PICARRO

A0340 Autosampler
User Manual

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Thank you for purchasing a Picarro product. Your Picarro autosampler is a quality product that has been designed and manufactured to provide reliable performance.

This manual is an important part of your purchase as it will help familiarize you with the autosampler and explain the numerous features that have been designed into it. Please read this manual thoroughly before using the autosampler.

Please contact Picarro or your authorized Picarro distributor should you have questions regarding specific applications or if you require additional information.

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1. Introduction

This manual provides details on the relevant installation and operation tasks of the Picarro Autosampler when used with the Picarro L2130-*i* or L2140-*i*. This manual is supplementary to the *L2140-i, L2130-i Isotopic Water Analyzer and Peripherals Installation and Operation Manua*l, PN 40035

If any problems are encountered during installation and setup, contact us at (support@picarro.com). Always purchase additional syringes if you plan to reprogram methods – damaged syringes caused by unexpected travel are the cause of most common failures.

During normal operation of the analyzer, the autosampler is controlled by a coordinator software running on the computer installed on the Picarro analyzer. This software coordinates sample injections with the Picarro instrument and eliminates the need for user intervention during automated multiple sample runs. However, there are some one-time set up and once-per-run operations which will need to be performed directly with the autosampler software, these are described in this document.

1.1 Intended Use

The A0340 autosampler pairs with the Picarro A0211 High Precision Vaporizer provides automated sampling for the Picarro L2130-*i* or L2140-*i* analyzers. The autosampler is a XYZ sampler system and can prepare, move, and inject samples into the Picarro L21x0-*i* analyzers. The user interface offers impressive customization with low barrier to entry.

1.2 Factory Default

The Picarro analyzer is delivered with a single method and job. The factory default method (named ‘Picarro’) was used to verify instrument performance specifications and is recommended for general use. For more information regarding methods and jobs, see ***Chapter 7 Autosampler UI Software***.

The factory default job delivers 6 injections from vial number 1 of the tray provided with the instrument. The default job may be easily modified to deliver injections from all sample vials in the tray. Instructions can be found in this chapter under .

1.3 Specifications

Table 1: A0340 Specifications

Parameter	Specification
Maximum number of vials	130
Syringe	Picarro recommends SGE 10 µL syringes, Equivalent syringes from other manufacturers may be used. See section ***10.8 Compatible Syringes***.
Autosampler Dimensions	Width: 22” (557 mm) Depth: 29.5” (750 mm) Height: 30” (770 mm) For system measurements and workspace requirements, see ***4.2 Dimensions and Bench Space Requirements***
Weight Autosampler Vaporizer	23.15 lb. (10.5 kg) (without sample tray and waste station) 12 lbs (5.4 kg) (supported by autosampler)
Electrical	Voltage: 48 VDC Current: 1.5 A
Power Adapter	Voltage Range: 100/230 VAC-50/60 Hz Voltage Output: 48 V Current Output: 2.1 A Note: Only use power adapter supplied by Picarro.
Operating Temperature	4°C to 40°C
Storage Temperature	4°C to 50°C
Relative Humidity	10% to 75% non-condensing

1.4 Acronyms

This manual includes various acronyms and abbreviations. For definitions, see below:

Table 2: Acronyms, Formulas, Units, and Symbols

Acronym	Definition
” (as in 1/4”)	Inches
°C	Degrees Celsius
<	Less Than
>	Greater Than
‰	per mil
µL	Microliter
AUX	Auxiliary Port
COM	Communication Port
CRDS	Cavity Ring-Down Spectroscopy
cm	Centimeters
DI, DIW	Deionized Water
DLY	Delay
GUI	Graphical User Interface
Hz	Hertz
ID	Inside Diameter
Inj	Injection
kg	Kilograms
lbs	Pounds
LAN	Local Area Network
max	Maximum
MCM	Micro Combustion Module

Acronym	Definition
mm	Millimeters
mL	Milliliter
N/C	No Connection
OD	Outside Diameter
PC	Personal Computer
PN	Part Number
PTFE	Polytetrafluoroethylene
RS232	Recommended Standard 232 (Serial communication protocol)
sec	Seconds
USB	Universal Serial Bus
VAC	Volts AC power
VDC	Volts Direct Current
XML	Extensible Markup Language
WLM	Wavelength Monitor

1.5 Text Conventions

The following conventions are used in the manual.

- *Italic* text identifies screen names and emphasizes important text or certain features.
- ***Bold Italic*** text identifies section reference links.
- **Bold** text is for actions to take (such as clicking on a UI button), caution and warning statements, and text you should type or select in screens.

2. Safety

2.1 Warning Symbols

The following icons are used throughout this manual to emphasize important information in the text. These icons indicate dangers to either the operator or to the analyzer, and other important information.

Table 3: Warning/Information Icons

	Consult the user manual for important information (When you see this symbol placed at hazard points on equipment, consult the user manual).
 NOTE	**NOTE** is important information that you should be aware of before proceeding.
 CAUTION	**CAUTION** alerts you of a potential danger to equipment or to the user.
 WARNING	**WARNING** indicates an imminent danger to the user.
 WARNING	**WARNING** alerts user to hot surface hazard.
 CAUTION	**CAUTION** alerts user to electrical hazard.
 WARNING	**WARNING** indicates lift injury hazard
 REMINDER	**REMINDER** is a helpful hint to procedures listed in the text.

2.2 General Safety

CE Certification

This Picarro product complies with European standards and the instrument is affixed with a CE label. This CE label is located on the rear of the instrument.

WARNING

Using this autosampler in a manner not specified by Picarro may result in damage to the sequencer and render it unsafe to operate.

WARNING

This autosampler is for indoor use only and has an ingress protection rating of IPx-0. The autosampler is NOT protected against exposure to water including dripping, spraying, splashing or immersion. Do not operate or store the unit outside or exposed to the elements.

WARNING

Do not operate in an explosive atmosphere. Do not operate in the presence of flammable gases or fumes.

CAUTION

The autosampler contains no user serviceable components except the Syringe. Do not attempt any repairs. Instead, report all problems to Picarro Customer Service or your local distributor. Please contact Picarro if you have any questions regarding the safe operation of this equipment.

CAUTION

Only authorized persons may open the autosampler covers or perform internal maintenance. Contact Picarro for maintenance instructions and maintenance kits. Unplug the autosampler before working with the internal components. Failure to do so may result in electric shock or electrocution or can damage the autosampler.

CAUTION

The inlet gas connector on the back panel of the analyzer, and its immediate vicinity, runs hot during operation of the analyzer. Take care when connecting gas lines or working at the rear of the instrument to wear protective gloves or avoid contact with these surfaces.

WARNING

The analyzer weighs 48 lbs. (21.8 kg), the vaporizer weighs 12 lbs (5.4 kg), and the autosampler weighs 23.15 lbs. (10.5 kg). Use the technique described below when lifting the analyzer.

- **Before lifting, inspect the unit for slippery substances or sharp edges.**
- **Lift with two people, one on each side of the analyzer.**
- **Crouch down and stay close to the unit. Always keep your back as straight as possible.**
- **Position your feet for sturdy balance. Lift with your legs, not your back.**
- **Do not twist the back while carrying the unit. Rotate direction with hip joints.**
- **Lower the unit by bending at the knees.**

3. Unpacking

3.1 Shipping, Handling, and Storage

- The autosampler may be transported in non-pressurized aircraft.
- Do not store boxes outside in the rain, extreme heat, or cold.
- Handle Picarro equipment with care. Do not drop or shake boxes.
- Do not stack boxes more than five high.

3.2 Inspect the Shipping Box

Picarro products are inspected and tested before leaving the factory. The shipping boxes provide safety from most dropping, crushing, or spiking events. If the equipment arrives damaged, photograph the impairment, and contact Picarro (email pictures if possible) for consultation on the best course of action.

Save the original shipping materials for reuse when storing or shipping the unit.

3.3 Unpack the Shipping Box

Unpack the shipping box and verify the following components shown below. Extra care is required when removing the XYZ arm and tower. When the device is powered down, the tower is in an unlocked position. Uneven lifting can cause the tower to shift, leading to damage or injury. Use two people whenever moving.

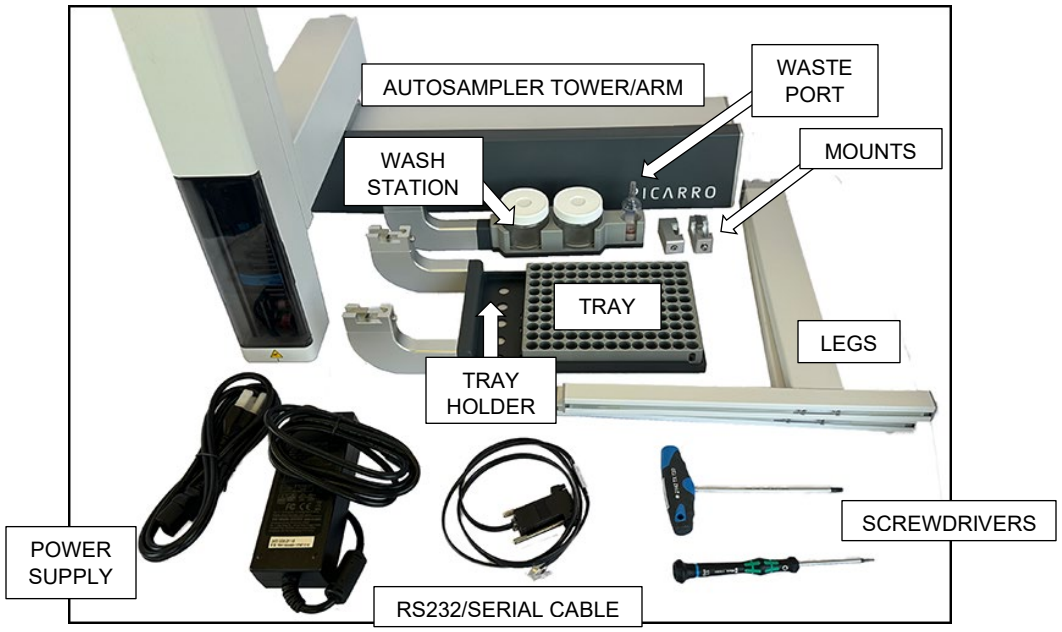


Figure 1: Autosampler Shipping Contents

NOTE

The autosampler has a universal power supply that accepts a power source range from 90-264 VAC, 47/63 Hz, and a voltage output of 48V.

Always use the 48V power adapter supplied by Picarro. Other power adapters can harm the autosampler. The autosampler is protected by using the supplied LPS power adapter.

The tower is in an unlocked position when the device is off. Use two people when removing the XYZ tower and arm from the box. For packing content removal, see Figure 2.

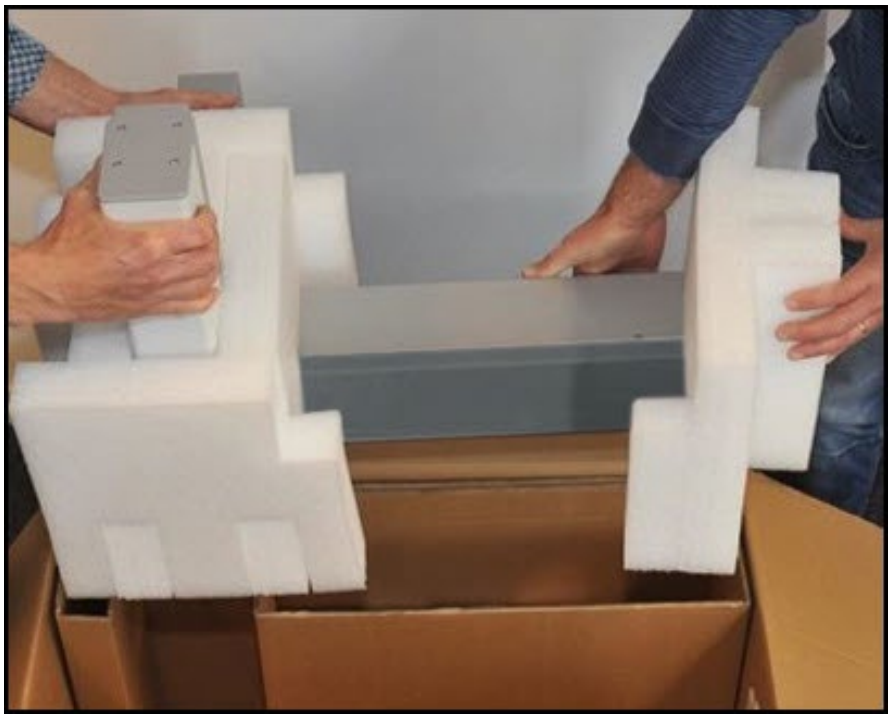


Figure 2: Removing the Autosampler Tower

4. Installation

The sequence of installation is as follows:

1. **Analyzer and Pump** (Refer to the User Manual for your analyzer).
2. **Autosampler Assembly.**
3. **Vaporizer** and MCM (optional) (Refer to the A0211 High-Precision Vaporizer User Manual, part number 40-0044, and A0214 MCM User's Manual, part number 40-0042).
4. **System Connections.**
5. **Sample and Solvent Station Set-up.**

4.1 Installation Safety

WARNING

Using this autosampler in a manner not specified by Picarro may damage the analyzer and render it unsafe to operate.

CAUTION

During installation, do not position the analyzer so that it is difficult to operate the electrical disconnecting device (such as an emergency off (EMO) switch or breaker).

CAUTION

The analyzer must have adequate ventilation and cooling to maintain the ambient temperature below 35 °C during operation. Failure to provide sufficient airflow, especially clearance at the front and rear panels, to ensure proper airflow and cooling to the analyzer will result in overheating of the analyzer, causing a shutdown and potential damage. There should be 4" (10 cm) of clearance in the front and back of the analyzer.

Thermal Specifications	Min	Max	Description
Ambient Operating Temperature	-10°C	35°C	Worst-case environmental limits (unless otherwise specified)

CAUTION

When the autosampler, MCM, and analyzer are integrated into an external system, the safety of that system is the responsibility of the assembler of that system.

CAUTION

Use the AC power cables supplied with the autosampler or a similarly rated cable. Check with Picarro technical support if you have questions about power cable replacement. A sufficiently rated power cable can result in equipment damage.

CAUTION

Power cables are rated for the maximum current for the equipment and meet the requirements of IEC 60227 or IEC 60245. Cables are certified or approved by a recognized testing authority and are regarded as meeting this requirement. The connector type used should be IEC320 C13.

4.2 Dimensions and Bench Space Requirements

The following outline diagram contains overall product dimensions and recommended bench space requirements for the combined autosampler, vaporizer, and MCM. Although system configurations can vary slightly, use the measurements provided as a minimum guideline for adequate space and system performance.

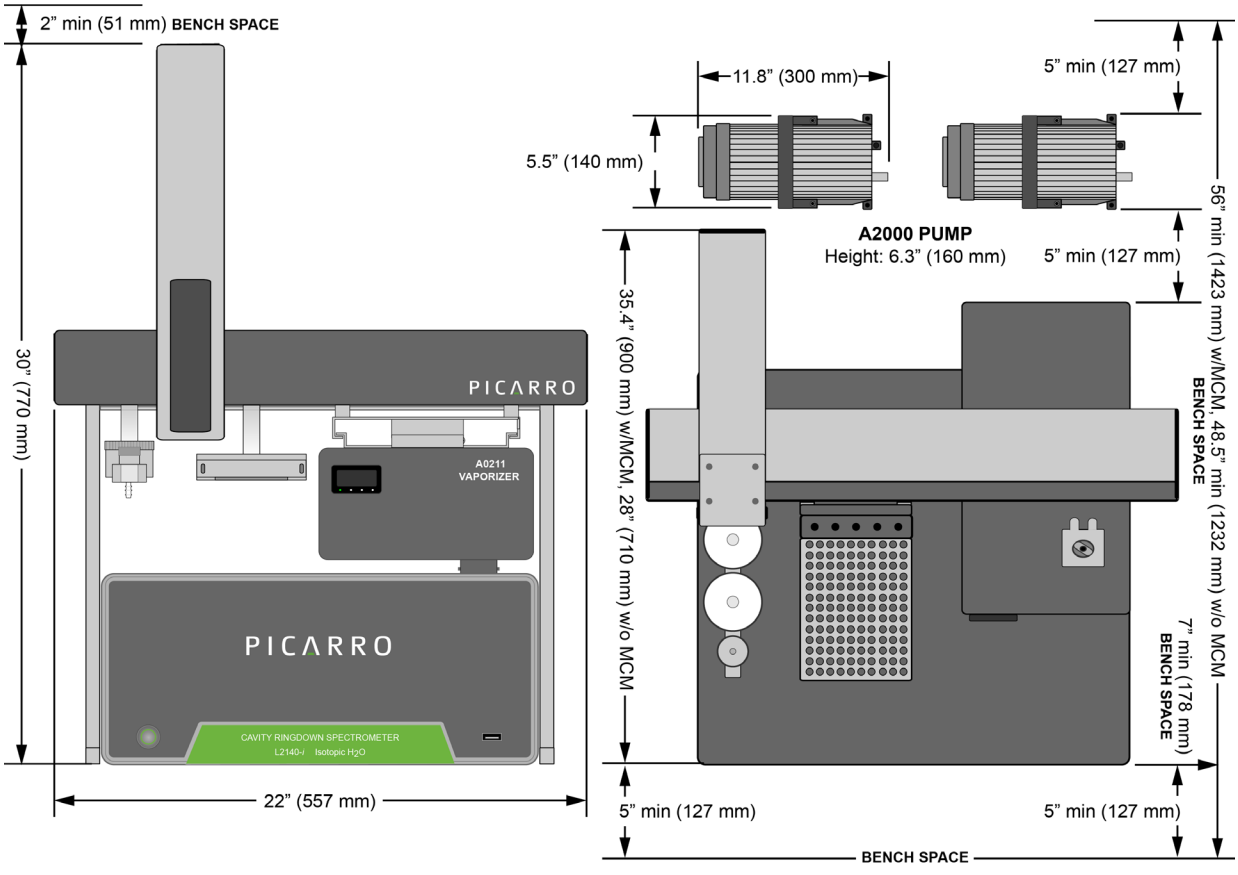


Figure 3: Dimensions and Bench Requirements (A0340, A0211, A0214)

NOTE

The analyzer is moved forward to provide clearance and mounting for the MCM at the back of the analyzer.

