any questions.

Table 5. Consumable parts for the LC instrument (Sheet 1 of 2)

Description	Part number	Component
Solvent filter	00301-01-00036	For systems with Agilent™ and Shimadzu™ pumps
PEEK Tubing, 0.005 ID × 0.062 OD × 1.5 m	00109-02-00041	For low pressure HPLC systems or post-column UHPLC use
One Piece Fingertight PEEK Fitting, 10-32	00109-00314	For low pressure HPLC systems or post-column UHPLC use

Table 5. Consumable parts for the LC instrument (Sheet 2 of 2)

Description	Part number	Component
DLW2 stainless steel needle/loop	00950-01-00360	–
DLW Teflon loop with needle adapter	00950-01-00317	–
DLW needle kit, 3-pack	00950-01-00328	–
DLW 100uL glass syringe	00950-01-00325	–
DLW syringe plunger, 10-pack	00950-01-00326	–
Syringes (use X-type for longer life)		
100 µL Std bore	CH-952489	–
250 µL Std bore	CH-952490	–
25 µL Std bore	CH-952488	–
100 µL X-Type Wide bore	CH-952929	–
100 µL X-Type Std bore	CH-952930	–
25 µL X-Type Std bore	CH-952931	–

Aria Spare Parts

Table 6. Spare parts for the Aria HPLC system (up to 400 bar)

Description	Part number	Component
Low pressure rotor seal (3 groove)	CH-952356	Can be used with the following valves: • Injection valve • VIM A valve • VIM B valve (Quick Elute Mode) • VIM bypass valve
Hi-Res rotor seal	CH-952357	VIM B valve (Focus Mode)
Injector stator	CH-952480	–
6-port stator	CH-952679	Can be used with the following valves: • VIM A valve • VIM B valve • VIM bypass valve
Selector stator (H-Style)	CH-106686	–
Needle seal, 10-pack	CH-952451	–
Solvent filter	CH-952835	Aria systems with Allegro pumps

Transcend UHPLC Spare Parts

The following sections provide information for Transcend configurations that use either TriPlus or Accela Open autosamplers, a Valve Interface Module (VIM), or the Duo LX-2 hardware.

VIM and Accela Open Spare Parts

Table 7. Spare parts for Transcend UHPLC systems (greater than 400 bar)

Description	Part number	Component
High pressure rotor seal (3 groove)	CH-953197	Can be used with the following valves: • Injection valve • VIM A valve • VIM B valve (Quick Elute Mode) • VIM bypass valve
High pressure Hi-Res rotor seal	00950-01-00528	VIM B valve (Focus Mode)
High pressure injector stator (15 000PSI)	CH-953295	(Used in Accela Open autosamplers)
High pressure 6-port stator (15 000PSI)	CH-953264	Can be used with the following valves: • VIM A valve • VIM B valve • VIM bypass valve
Selector rotor seal	CH-953396	–
Selector stator (H-Style)	CH-106686	–
Needle seal, 10-pack	CH-952451	–
Solvent filter	CH-952835	Transcend systems using UltiMate pumps

Vanquish Spare Parts

- See Table 8 for information regarding the spare parts for the Vanquish Dual Split Sampler
- See Table 9 for information regarding spare parts for the Vanquish Flex and Vanquish Horizon pumps
- See Table 10 for Vanquish system spare part accessories

Table 8. Vanquish Dual Split Sampler spare parts

Description	Part number
INJECTOR WASTE CAPILLARY, VH-A1, VF-A1	6850.1930
METERING HEAD CAPILLARY, VH-A1 , VF-A1	6850.1920
METERING HEAD CAP.,RIGHT, MP35N, VH/VF-A40	6850.1922
Viper Plug, Titanium	6040.2303
INJECTION VALVE, VH-A1, VF-A1	6036.1500
NEEDLE SEAT, VH-A1, VF-A1	6850.2430
NEEDLE UNIT, VH-A1, VF-A1	6850.1100
METERING HEAD, 100UL, VH-A1, VF-A1	6850.1743
SAMPLE LOOP, 10UL, BIOCOMP, VH-A1, VF-A1	6850.1915
SAMPLE LOOP, 25UL, BIOCOMP, VH-A1, VF-A1	6850.1911
SAMPLE LOOP, 100UL, BIOCOMP, VH-A1,VF-A1	6850.1913
SAMPLE LOOP,RIGHT,10UL,MP35N,VH/VF-A40	6850.1919
SAMPLE LOOP,RIGHT,25UL,MP35N,VH/VF-A40	6850.1917
SAMPLE LOOP,RIGHT,100UL,MP35N,VH/VF-A40	6850.1918
COVER FOR DUST AND HUMIDITY, VX-A	6850.1627

Table 9. Vanquish Flex (VF) and Horizon (VH) pump spare parts (Sheet 1 of 2)