4.3 Setup Analyzer and Vacuum Pump

NOTE

Refer to the L2140-*i* and L2130-*i* Isotopic Water Analyzer and Peripherals Installation and Operation Manual, P/N 40035, for detailed analyzer installation instructions.

Refer to the A0211 High-Precision Vaporizer User Manual, P/N 40-0044 for vaporizer installation instructions.

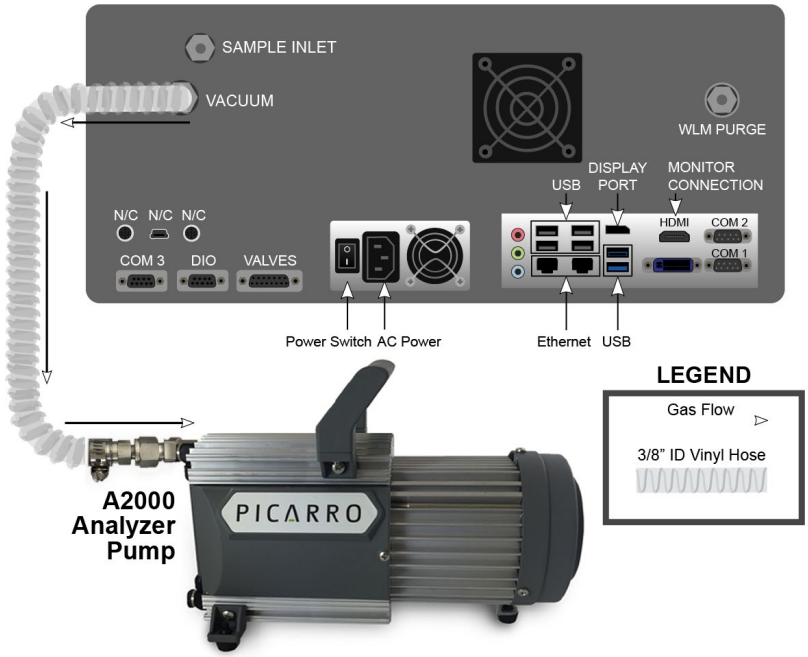


Figure 4: Analyzer and A2000 Pump Setup

NOTE

The analyzer and the vaporizer each have their own pump – a single pump is inadequate to run both.

4.4 Autosampler Assembly

Assembly Instructions

Remove the autosampler from the shipping box as described in ***Chapter 3 Unpacking*.** Follow the assembly instructions below.

1. Place the autosampler on a table with enough space. Initially, place the autosampler with the XYZ tower arm up.
2. Carefully rotate the autosampler on its side such that the XYZ arm is now on the downward side.
3. Remove the top protection cap. For more information, see Figure 5.

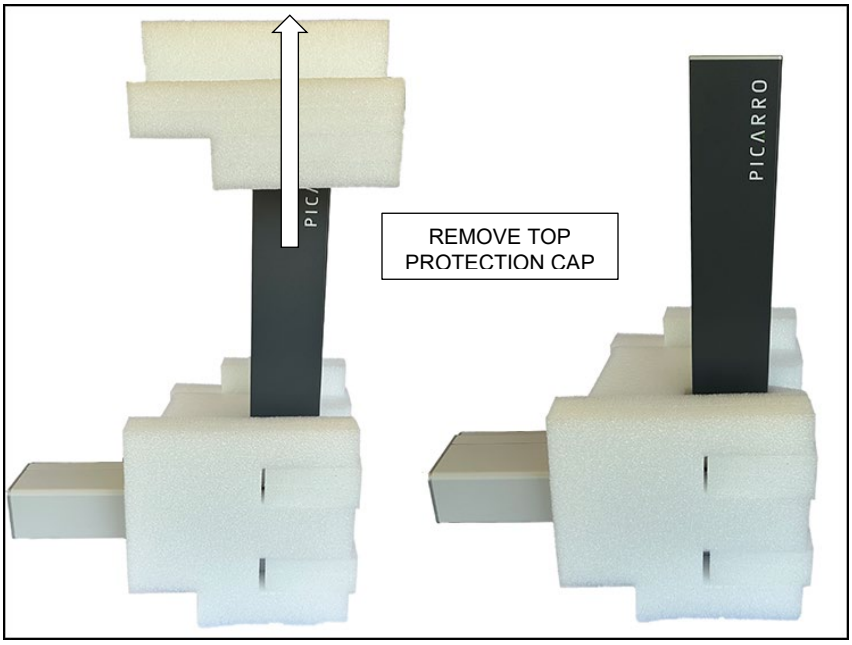


Figure 5: Assembly Instructions/Protection Cap Removal #1

4. Remove front and rear foam protection caps at the tower side.
5. Slide and remove the tower protection cap off of the top of the autosampler arm, as shown in **Error! Reference source not found.**.

TIP

Save all foam packaging and shipping materials if relocating the autosampler is required.

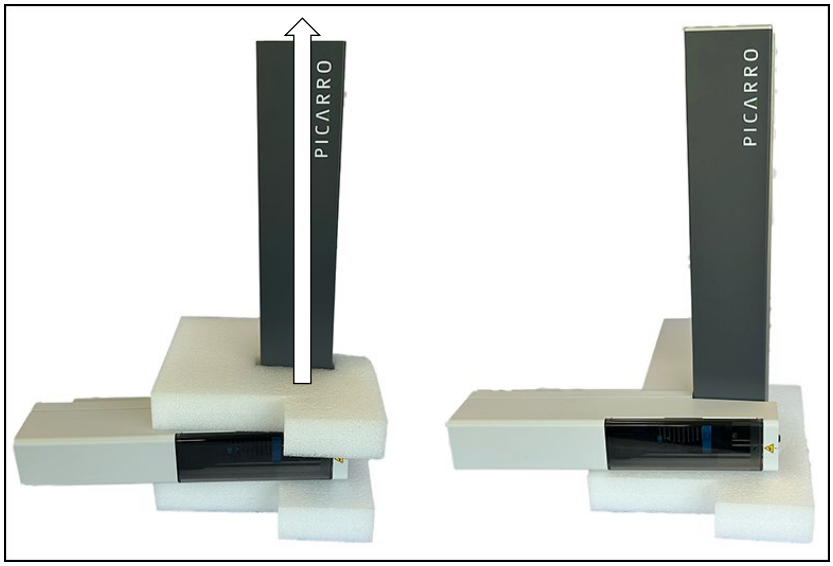


Figure 6: Assemble Instructions/Protection Cap Removal #2

6. Mount both supports, on each side of the x-rail, by fastening the support screws with the TX-20 screwdriver. The legs support the autosampler above the analyzer. Ensure the distance between the legs is greater than 44 cm (17 in)
7. Carefully rotate the autosampler and place it on its legs. Hold the XYZ arm steady while moving.

CAUTION

Be careful that the XYZ tower is not locked in place. Unless held in place, it will slide when rotated. Picarro recommends two individuals when assembling the autosampler.

8. Slide and remove the left protection cap from the XYZ arm.

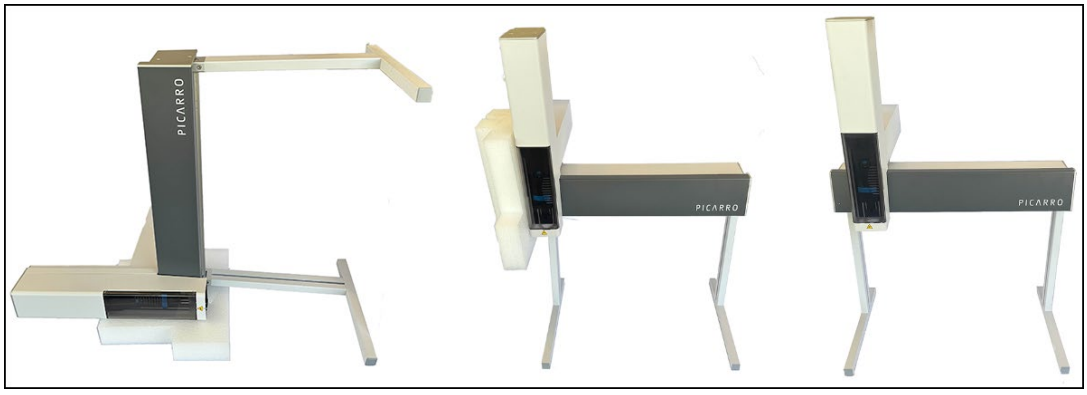


Figure 7: Assembly Instructions/Support Positions

9. Move the left support to the left side of the instrument.
10. Open the tower door, remove the transport lock, and tag using a TX-20 screwdriver.

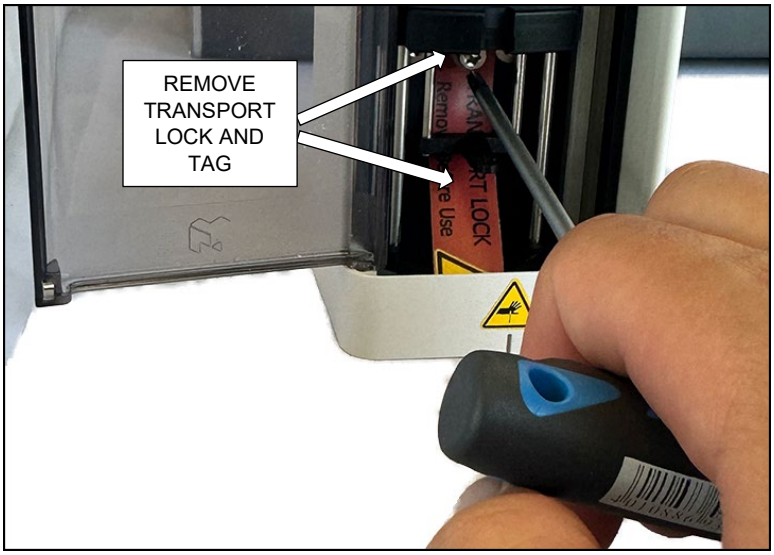


Figure 8: Assembly Instructions/Remove Transport Lock

WARNING

Make sure the supports are mounted correctly and tightened. If the supports are not tightened properly, the autosampler is unstable to absorb the motion forces. It can stagger and cause severe damage to the device.

WARNING

Make sure the supports are mounted on each side of the autosampler. The tower should not move beyond the supports. If the tower moves beyond its base, it can cause the autosampler to fall and cause severe damage to the device.

11. Place the autosampler over the analyzer. The autosampler is heavy and may require two people to move it. Hold the XYZ arm and tower steady when moving the autosampler.

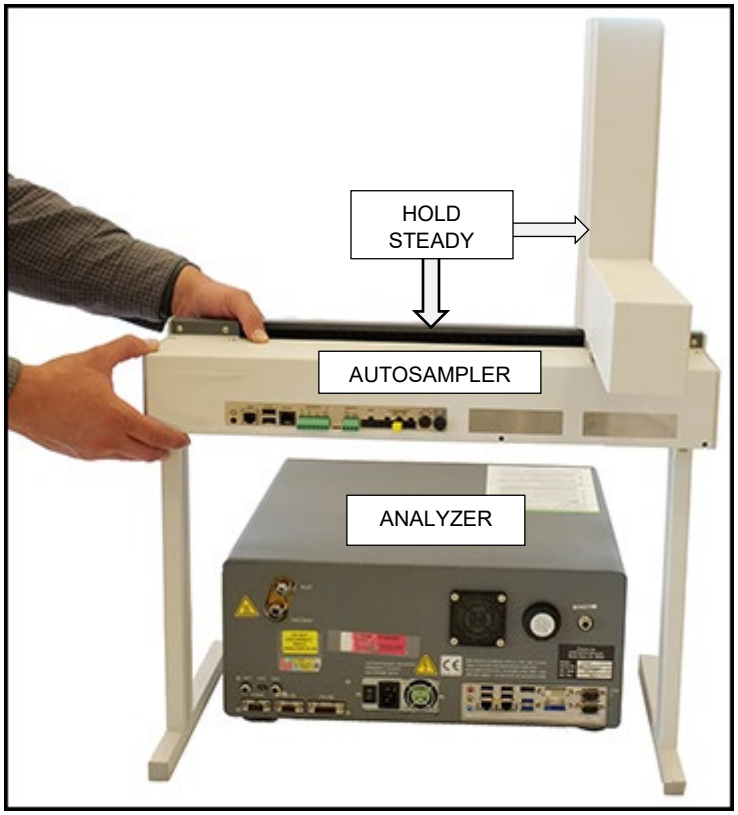


Figure 9: Positioning the Autosampler Over the Analyzer

12. Adjust the location of the two legs until they are snug against the sides of the analyzer, then firmly tighten each leg screw where it attaches to the leg mounting rail.

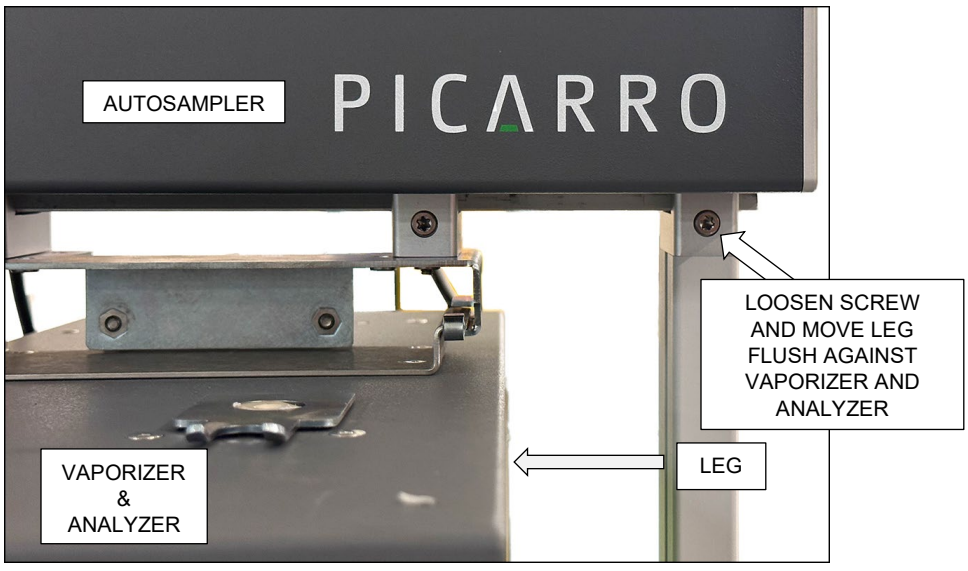


Figure 10: Adjusting and Tightening Autosampler Legs

13. Lay out the station holder, waste station, wash stations, tray holder, and tray as shown below.

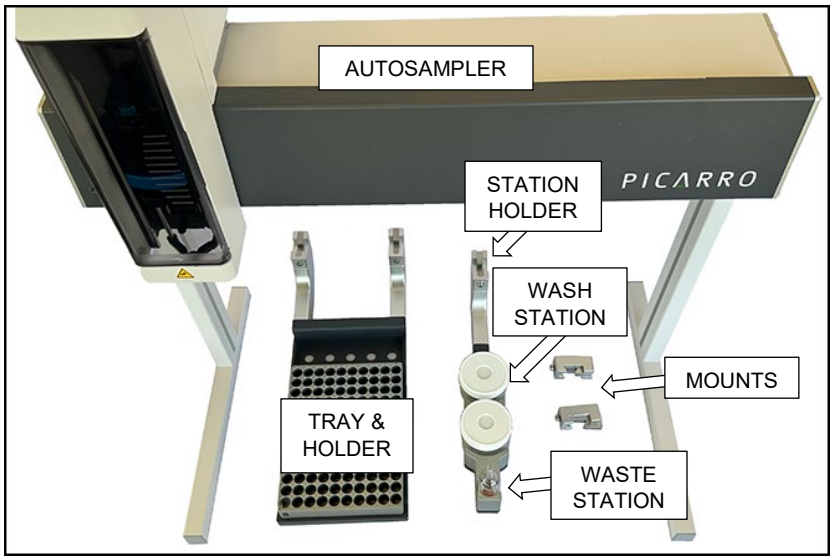


Figure 11: Autosampler Components

14. Attach the Wash Station and Tray Holders to the autosampler mounting rail; the same the legs were attached in the previous steps. For now, keep the connections loose. It is recommended to place the Wash Station as far to the left as allowed. Place the sample tray approximately 8 cm away from the Wash Station. It may be required to readjust their locations to fit the vaporizer later. See below for the relative locations of the holders. For more information, see ***4.7 Solvents Wash Station Set-Up*** and ***4.8 Sample Tray Set-Up***.

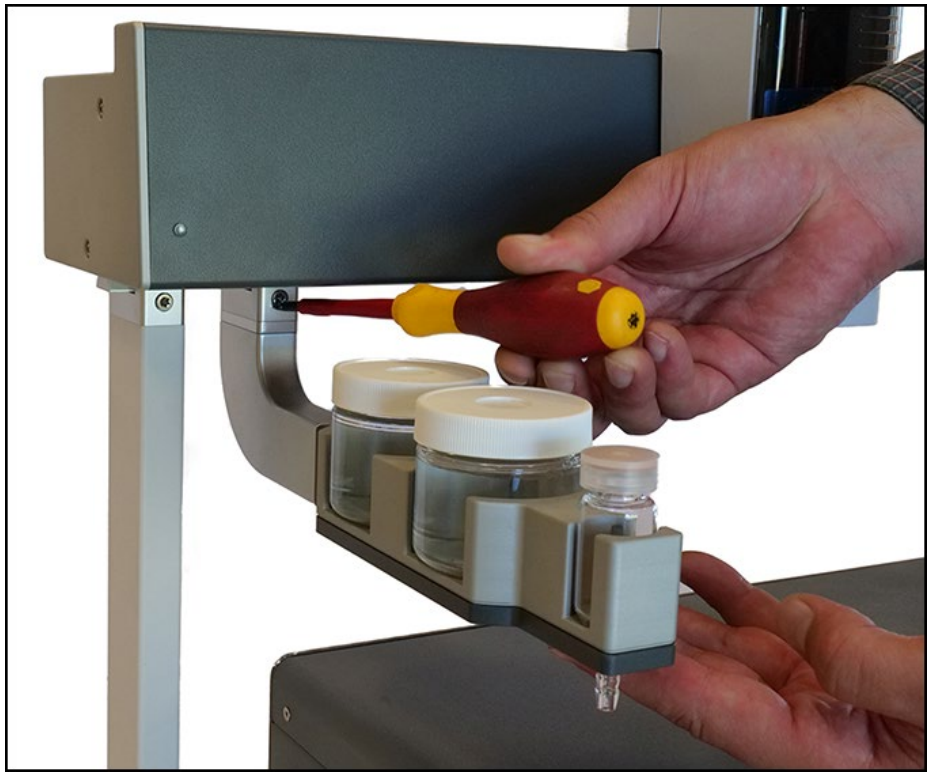


Figure 12: Attaching Wash Station

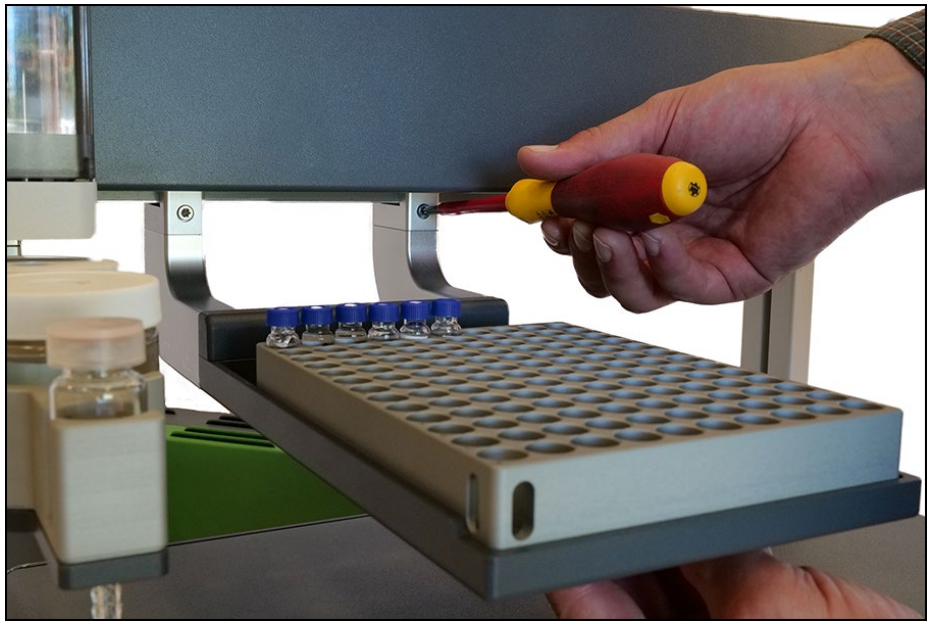


Figure 13: Attaching Tray Holder

4.5 Vaporizer Setup and Connection to CRDS

NOTE

There are two interconnection possibilities for the vaporizer:

- **A0211 Vaporizer (Figure 20, Figure 22).**
- **A0211 with A0214 Micro Combustion Module (MCM) comes mounted to the vaporizer. (Figure 21, Figure 23).**

Mounting Vaporizer to A0340

1. First, remove the mount attached to the vaporizer for shipment, then attach the mount to the autosampler the same way the legs connect to the XYZ arms in the previous steps (Figure 15, Figure 16).

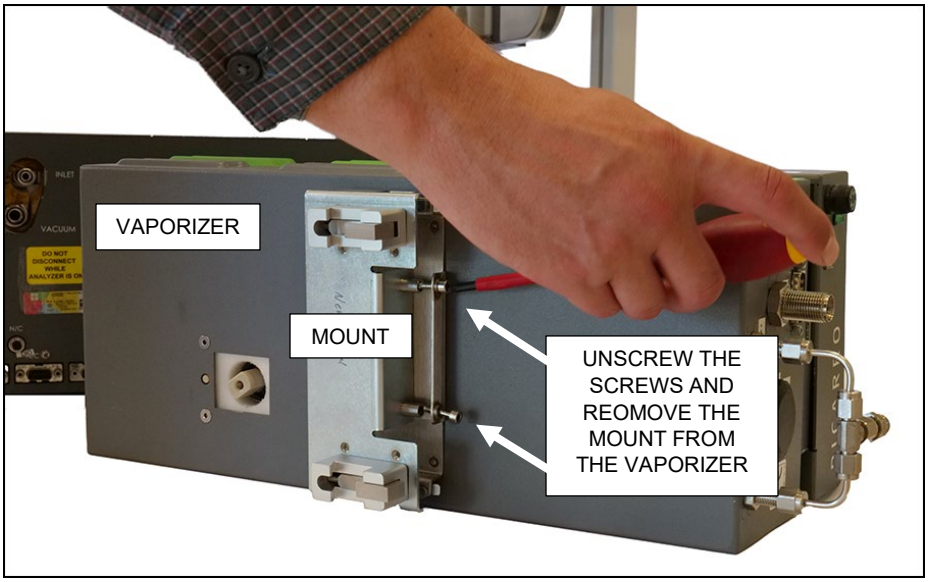


Figure 14: Removing Mount from Vaporizer

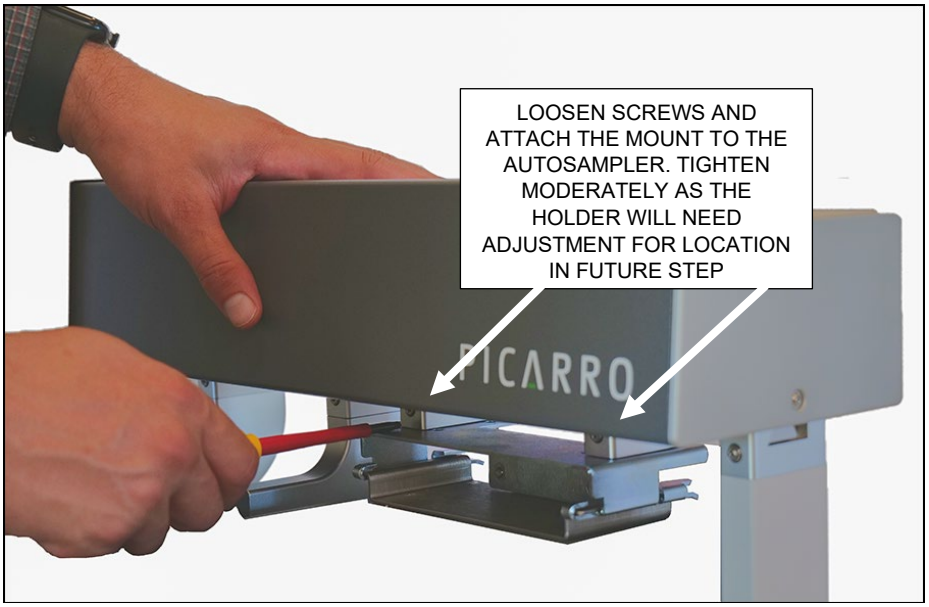


Figure 15: Attaching Mount to Autosampler

2. Slide the vaporizer into the mount and tighten the two screws, as shown in Figure 16.

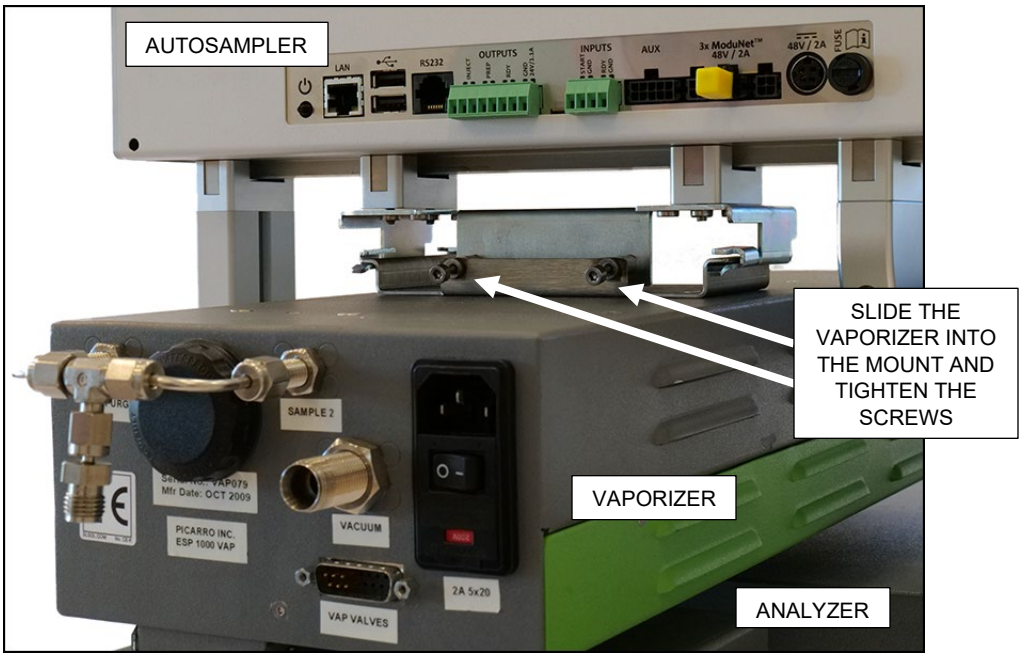


Figure 16: Mounting Vaporizer

Align Vaporizer Delivery Line to Analyzer Sample Input

3. Align the gas delivery line of the vaporizer (or MCM if equipped) to the analyzer's gas inlet port by adjusting the location of the vaporizer along the autosampler. Lift and slide the vaporizer to adjust (Figure 17). Note that the tray and station holders may need to be repositioned to make room for the vaporizer.

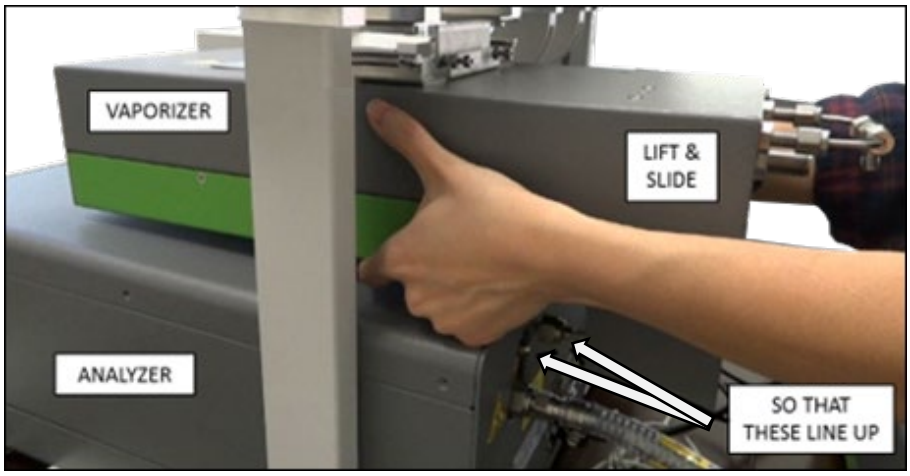


Figure 17: Adjusting to Align Vaporizer/Analyzer Gas Connections

4. When satisfied with the location of the vaporizer and the holders, tighten the screws that connect them to the autosampler (Figure 18).

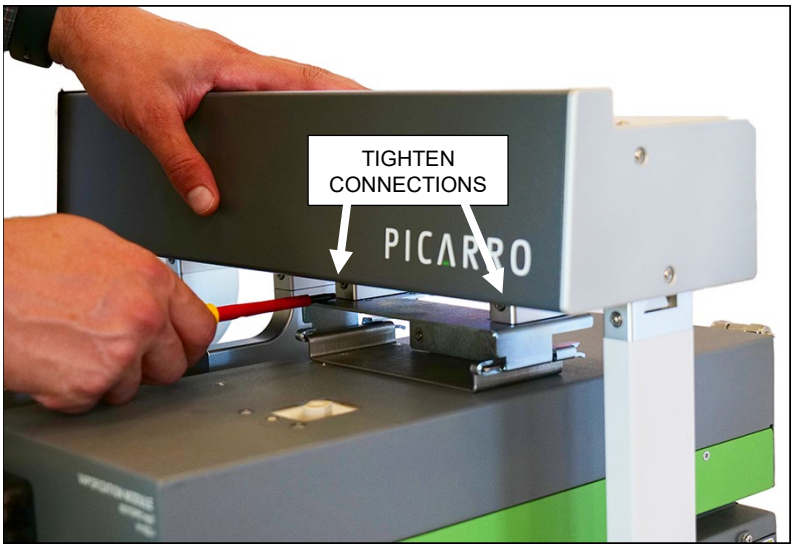


Figure 18: Tightening Vaporizer Mounting Screws After Alignment

NOTE

There are two sample gas connection possibilities for the vaporizer:

- **A0211 Vaporizer (Figure 20, Figure 22).**
- **A0211 with A0214 Micro Combustion Module (MCM)**
  The MCM comes already mounted to the vaporizer in this case (Figure 20, Figure 23).

5. Hand-tighten the gas connection between the vaporizer and the analyzer (or when the A0214 MCM is attached) as shown in Figure 20.

In practice, the vaporizer and the analyzer should be closer to each other than shown below. Note that a larger space was provided in the image for demonstration purposes.