Description	Part number
Note Part descriptions that do not contain a “VF” or “VH” designation apply to both the Flex and Horizon models.	
PUMP HEAD VF-P1, 100MPA KPL.	6044.5201
SET PISTON SEALS, T-RINGS, VF-P20	6044.0295
PISTON SEAL - SUPPORT RING CERAMIC 2 PCS	6040.0012
SAPPHIRE PISTON 2PCS,VF-P20,2G PUMPS	6040.0042
VALVE NUTS, BIO, 2PCS, VF-P20, 2G PUMPS	6037.1964
VALVE CARTRIDGE, VF-P20,NCS,NCP,RS,SD	6041.2301
PUMP HEAD SEALS (PTFE), VF-P20, 2G PUMPS	6040.2208
SET CAPILLARIES, VF-P1	6044.5016
MOUNTING TOOL VIPER,VF-P20, RS PUMPS	6040.2314
PUMP HEAD VF-P20	6044.5204
CAPILLARY KIT, MP35N,VF-P20,LPG-/DGP-RS	6040.3003

Table 9. Vanquish Flex (VF) and Horizon (VH) pump spare parts (Sheet 2 of 2)

Description	Part number
Maintenance kit, VH-P1	6044.1956
PUMP HEAD, VH-P1	6044.1201
Piston seal, RP, VH-P1	6266.0309
Piston Unit, Sapphire, VH-P1	6267.0050
Pump head inlet assembly VH-P1	6044.2330
Inlet check valve unit, VH-P1	6044.2300
Outlet check valve unit, VH-P1	6044.2310
PUMP HEAD SEALS (PTFE) VH-P1	6044.1210
Screws seal wash plate, VH-P1	6000.0036
Tool seal handling RS/SD pump	6040.7158
Drop detector with funnel, VH-P1	6044.1898
PERISTALTIC AND WASH TUBING KIT,VANQUISH	6044.1150
Piston seal, RP, VH-P1	6266.0309

Table 10. Vanquish spare parts (accessories)

Description	Part number
ELUENT BOTTLE 1L,CAP,OPENINGS	2270.0012
ELUENT BOTTLE 0.25L,CAP,OPENINGS	2270.0026
CAP WITH INLAY FOR ELUENT BOTTLE, 4 PCS.	6270.0013
Plugs and retaining guides, bottle caps	6030.9101
Bottle Cap plugs 8/5.5/5.8, 20 pcs.	6000.0047
RETAINING GUIDE (ELUENT BOTTLE), 5 PCS	6000.0042
Set Solvent Lines Vanquish	6036.1701
TUBING KIT, VH-P1	6044.2055
SOLVENT FRIT HOLDERW/O INSERT, 6 PCS.	6268.0115
ELUENT FILTER FRITS,TI,10PCS.,U3000 PMP	6268.0111

Prelude SPLC Spare Parts

Table 11. Spare parts for Prelude SPLC systems

Description	Part number
Needle seal, 5-pack	00950-01-00437
Graphite column ferrules, 5-pack	00109-02-00044
Solvent inlet filter, 1/8 inch	00301-01-00036
Corning square solvent bottle, 1 L	00301-01-00032
Bottle cap adapter	00301-01-00065
Accucore™ PFP 50 × 2.1 mm column	17426-052130
TurboFlow Cyclone-P 0.5 × 50 mm column	CH-953289

TriPlus RSI Autosampler Spare Parts

Note For spare parts specific to the TriPlus autosampler used in the Transcend DSX-1 configuration, refer to Table 13.

Table 12. Spare parts for TriPlus (RSI) autosampler

Description	Part number
Needle seal, 5-pack	00950-01-00437
DLW needle kit, 3-pack	00950-01-00328
Syringe, 100 uL, for the LCMS tool (RSI model)	00950-01-00506
Injector rotor seal (3 groove)	00110-03-00025

DSX-1 Dried Spot Module Spare Parts

Table 13. Spare parts for Transcend DSX-1 DSM (Sheet 1 of 2)

Description	Part number (Spark Holland)
Clamp head set, 2 mm, tubing included (HotCap)	0410.701
Clamp head set, 4 mm, tubing included (HotCap)	0410.703
Clamp head set, 6 mm, tubing included (HotCap)	0410.705
Clamp head set, 8 mm, tubing included (HotCap)	0410.707
Rotor seal for 10-port DBS-A (autosampler) valve	0410.750

Table 13. Spare parts for Transcend DSX-1 DSM (Sheet 2 of 2)

Description	Part number (Spark Holland)
HPD Syringe Valve, rotor seal	3796.120
Tubing set Internal Standard incl. nut and ferrule	0410.713

Chemicals List

The following LC/MS grade chemicals are available from Fisher Scientific.

Table 14. Chemicals list

Description	Part number	Size
Ammonium formate in water, 10 mM, with 0.05% formic acid	MB123-1	1 L
Ammonium formate in methanol, 10 mM, with 0.05% formic acid	MB122-1	1 L
45:45:10 isopropanol/acetonitrile/acetone	MB124-1	1 L
Acetone	A929-1	1 L
Acetonitrile	A955-4	4 L
	A955-1	1 L
Ammonium formate	A11550	4 L
Water	W6-4	4 L
	W6-1	1 L
Formic acid	A117-10X1AMP	10 × 1 mL ampules
Isopropanol	A461-1	1 L
Methanol	A456-4	4 L
	A456-1	1 L