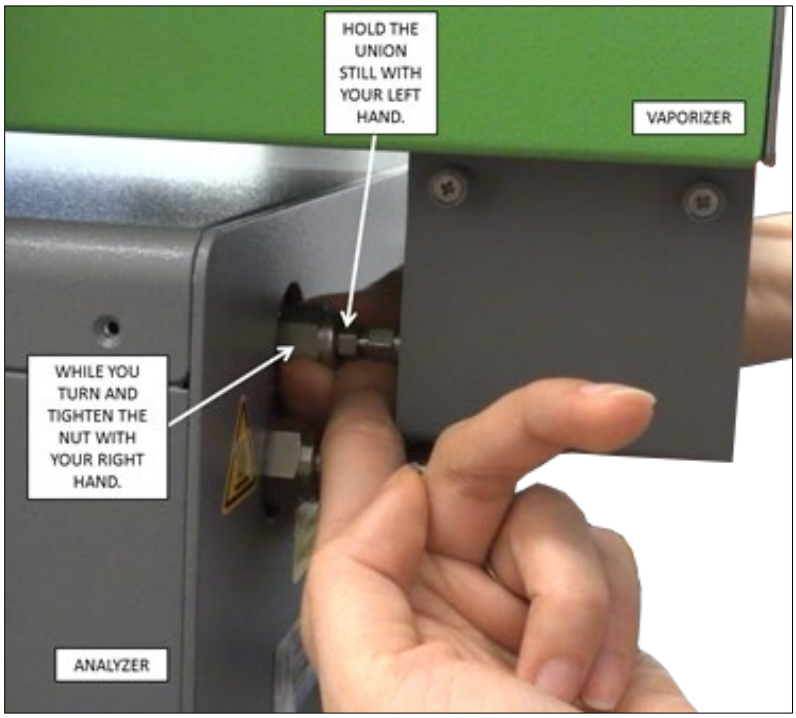


Figure 19: A0211 Vaporizer to Analyzer Connection

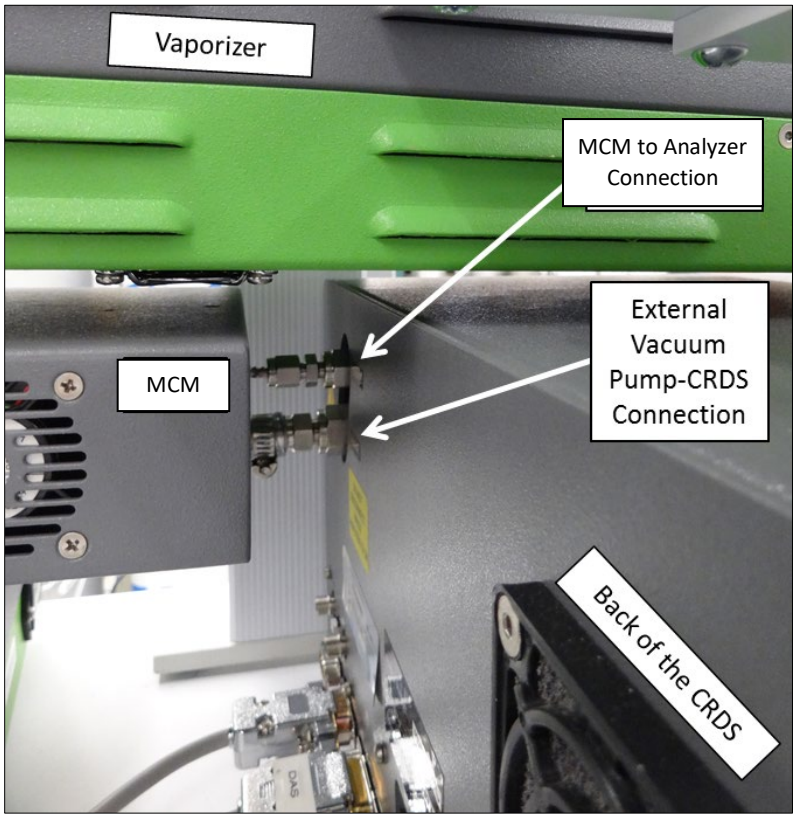


Figure 20: A0214 MCM Vaporizer to Analyzer Connection

6. Tighten the connection using the 5/16” and the 9/16” wrenches (Figure 21).

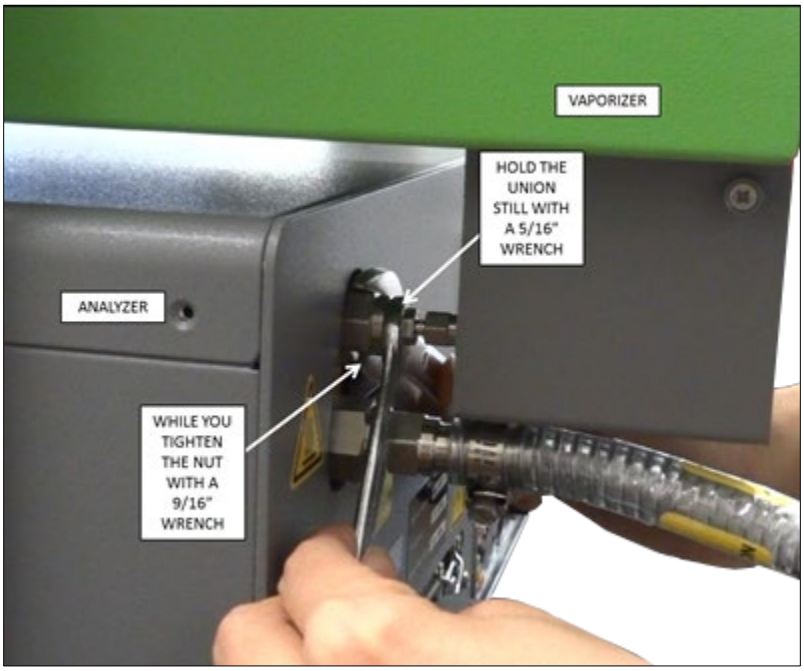


Figure 21: Tightening Vaporizer to Analyzer Connection

4.6 System Connections

NOTE

There are two gas and communication connections for the A0340:

- **A0211 Vaporizer (Figure 22)**
- **A0211 Vaporizer and A0214 Micro Combustion Module (MCM) – (Figure 23).**

Gas Connections – A0340 + A0211

1. Connect the 1/8” Swagelok connection port to a source of dry gas as shown in Figure 22 (see the ***L2140-i and L2130-i Isotopic Water Analyzer and Peripherals Installation and Operation Manual***, P/N 40035 for more detailed information).
2. Connect the vaporizer to its Vacuum Pump. (The analyzer has a dedicated pump.) Hand tighten, then use the 11/16” wrench to tighten.

Electrical Connections – A0340 + A0211 (A0214 if applicable)

3. Make the cable connections between the analyzer, vaporizer, and autosampler, as shown in Figure 22 or Figure 23, for the A0214 MCM application.Note that the WLM Purge is an optional feature and is not required. For more information, see the L21x0-i User Manual.

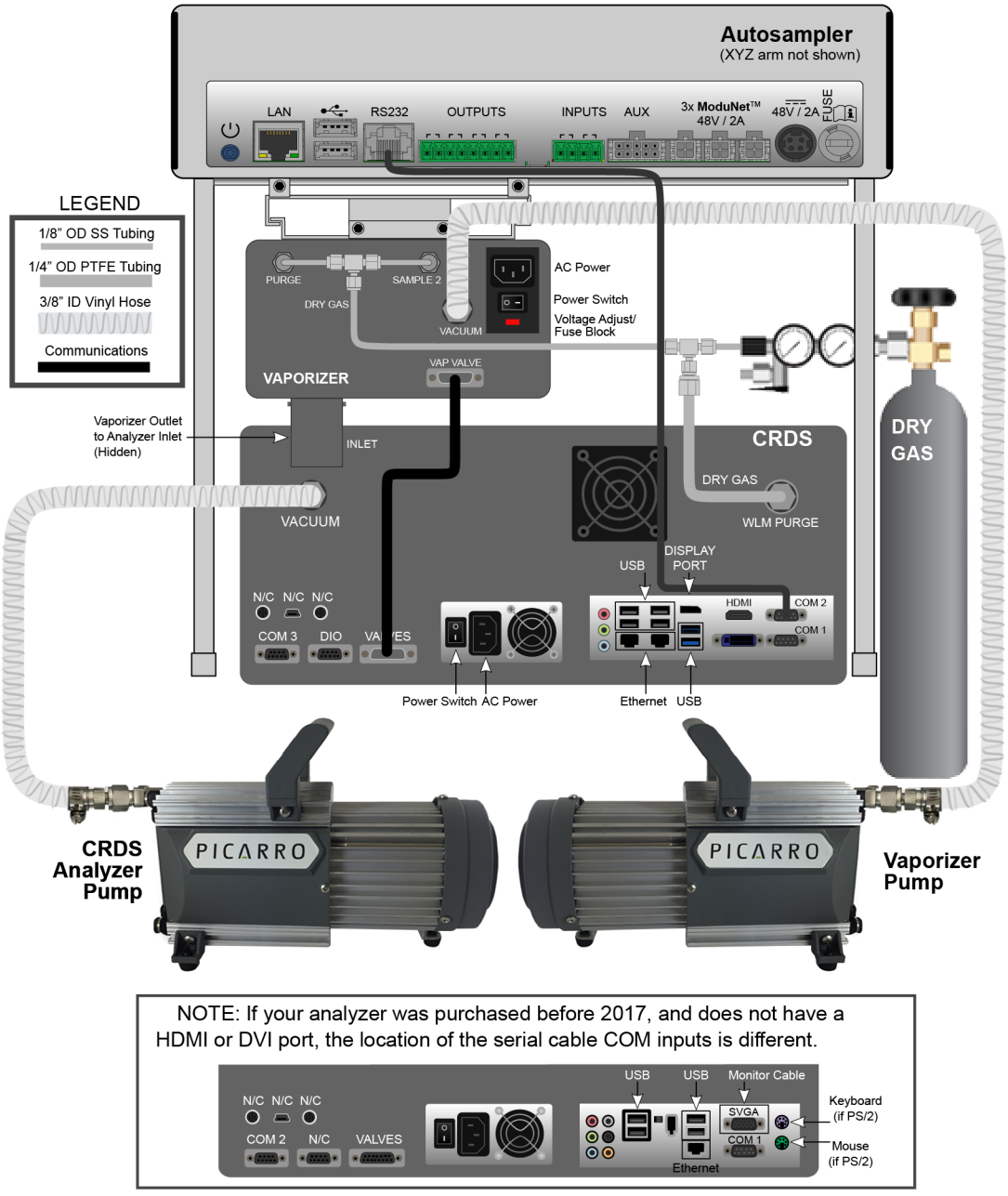


Figure 22: Connections: A0340 and A0211 Vaporizer (without A0214 MCM)

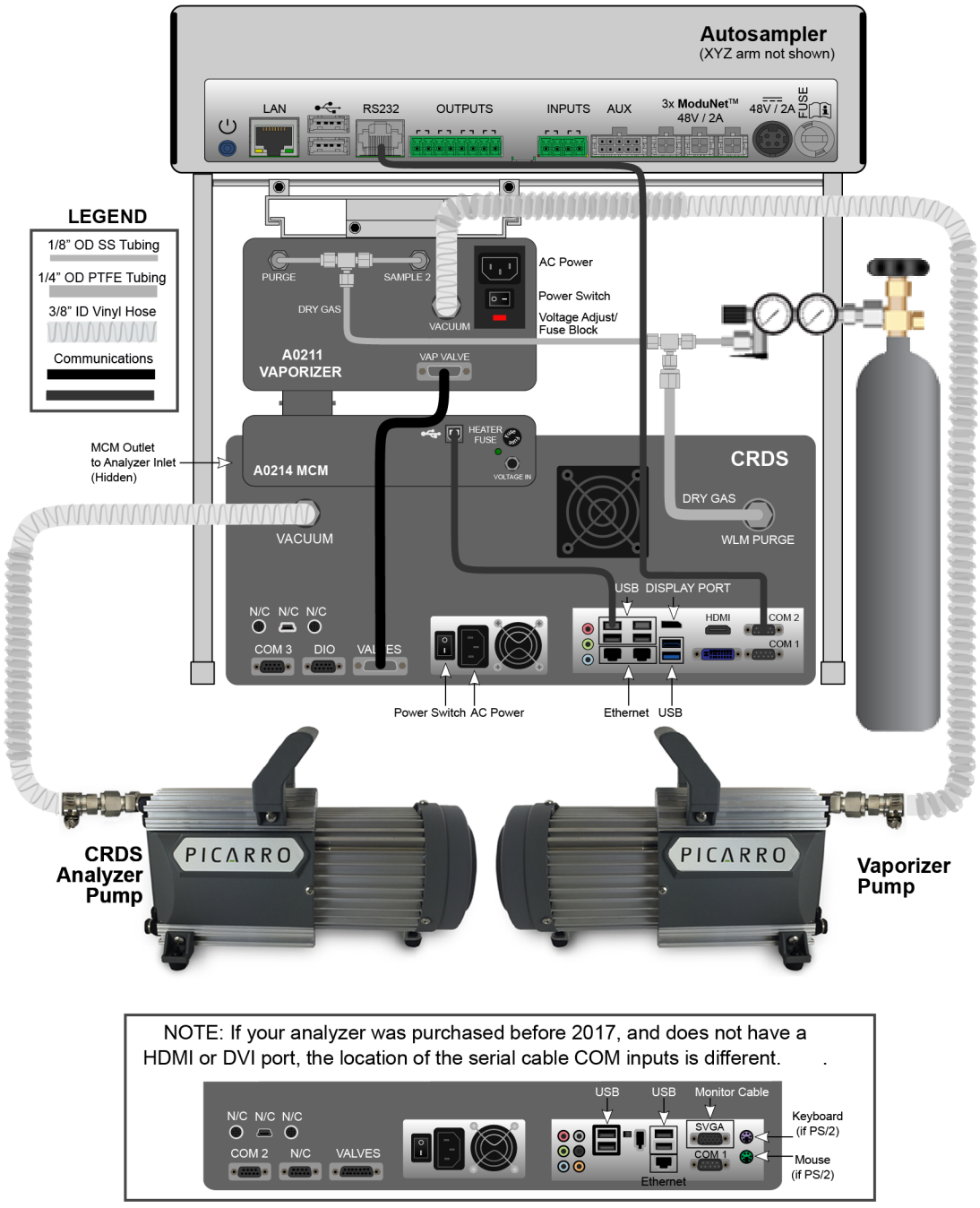


Figure 23: Connections: A0340 and A0211 Vaporizer with A0214 MCM

4.7 Solvents Wash Station Set-Up

Picarro recommends installing the Solvent Wash Station arm furthest to the left. Place glass wool inside the waste port and remove the septa from the waste port cap. Optionally, applications that generate larger volumes of waste use a small pump to actively dry glass wool in a waste port.

Note that the autosampler can use a solvent jar for method rinses and precision/drift testing by filling at least one solvent jar with DI water.

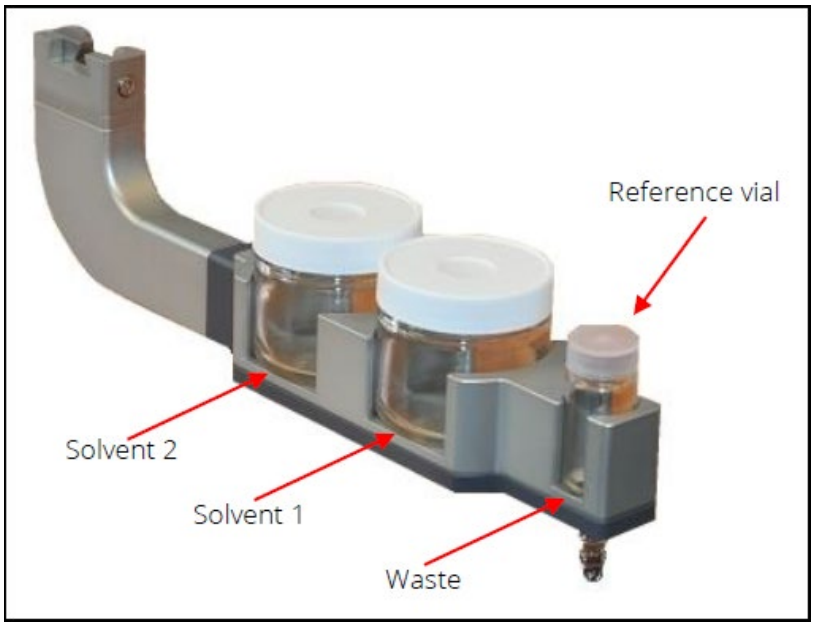


Figure 24: Wash Station Setup

4.8 Sample Tray Set-Up

Install Sample Tray no closer than 8 cm from the edge of the Solvent Wash Station. This configuration allows for unincumbered movement of the syringe arm. Load a single vial in spot M1. Note that this is the reference vial used for training in section ***6.10 Sample Tray Configuration***.

Place samples in provided vials. The sample vials hold up to 2 mL of sample. Take care to fill sample vials evenly and not overflow. Carefully place the provided cap on the loaded vial. Picarro recommends loading samples from the back starting at position A1, as shown in Figure 25.

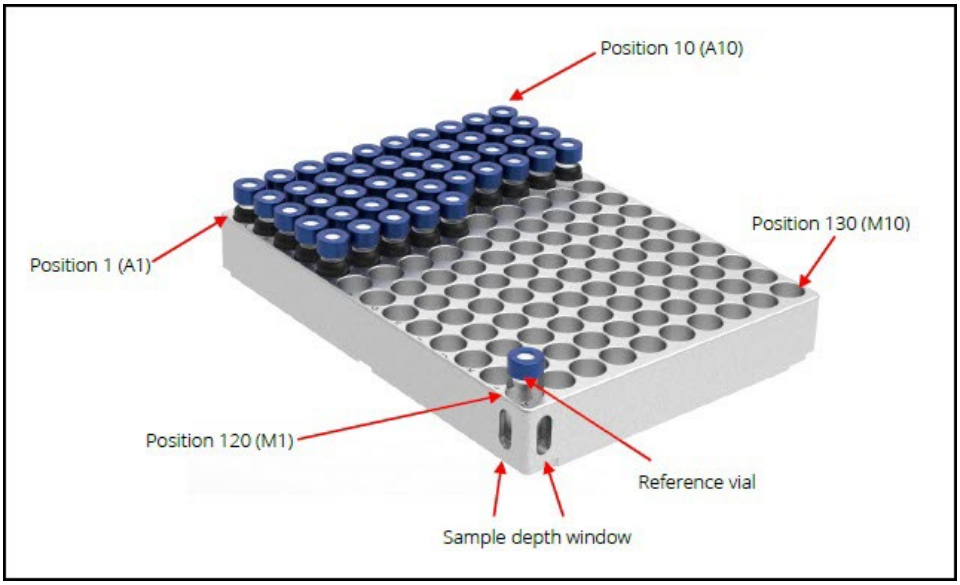


Figure 25: Sample Tray Loading

5. System Startup Sequence

CAUTION

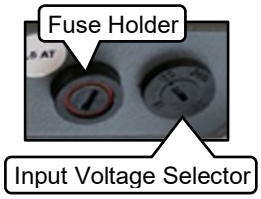
Injury/Equipment Damage: When the autosampler is running, either during manual setup or under the control of the configurator software, the autosampler robot will move rapidly and automatically as part of its normal operations. Always keep yourself and all non-sample-related items away from the autosampler robot arms to prevent injury or damage to the equipment.

CAUTION

Equipment Damage: Manual interference with the robotic arm during its movement can cause extensive damage to the autosampler. One of the most common cases is a damaged z-lock of the component that controls the up and down motion.

CAUTION

Ensure the input voltage of both A2000 vacuum pumps is at the correct operation level. The voltage is adjustable by rotating the voltage selector switch on the side of the pump next to the fuse holder.



CAUTION

Be sure to turn on the modules in the correct order (Figure 26).

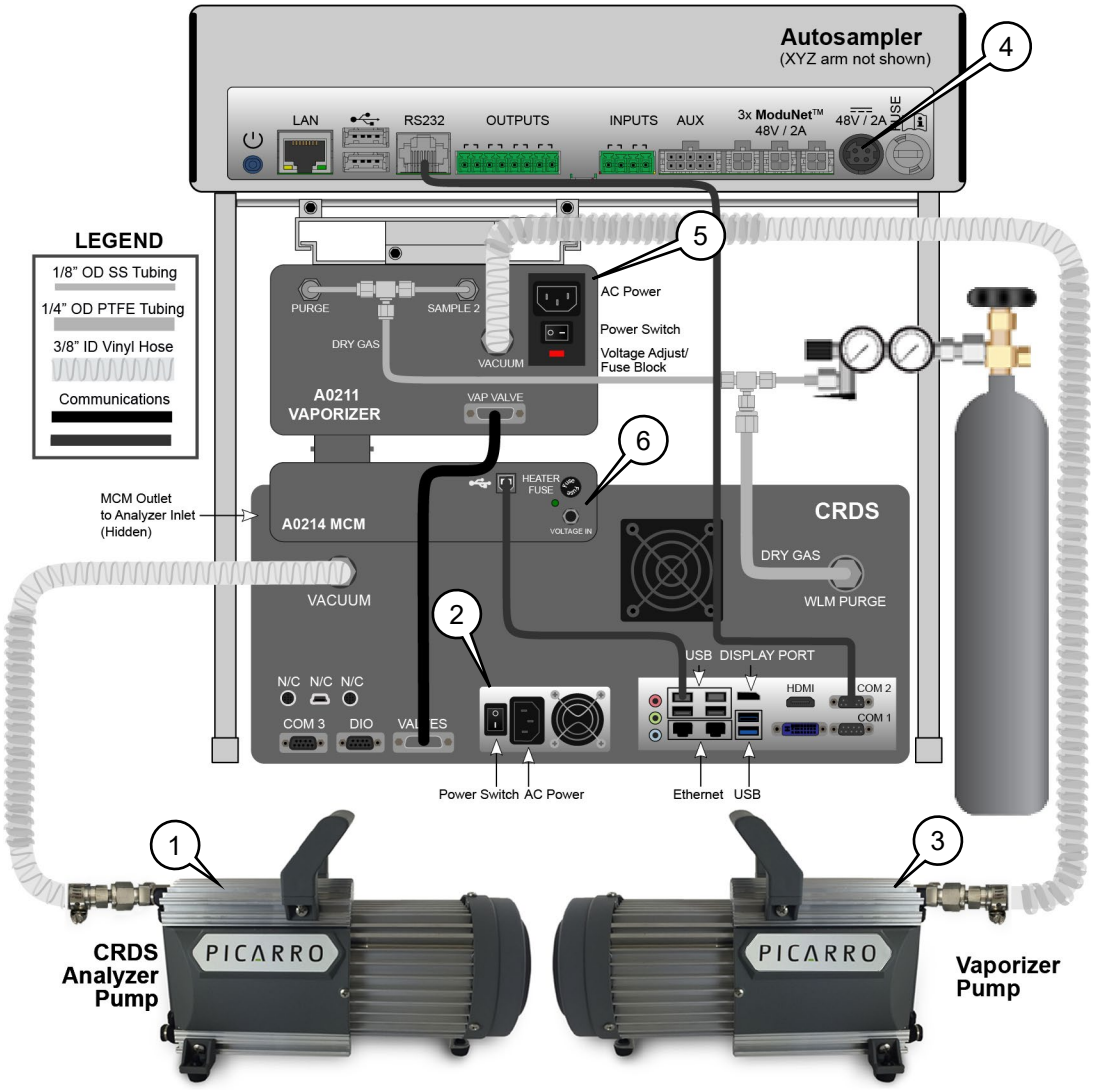
WARNING

Equipment Damage: Never disconnect the vacuum hose unless the pump and analyzer are OFF, otherwise can result in damage to the system.

WARNING

When using compressed gases, follow all appropriate safety conventions, including the use of eye protection, physical restraint of cylinders, etc.

1. Apply power to the components in the sequence shown below in Figure 26.
2. Wait until the vaporizer temperature stabilizes before running samples (see Figure 27).
3. Install the autosampler needle. For instructions, see section ***6.13 How to Exchange a Syringe*** in Autosampler Configurator Chapter.



1. Analyzer pump (if not already done). Make sure switch is **OFF**, plug in, then turn switch to **ON** position.
2. Analyzer (if not already done). Make sure switch is **OFF**, plug in, then turn switch to **ON** position.
3. Vaporizer pump: Make sure switch is **OFF**, plug in, then turn switch to **ON** position.
4. Plug in autosampler power adapter cable. Press the **power** button on the back of the autosampler.
5. A0211 Vaporizer: Check the **Voltage Adjust** at the back of the vaporizer. Make sure switch is **OFF**, plug in, then turn switch to **ON** position.
6. A0214 MCM (if used): Plug in power adapter cable. MCM will energize automatically.

Figure 26: Startup Power-On Sequence

The temperature in the vaporizer chamber is set by using the controller pad located in the front of the vaporizer panel and should not need to be changed from the factory default value of 110 °C as this is sufficient for most customers. For more information about the vaporizer temperature setting, see the ***A0211 High-Precision Vaporizer User Manual***.

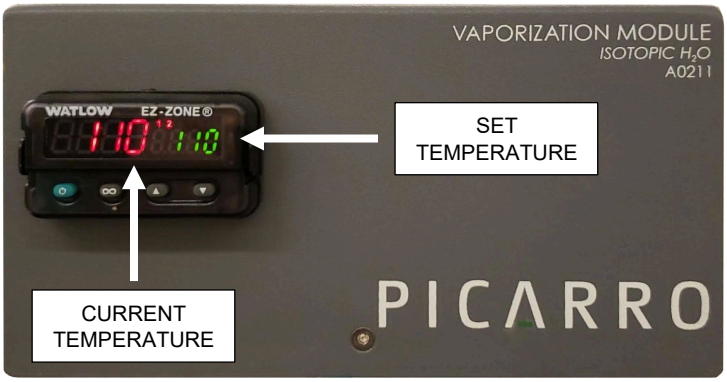


Figure 27: Vaporization Module Temperature Monitor Setpoint vs Actual Temp

6. Autosampler Configurator

The Autosampler Configurator can configure the autosampler and train module positions. An offline mode is also present to build a configuration when the autosampler is not connected.

Upon initial assembly and installation of the autosampler, most of its parts are preconfigured in the software. However, training positions is a crucial step that needs to be performed before the autosampler can operate. Training involves teaching the autosampler the specific locations to navigate for sample processing. This training is required before the first use and repeated after moving any of the components on the rail. This chapter describes the software and the necessary steps to train the autosampler.

6.1 Starting the Autosampler Configurator

Training is done using the **Autosampler Configurator**. Start the software by clicking the desktop icon.

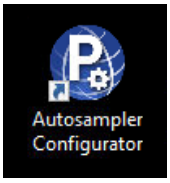


Figure 28: Autosampler Configurator/Desktop Icon

The main screen displays and provides the following options:

- **Connect Serial** – Connect to the autosampler using the serial port.
- **Offline** – Build a configuration without connecting to the autosampler. For more information, see section ***6.2 Offline Mode***.

Upon starting the software, choose **Connect Serial** and provide the software with the port number to which the autosampler is connected. Picarro recommends port COM 2. See Figure 29 and Figure 30.

Figure 29: Autosampler Configurator/Connection Type

Figure 30: Autosampler Configurator/Comport Selection

At start-up, the autosampler will not move by itself. After start-up, the autosampler requires initialization to determine its XYZ-axis positions. Therefore, it is possible that a message displays to execute the initialization process after connecting with the autosampler.

Figure 31: Autosampler Initialization

If the autosampler's not ready message displays, select **OK** to execute the initialization process. The autosampler will start to move to detect its XYZ-axis positions. Press the **Cancel** button to return to the main screen.

6.2 Offline Mode

The Autosampler Configurator provides an Offline mode that allows you to create a sampler configuration without being connected to the autosampler. This can be used to create standard configurations which can be uploaded and used with any autosampler instrument when desired.

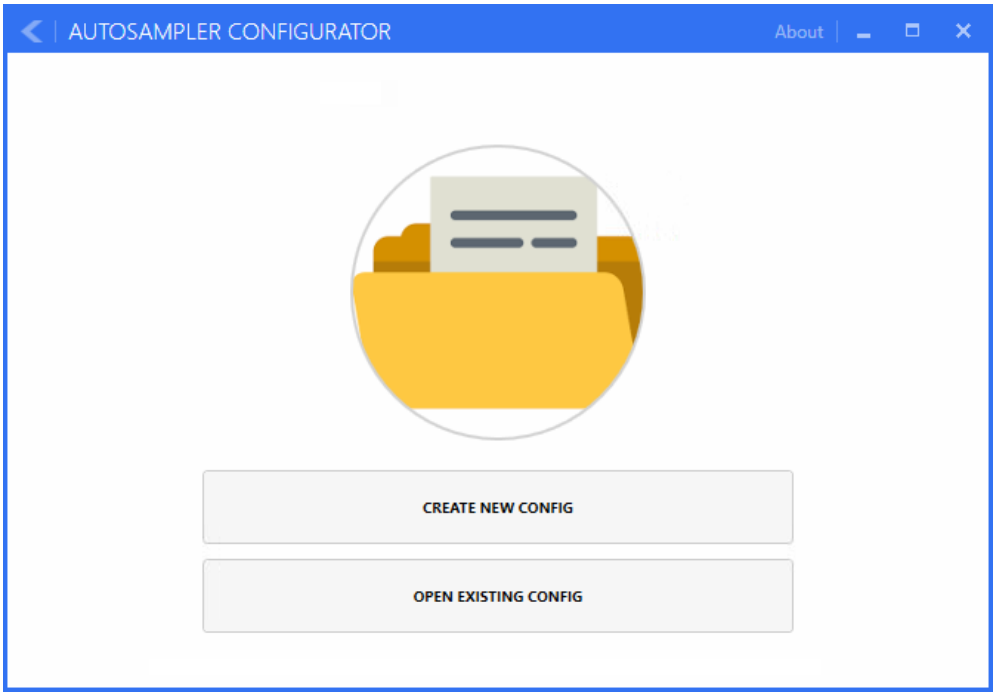


Figure 32: Autosampler Configurator/Offline Configuration Options

The Offline mode provides two options:

- **Create New Config** – When selected, the Autosampler Configuration screen displays to create and save a configuration file (XML) to use at a later.
- **Open Existing Config** – Open an existing configuration using the Windows File Explorer to load an XML file. Once an xml file is loaded, the Autosampler Configuration screen displays.

See the following section for more information about the Autosampler Configuration screen.

6.3 Autosampler Configuration

The Configuration screen displays after a connection is established with the autosampler or the offline option is chosen. The window below shows Autosampler Configuration without any modules.

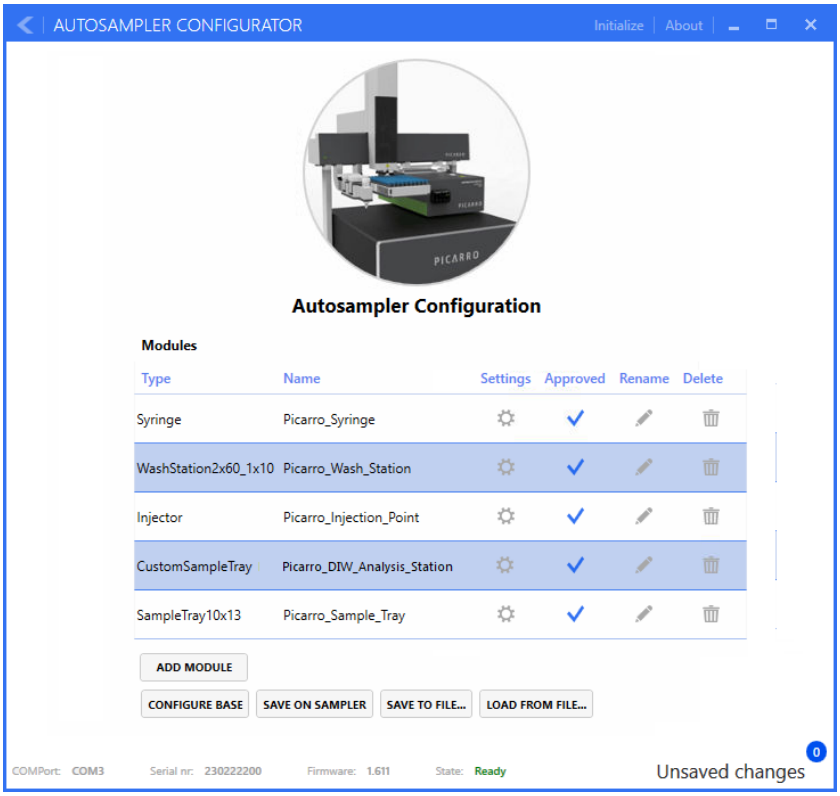


Figure 33: Autosampler Configuration

In the configuration screen, the following options are available:

- **Back Button** – Returns to the previous screen.

- **Initialize** – If the autosampler runs into a fault condition (for example, a teaching error), clicking Initialize will clear the fault and move the tower and plunger to their home positions.
- **Add Module** – Add new modules (injectors, trays etc.) to the autosampler configuration. When added the new modules display in the Modules list. For more information, see section ***Add a*** Module.
- **Configure Base** – Opens the Autosampler Base Settings window to provide configuration for required options.
- **Save on Sampler** – Save changes on the autosampler so the configuration can be reused when rebooted (not available in offline mode).
- **Save to File** – Saves the current configuration to a file.
- **Load From File** – Load a configuration from a file. For example, a configuration created in offline mode.
- **Unsaved Changes** – Displays the number of unsaved changes. Click to show a complete list of changes.
- **State** – Shows the autosampler's current state:
  - Ready
  - Not Ready
  - Faulted: displaying error details
  - Connected
  - Disconnected

Add a Module

Use the **Add Module** button to add a module for the autosampler configuration. When selected, the Add a New Module window displays.

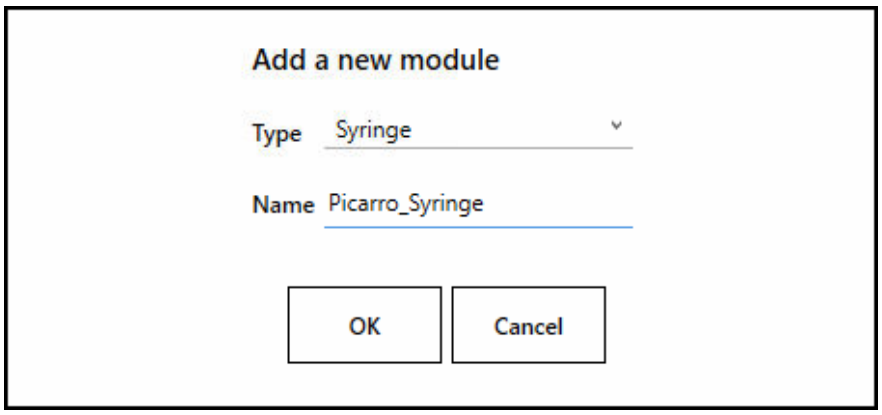


Figure 34: Autosampler Configuration/Add Module

1. From the **Type** drop-down menu select the module you want to add.
2. Provide a name for the addded module and click **OK**.

   The Autosampler Configuration screen displays with the added module.

Loaded Modules

The modules added by the user display in the table, as shown in Figure 35.

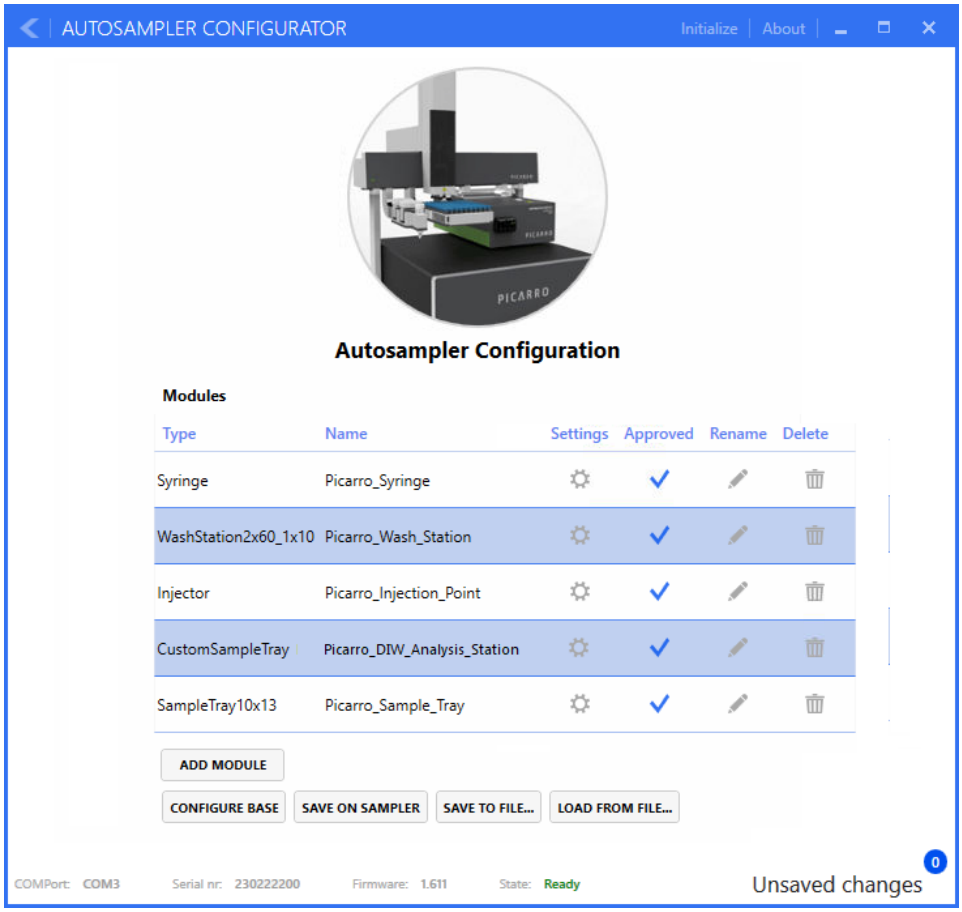


Figure 35: Autosampler Configurator/Loaded Modules

In the configuration screen the following and column information displays:

- **Type** – Type of module, for example: syringe, wash station or injector.
- **Name** – The name of the module.
- **Settings** – Gear wheel button, press the button to enter the settings screen.
- **Approved** – Symbol showing if the module is configured correctly. Blue check for correct and red cross for incorrect.
- **Rename** – Pencil button, press to rename the specific module.

- **Delete** – Trash can button, press to delete this specific module.

The default Picarro list should contains the following module names:

- Picarro_Syringe
- Picarro_Wash_Station
- Picarro_Injection_Point
- Picarro_DIW_Analysis_Station
- Picarro_Sample_Tray

NOTE

An empty list indicates that the default methods need to be specified. Click the LOAD FROM FILE and look for C:\Picarro\G2000\Autosampler\Picarro_A0340_default.xml

6.4 Autosampler Settings (Configure Base)

This menu allows users to add or change the required settings to configure the autosampler. This chapter describes each option. Note some of these settings are not configurable.

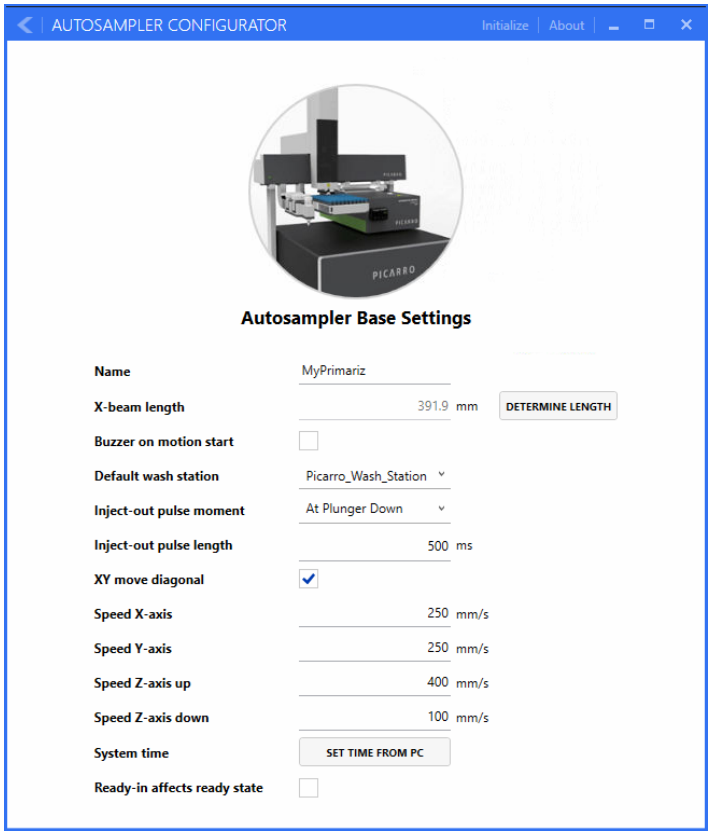


Figure 36: Autosampler Configurator/Settings

The Autosampler Settings provide the following options:

- **Name** – The name of the autosampler.
- **X-Beam Length** – Specifies the length of the x-beam. Usually not required for normal configuration. This is an automated process which is not available in the offline mode.
- **Buzzer on Motion Start** – When selected, the autosampler makes a sound each time it starts an analytical function or script as a warning the instrument will start moving.
- **Default Wash Station** – Select the name of the default wash station that the autosampler will use for initialization. In this process the syringe is emptied in the wash station.
- **Inject-out Pulse Moment** – Select the start out injection event:
  - at plunger down.
  - at syringe down.

  At injection, on the selected event, the autosampler generates a pulse on the start out pin at the back of the instrument.
- **Inject-out Pulse Length** – Enter the duration of the start out pulse in milliseconds.
- **XY Move Diagonal** – Select this option if the autosampler is allowed to move the X- and Y-axis simultaneously. This option is ignored when an obstacle is configured.
- **Speed X-axis** – Enter the speed of the x-axis.
- **Speed Y-axis** – Enter the speed of the y-axis.
- **Speed Z-axis Up/Down** – Enter the up and down speed of the Z-axis. This setting is ignored when running an analytical cycle.
- **System Time** – Set the autosampler clock to the time of the PC.
- **Ready-in Affects Ready State** – When selected the ready-in input at the back of the autosampler is included in the autosampler overall ready state. When this input is not ready, the autosampler is not ready, and the ready-out output is in a not-ready state.

Note a field will display red when the entered value is outside its range. Decimal or negative inputs are rejected when not supported by the parameter.

NOTE

Inject-out pulse length	1000	ms
XY move diagonal	☑	
Speed X-axis	800	mm/s
Speed Y-axis	250	mm/s

6.5 Configuration – Teaching XYZ Positions

Most autosampler modules require one or more valid positions and distances to function. The process of configuring positions and distances for a module is called teaching. This applies to XY (2D position), XYZ (3D position), or Z (depth).

The location where the tower must be moved is indicated by a red circle. This is called the reference position (or reference vial for trays) as shown in the following figure.

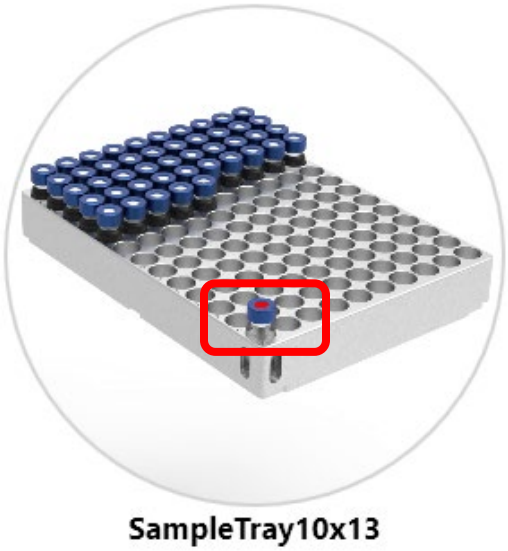


Figure 37: Autosampler Configurator/XYZ Positions

Some modules (sample trays and wash stations) require a sample depth. The sample depth communicates to the sampler how far to move the needle into the vial or destination target. Detailed descriptions on teaching specific modules are included in this chapter.

6.6 Syringe Configuration

Use the **Syringe** configuration screen to configure the syringe settings for the autosampler.

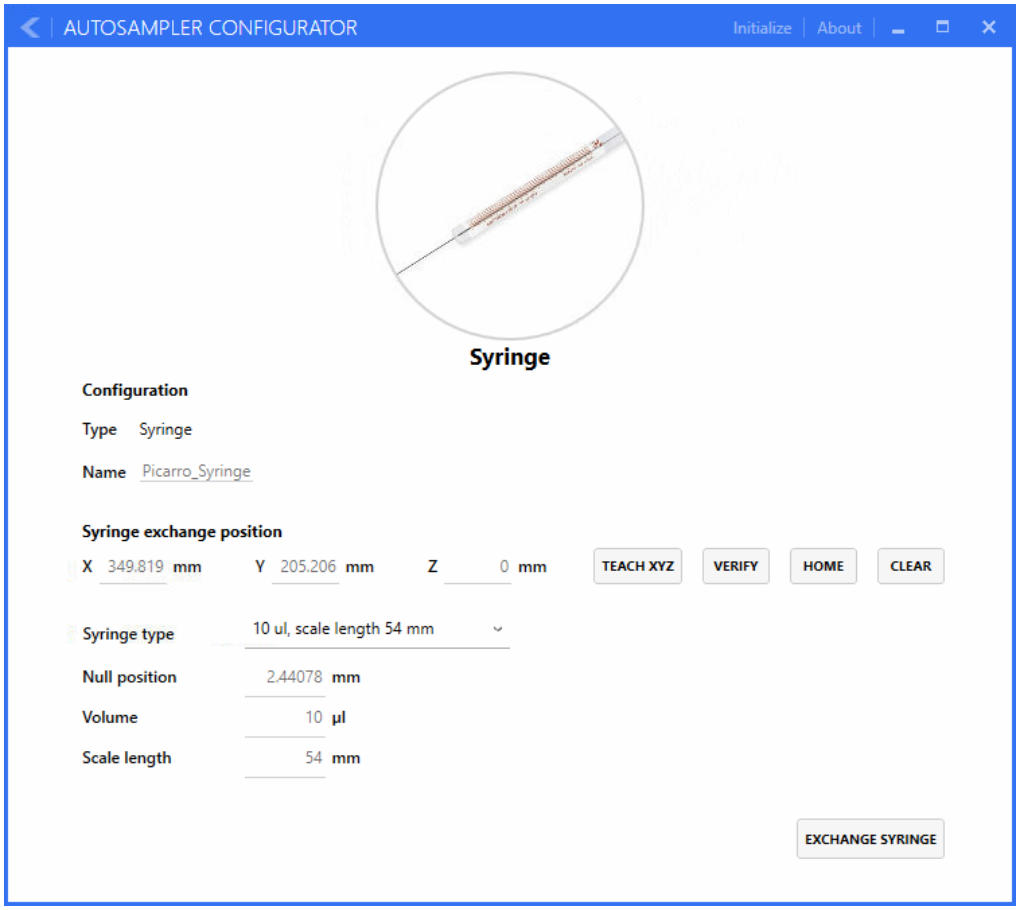


Figure 38: Autosampler Configurator/Syringe Configuration

The Autosampler Configurator provides the following options for syringe configuration.

- **Type** – This field displays the type of module. This field cannot be changed
- **Name** – The module name, which is custom, is displayed in this field. Changing the name is only possible in the table of the main screen.
- **Teach XYZ** – Use this option to teach the syringe exchange position. The tower will move to the current known position and the motors are unpowered (as shown in the unpowered status message). For more information, see ***Syringe Exchange Position***.
- **Verify** – Verifies the position. The tower moves to the current taught position.

- **Home** – Move the tower to its home position.
- **Clear** – Sets the taught positions to 0.0 mm.
- **Syringe Type** – Provides a selection of pre-defined syringe types and options for custom syringes. Note Volume, Length and Plunger Friction Force are only editable when the custom option is selected. For more information on supported syringes, see section ***10.8 Compatible Syringes***.
- **Null position** – Indicates the relative position of the plunger at zero volume. This field is automatically updates when a syringe is exchanged.
- **Volume** – The volume of the syringe in microliters.
- **Scale Length** – Length of the barrel scale in mm. Measure the distance between 0 and x microliters in mm using a slide gauge where x is the maximum volume of the syringe.
- **Plunger Friction Force** – The motor force level for plunger motions. The higher the syringe volume the higher the force level. Generally, friction force is set to low for syringe volumes up to 25 µL, medium for volumes between 100 and 200, and high for volumes from 250 and higher.
- **Exchange Syringe** – Exchanges the syringe. For more information, see ***Section 6.13, How to Exchange a Syringe***.

Syringe Exchange Position

Use the following steps to move the tower to the desired syringe exchange position. Note that the motors must be unpowered, as indicated by the unpowered status message below. For information about replacing the syringe, see ***Section 6.13, How to Exchange a Syringe***.

Figure 39: Autosampler Configurator/Unpowered Status Message

3. When the **Unpowered Status Message** displays, manually move the tower to the desired position where the user exchanges the syringe. For more information, see Figure 40.
4. Press **Ok** to store the new position.
5. Press **Cancel** to keep current position.

The autosampler will move back to its home position.

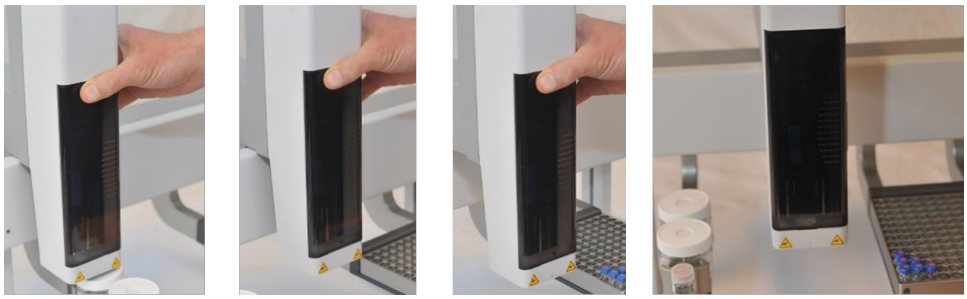


Figure 40: Autosampler Configurator/Tower Exchange Position

6.7 Wash Station Configuration

A selection of pre-defined wash stations is available from the **Type** list. The autosampler comes with a 2x60ml solvent and a 1x10ml waste option. As shown in the following figure, the XYZ teaching for this wash station is accomplished by using the **Waste Port** located in the first vial position.

Figure 41: Autosampler Configurator/Wash Station Configuration

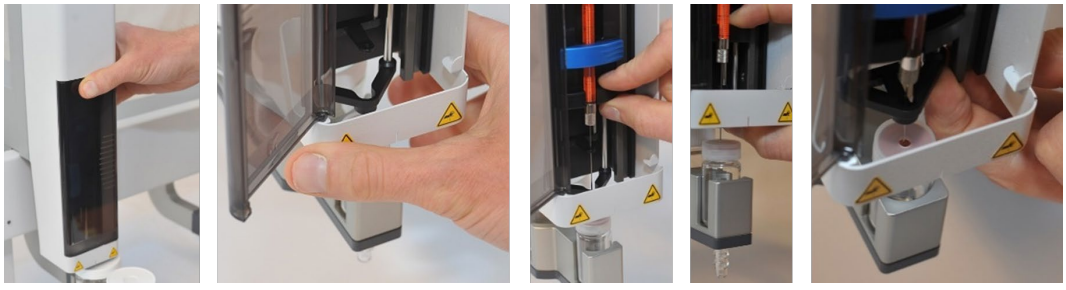
The Autosampler Configurator provides the following options for wash station configuration.

- **Type** – Displays the type of module. This field cannot be changed.
- **Name** – The module name, which is custom, is displayed in this field. Changing the name is only possible in the table of the main screen (see Figure 22 on page 33).
- **Waste Vial** – This field shows the vial number of the waste and cannot be changed.
- **Teach XYZ** – Press this button to teach the position of vial 1 (reference vial, frontmost position, the waste port vial). The tower will move to the last known position and the motors are unpowered as indicated in the unpowered status message. Manually move the tower to vial 1 of the wash station as demonstrated in Figure 42.
- **Verify** – Verifies the position. The tower moves to the current taught position.
- **Home** – Move the tower to its home position.
- **Clear** – Sets the taught positions to 0.0 mm.

For more information about setting the wash station position, see ***Wash Station Position***.

Wash Station Position

Perform the following steps to calibrate the XY position of the selected wash station.



Step 1 **Step 2** **Step 3** **Step 4** **Step 5**

Figure 42: Autosampler Configurator/Tower Teach Position

1. Move the tower of the Autosampler to the wash station (***Figure 42, Step 1***).
2. Position the tower above the teach position i.e vial 1, frontmost position (***Figure 42, Step 2***).

3. Take the syringe holder between two fingers and move it downwards (***Figure 42, Step 3***).

NOTE

Note some effort is required to move the syringe holder downward due to a z-axis mechanical lock, so ensure the syringe head does not fall. Use the other hand to push the needle guide upwards to check if the needle is in the correct position.

4. Push the needle guide upwards and check if the needle is positioned in the middle of the vial (***Figure 42, Step 4***).
5. Move the tower in order to position the needle in the middle of the vial. Be careful not to damage the needle (***Figure 42, Step 5***).

   From the Unpowered **Status Message**, press **Ok** to store the new position or press **Cancel** to keep current position.

   The autosampler will move back to its home position.

Sample Depth Table

Each vial in a wash station can have a different sample depth. Use the settings in the table to teach sample depth for a vial or select a reference vial to adopt its sample depth.

Vial #	Name	Depth	Reference Vial	Teach Depth
1	Waste	30.855	Off	TEACH
2	Solvent1	42.54	Off	TEACH
3	Solvent2	0	2	TEACH

Figure 43: Autosampler Configurator/ Vial Sample Depth

- **Vial #** – Vial number.
- **Name** – Name or function of the vial. Can be changed.
- **Depth** – Current sample depth in millimeters.
- **Reference Vial** – Use this drop-down to select another vial as reference. The sample depth of the reference vial is used. When Off is selected, the sample depth needs calibrated.

- **Teach Depth** – When initiated, the tower moves to the XY position of the vial and proceeds downward until the top of the vial is detected. The motors become unpowered, allowing the user to teach sample depth manually or remotely through up/down motion.

  For more information about training the syringe for sample depth, see the following section ***Sample Depth Configuration*.**

6.8 Sample Depth Configuration

The **Sample Depth** configuration screen allows you to train the tower for the sample depth of the vial. Note that each vial can have its sample depth or adopt a sample depth setting from another already established vial. Select the **Teach** button from the Sample Depth table to display the **Sample Depth Configuration** menu.

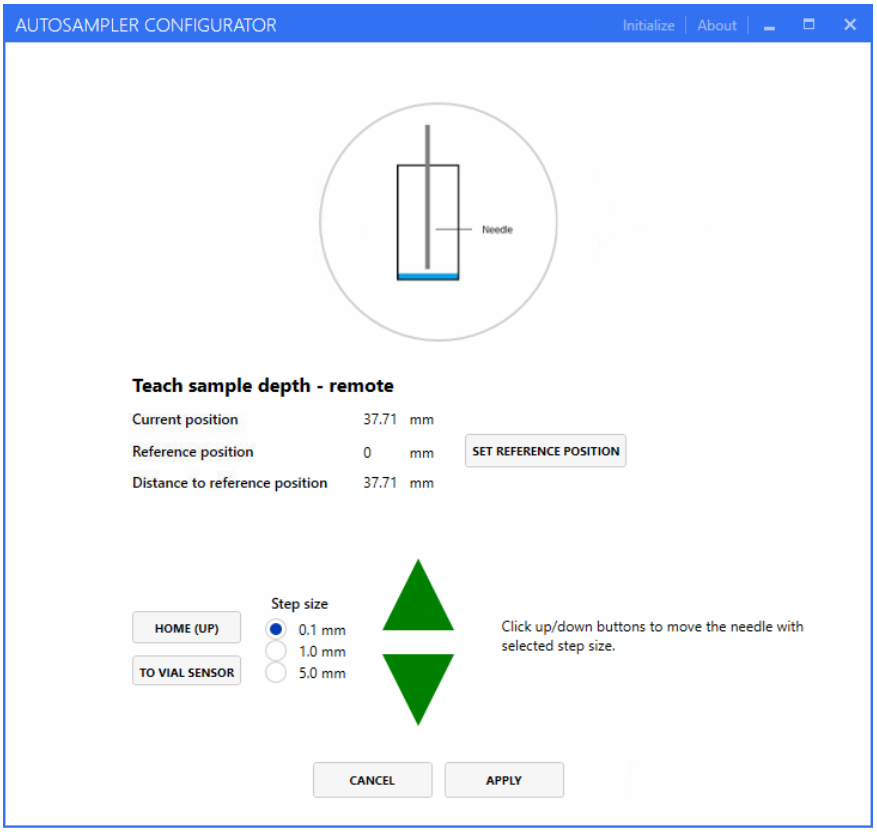


Figure 44: Autosampler Configurator/Teach Sample Depth

- **Current Position** – Absolute position of the z-axis (tower).
- **Reference Position** – Current position (mm) of the reference point.

- **Set Reference Position** – Sets a new reference position. The distance to the reference position is cleared. This function is used to work with relative distances instead of absolute positions.
- **Distance to Reference Point** – Relative distance (mm) from reference point. This field is updated when the position is changed through the up-and down buttons.
- **Home (UP)** – Moves the z-axis up to 0.0 mm.
- **To Vial Sensor** – Moves the z-axis down until the top of the vial is detected through its vial sensor.

Manually Teaching Sample Depth

The following procedure explains the manual process of teaching the sample for the appropriate vial depth.

1. Press the **Teach** button of the vial you would like to teach.

   The tower moves to the selected vial. The tower is now locked and not allowed to move in the XY direction. If the position is incorrect, verify that the proper wash station is selected and if the X- and Y-positions are correctly trained.
2. Check if the needle is in the middle of the (***Figure 36 Step 2***). If not, re-teach the wash station.
3. Take the syringe holder between two fingers and move it downwards. (***Figure 36 Step 3***).
4. Push the needle carefully through the septum and position it to the desired depth (***Figure 36 Step 4)***.
5. Press the **Apply** button to store the taught sample depth.

   The tower moves back to its home position.

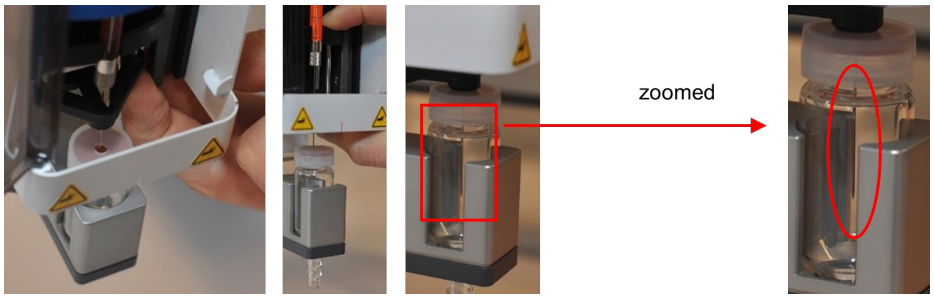


Figure 45: Autosampler Configurator/Teaching Sample Depth Waste Vial

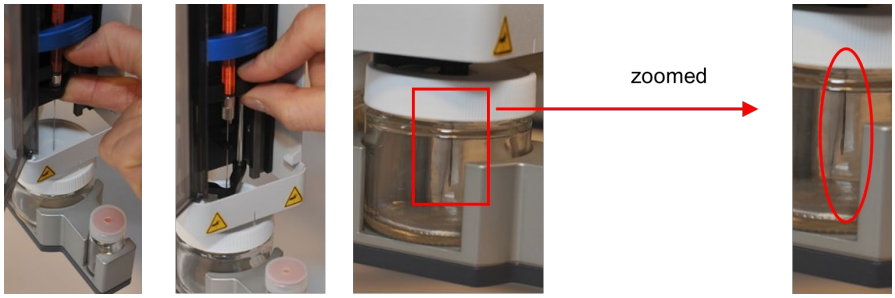


Figure 46: Autosampler Configurator/Teaching Sample Depth Solvent Vial

Remotely Teaching Sample Depth

Instead of manually pushing the needle through the septum, it is possible to teach the sample depth using the green up and down buttons.

6. Press the **Teach** button of the vial you want to teach.

   The tower moves to the selected vial. The tower is now locked and cannot move in the XY direction. If the position is incorrect, verify that the proper wash station is selected and if the X- and Y-positions are correctly trained.

7. Select step size (0.1mm, 1.0mm, or 5.0mm).
8. Press the **Set Ref Point** to clear the distance to the reference point. The reference point position field now shows the sample depth of the vial.
9. Press the **green down / up** buttons to position the needle at the desired depth.
10. Press the **Apply** button to store the new sample depth.

    The tower moves back to its home position.

11. Press **Cancel** at any time to stop the teaching operation.

    The sampler moves to its home position.

NOTE

Once teaching via the green buttons it is no longer possible to teach manually. If this is desired, cancel the operation and press the teach button again.

NOTE

Waste / solvent depth is limited to avoid damaging the needle. Default limit for wash stations is 42.3 mm

This field is also used to manually introduce depth of a sample vial or waste/wash bottle. The depth is measured from the vial cap to the bottom of the vial with a

digital caliper. This number minus a safety margin can be introduced by pressing the green arrows to the desired depth. For example: 30 mm: 30mm-2mm margin is 5x5 mm and 3x1 mm down

6.9 Injector Configuration

When changing injector settings, the **Injector** configuration screen displays.

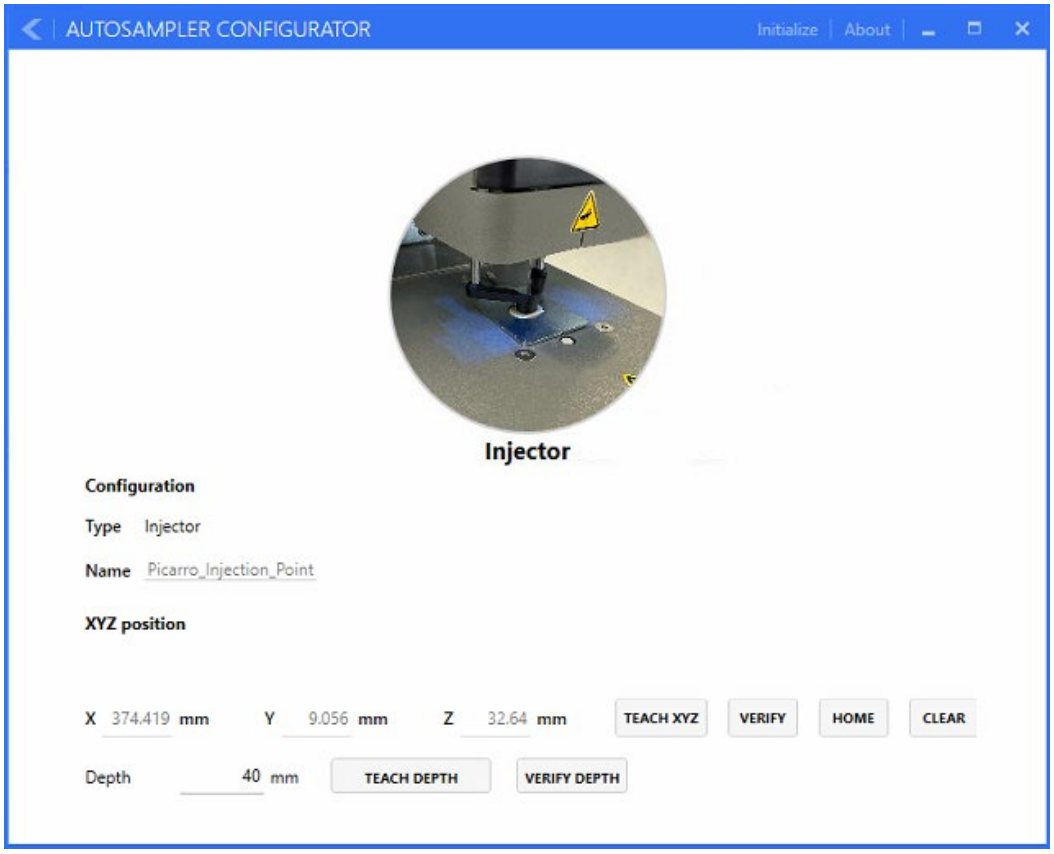


Figure 47: Autosampler Configurator/Injector Configuration

- **Type** – This field displays the type of module. This field cannot be changed.
- **Name** – The module name displays in this field. Changing the name is only possible in the table of the main screen (see Figure 22 on page 33).
- **Teach XYZ** – Teaches the position of the injector. For more information, see the following section ***Injector Position***.
- **Verify** – Verifies the position. The tower moves to the current taught position.
- **Home** – Moves the tower to its home position.

- **Clear** – Sets the taught positions to 0.0 mm.
- **Depth** – Enters a depth in mm relative to the taught z-axis position. A positive value positions the needle below the taught position, while a negative value positions it above the taught position. The default value used with the Picarro vaporizer is 40mm.
- **Verify Depth** – Verifies the extra depth position. The tower moves to the depth position.

Injector Position

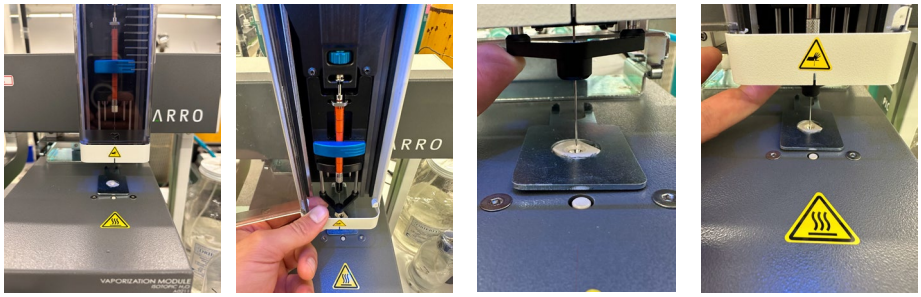
Perform the following steps to teach the XYZ position of the selected injector:

1. From the **Injector Configuration** screen, press the **Teach XYZ** button to teach the position of the injector.

   The tower moves to the current known position and the motors are unpowered as indicated by the **Unpowered Status** message.

Figure 48: Autosampler Configurator/Unpowered Status Message

2. Manually move the tower above the injection point (top of the Picarro vaporizer), (***Step 1, Figure 49***).



Step 1 **Step 2** **Step 3** **Step 4**

Figure 49: Autosampler Configurator/Injector Position

3. Take the syringe holder between two fingers and move it downwards (***Step 2, Figure 49***).

NOTE

Some effort is required to move the syringe holder downward due to a z-axis mechanical lock, so ensure the syringe head does not fall. Use the other hand to push the needle guide upwards to check if the needle is in the correct position.

4. Push the needle guide upwards and check if the needle is positioned in the middle of the injection point (***Step 3, Figure 49***).
5. If the needle is positioned in the middle of the injection point, move the z-axis further down. The needle will enter the injection point. Be careful not to damage the needle (***Step 4, Figure 49***).
6. From the Unpowered **Status** message, press **Ok** to store the new position.

   Or press **Cancel** to keep current position and the sampler moves back to its home position.

6.10 Sample Tray Configuration

The autosampler has a sample tray of 10” x 13”, 1.5ml vials. This size tray is a pre-configured option available in the Autosampler Configurator. The default Picarro_Sample_Tray module requires training for XY positions using the red dot vial as the reference vial, as shown in the figure below.

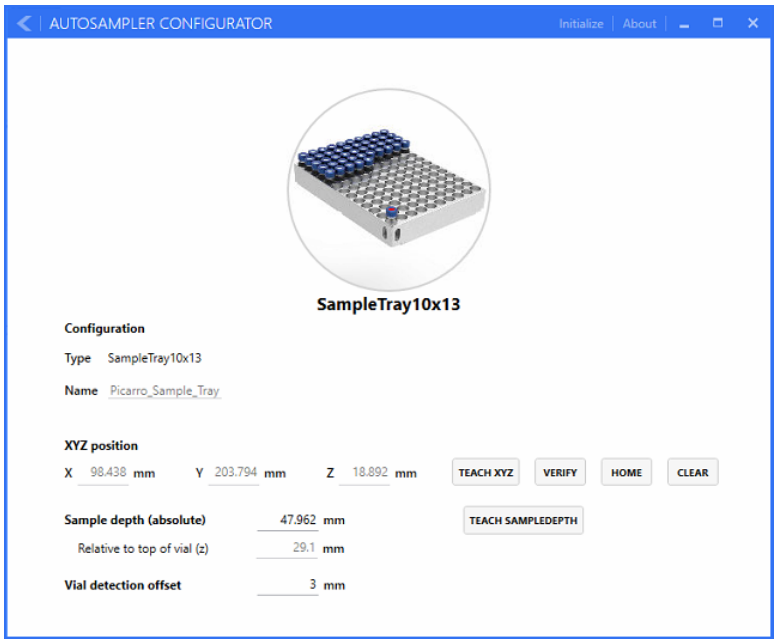


Figure 50: Autosampler Configurator/Sample Tray Configuration

The **Sample Tray Configuration** screen is the same for all predefined types. When adding a sample tray, the configurations are as follows.

- **Type** – This field displays the type of module that is selected. This field cannot be changed.
- **Name** – The module name displays in this field. Changing the name is accomplished by using the table of the main screen (see Figure 22 on page 33).
- **Teach XYZ** – Teaches the position of the reference vial (left-front position). For more information, see ***Sample Tray***.
- **Verify** – Verifies the position. The tower moves to the current taught position.
- **Home** – Moves the tower to its home position.
- **Clear** – Sets the taught positions to 0.0 mm.
- **Sample Depth - Absolute** – The absolute sample depth taught; origin is position 0.0. Adjust this setting by entering a new value.
- **Sample Depth - Relative to Top of Vial** – The derived relative sample depth. Origin is the detected position of the top of the vial or well plate.

  Vial Detection Offset – The height of the vials is trained by the user and saved in memory by the autosampler. If the autosampler cannot find a vial at the recorded height, it will search for a vial within the Vial Detection Offset distance. If a vial is not located within the offset distance, the autosampler concludes there is no vial present.

  The standard value of the vial detection offset is 3mm.
- **Teach Sample Depth** – When initiated, the tower moves to the XY position of the vial and proceeds downward until the top of the vial is detected. The motors become unpowered, allowing the user to teach sample depth manually or remotely through up/down motion.

Sample Tray Position

Perform the following steps to teach the XYZ position of the sample tray:

1. From the **Sample Tray Configuration** screen, press the **Teach XYZ** button.

   The tower moves to the last taught position, and the motors are unpowered, as indicated in the **Unpowered Status** message.

Figure 51: Sample Tray Position/Unpowered Status Message

2. Manually move the tower to the position of the reference vial.

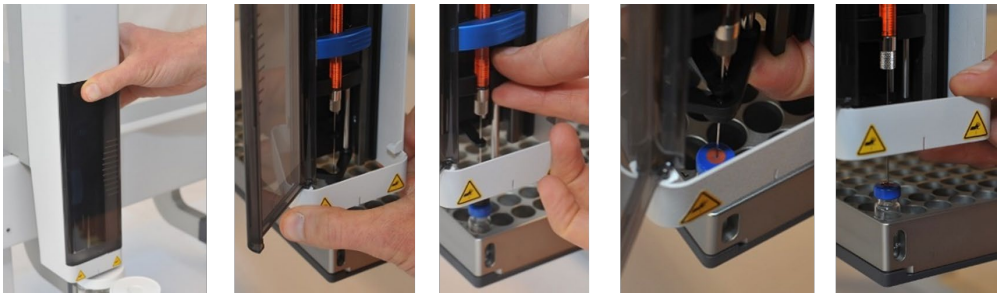


Figure 52: Autosampler Configurator/Teaching Sample Tray

3. Move the tower of the autosampler to the sample tray (***Figure 52, Step 1***).
4. Position the tower above the reference vial. For example the vial at the left-front position (***Figure 52, Step 2***).
5. Take the syringe holder between two fingers and move it downwards (***Figure 52, Step 3***).

NOTE

Some effort is required to move the syringe holder downward due to a z-axis mechanical lock, so ensure the syringe head does not fall. Use the other hand to push the needle guide upwards to check if the needle is in the correct position.

6. Push the needle guide upwards and check if the needle is positioned in the middle of the vial (***Figure 52, Step 4***).

7. Move the tower to position the needle in the middle of the vial (***Figure 52, Step 5***). Note take care to prevent damage to the needle.
8. From the **Unpowered Status** message, press **Ok** to store the new position.

   Or press **Cancel** to keep current position and the sampler moves back to its home position.

Sample Depth Configuration

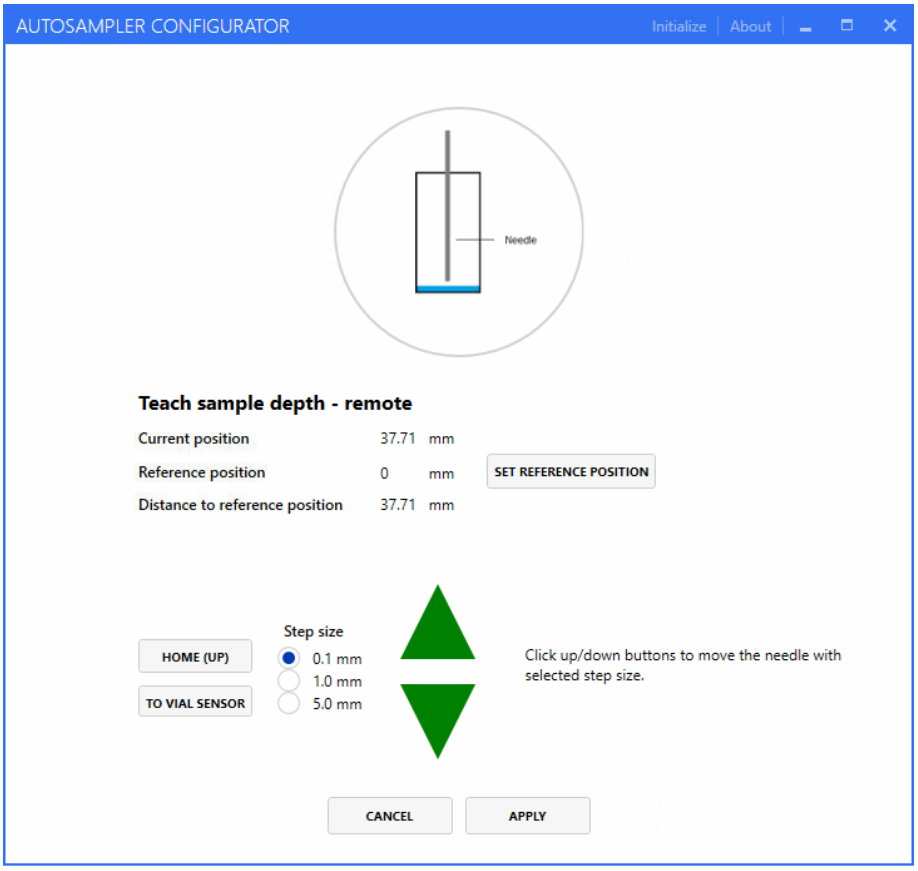


Figure 53: Autosampler Configurator/Teaching Sample Depth

- **Current Position** – Absolute position of the z-axis (tower)
- **Reference Position** – Current position (mm) of the reference point.
- **Set Reference Position** – Sets a new reference position. The distance to the reference position is cleared. This function works with relative distances instead of absolute positions.
- **Distance to Reference Position** – Relative distance (mm) from the reference point. The up-and-down buttons update this field when the position is changed
- **Home (UP)** – Moves the z-axis up to 0.0 mm.

- **To Vial Sensor** – Moves the z-axis down until the top of the vial is detected through its vial sensor.

Manually Teaching Sample Depth

The following procedure explains how to manually teach sample depth.

1. Press **Teach** to train the sample depth of the sample tray.

   The tower moves to the selected vial. The tower is now locked and cannot move in the XY direction. If the position is incorrect, verify that the proper wash station is selected and if the X- and Y-positions are correctly trained.

2. Check if the needle is in the middle of the septum (***Figure 54, Step 2)***. If not, re-train the sample tray.
3. Take the syringe holder between two fingers and move it downwards (***Figure 54, Step 3)***.
4. Push the needle carefully through the septum and position it to the desired depth as displayed in (***Figure 54, Step 4)***.
5. Press the **Apply** to store the taught sample depth.

   The tower moves back to its home position.

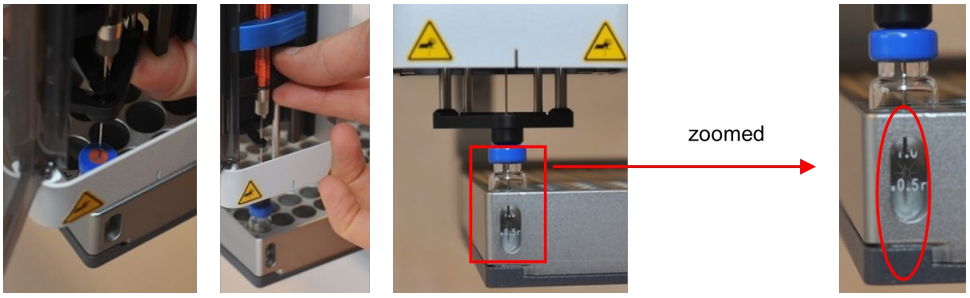


Figure 54: Autosampler Configurator/Teaching Sample Depth Vial

Remotely Teaching Sample Depth

Instead of manually pushing the needle through the septum, it is also possible to teach the sample depth using the green up and down buttons.

1. Press **Teach** for the vial you would like to train.
2. The tower moves to the selected vial. The tower is now locked and not cannot move in the XY direction. If the position is incorrect, verify that the proper wash station is selected and if the X- and Y-positions are correctly trained.
3. Select step size (0.1mm, 1.0mm, or 5.0mm).

4. Press the **Set Reference Position** to clear the distance to the reference point. The reference point position field now shows the sample depth of the vial.
5. Press **Green Down** or **Up** to position the needle at the desired depth.
6. Press the **Apply** button to store the new sample depth.

   The tower moves back to its home position.
7. Press the **Cancel** at any time to stop the teaching operation. The sampler will move to its home position.

6.11 Custom Tray Configuration

The Autosampler Configurator allows defining of custom user trays. Users can program almost any custom tray to work with the A0340 autosampler.

The Picarro default configuration uses this option by utilizing the Picarro_DIW_Analysis_Station module.

The Picarro DIW Analysis Station is a virtual tray programmed to identify the two jars in the wash station mounted on the autosampler as sampling sources. This approach is most commonly used for repeated sequences of DIW injections for precision and drift testing.

For more information, see the ***L2140-i and L2130-i Isotopic Water Analyzer Installation and Operation Manual***.

NOTE

When training the autosampler with the Configurator software for this scenario (Picarro_DIW_Analysis_Station), the reference point is at the center of the first jar, not at the waste port (which is a valid reference for the wash station).

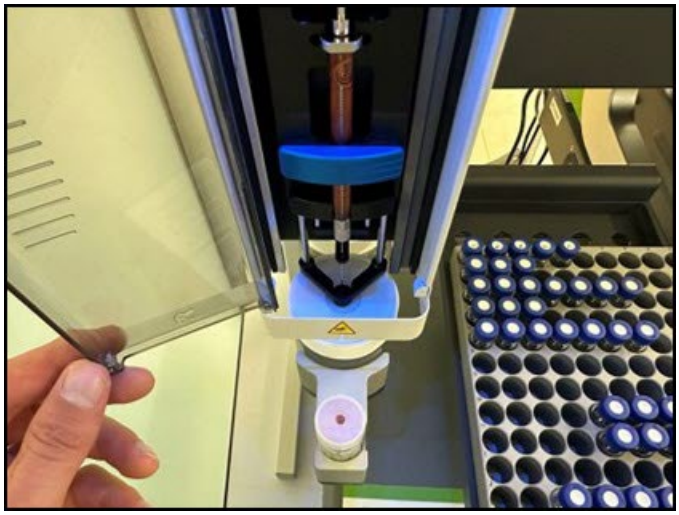


Figure 55: Autosampler DIW Analysis Station Reference Training Point

NOTE

The autosampler recognizes the wash station as a source of DI water rinsing but is configurable for DIW injections by using the Picarro software and selecting Picarro_DIW_Analysis_Station 1 and 2. As shown in Figure 55, this custom tray is defined as two jars with a 6 cm distance between them.

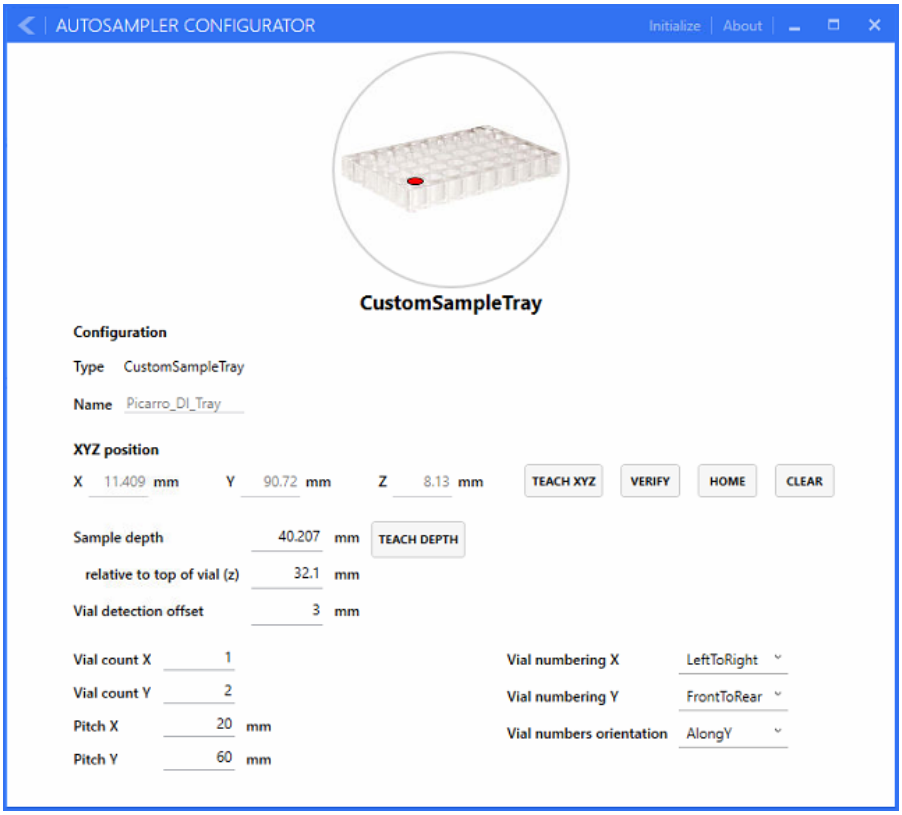


Figure 56: Autosampler Configurator/Custom Tray Configuration

The Figure above shows the default settings of the Picarro custom tray, the Picarro_DIW_Analysis_Station. The section below explains in detail the parameters for setting up any other custom tray in the autosampler software.

Users can add new custom tray modules and define them using the options explained below:

- **Type** – This field displays the type of module that is selected. This field cannot be changed.
- **Name** – The module name displays in this field. Changing the name is possible in the table of the main screen (see Figure 22 on page 33).

- **Teach XYZ** – Teaches the XYZ position of the reference vial (left-front position). The tower moves to the last known position and the motors are unpowered as shown in the pop-up window. Manually move the tower to the vial that is positioned in the left-front position. Teaching the XYZ positions is a similar procedure to training a sample tray. For more information see ***Sample Tray Configuration***.
- **Sample Depth** – The sample depth that has been taught.

  Vial Detection Offset – The height of the vials is trained by the user and saved in memory by the autosampler. If the autosampler cannot find a vial at the recorded height, it will search for a vial within the Vial Detection Offset distance. If a vial is not located within the offset distance, the autosampler concludes there is no vial present.

  The standard value of the vial detection offset is 3mm.
- **Teach Sample Depth** – Teaches sample depth. The tower moves to the reference vial. Teaching sample depth for a custom tray is similar to a sample tray: see chapter 5.2.7.
- **X Vial Count** – Number of vials in the X direction.
- **Y Vial Count** – Number of vials in the Y direction.
- **X Vials Pitch** – Distance (in mm) between the vials in the X direction.
- **Y Vials Pitch** – Distance (in mm) between the vials in the Y direction.
- **Vial Numbering X** – Drop-down to select vial number counting in the X-direction: right to left or left to right.
- **Vial Numbering Y** – Drop-down to select vial number counting in the Y-direction: rear to front or front to rear.
- **Vial Numbers Orientation** – Drop-down to select vial number counting direction (or orientation): along the X-axis or Y-axis.

6.12 Saving Changes on the Autosampler

A small blue circle with the number of unsaved changes is in the bottom right corner of the Autosampler Configuration screen. Clicking the sign displays the list of changes. Make sure to click the **Save on Sampler** button after applying changes and verify there are none left to save before closing the software.

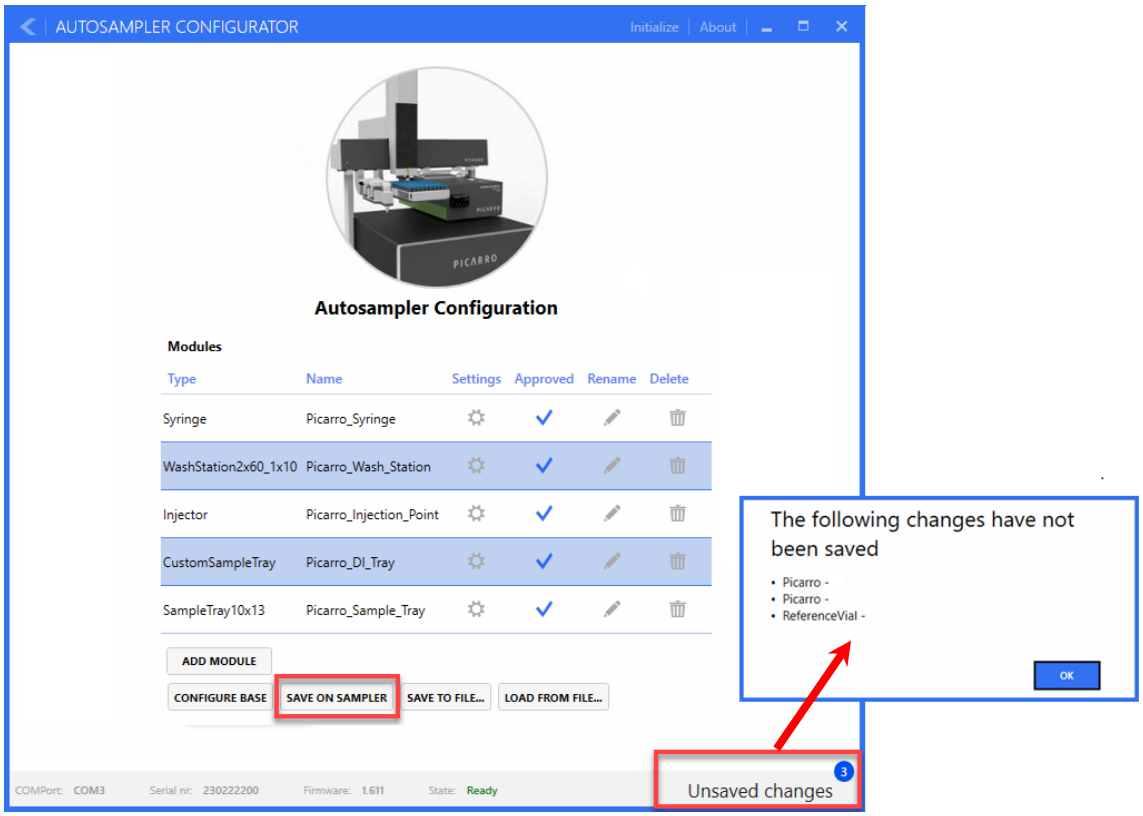


Figure 57: Enter Caption

6.13 How to Exchange a Syringe

The Syringe Configuration screen allows you to remove the current syringe and replace it with a new one. For information about syringe configuration and exchange position, see ***Syringe Configuration***. For information about supported syringe types, see section ***10.8 Compatible Syringes***.

To replace a syringe, go to the **Syringe Configuration** of the syringe and press the **Exchange Syringe** button, as shown in the following figure.

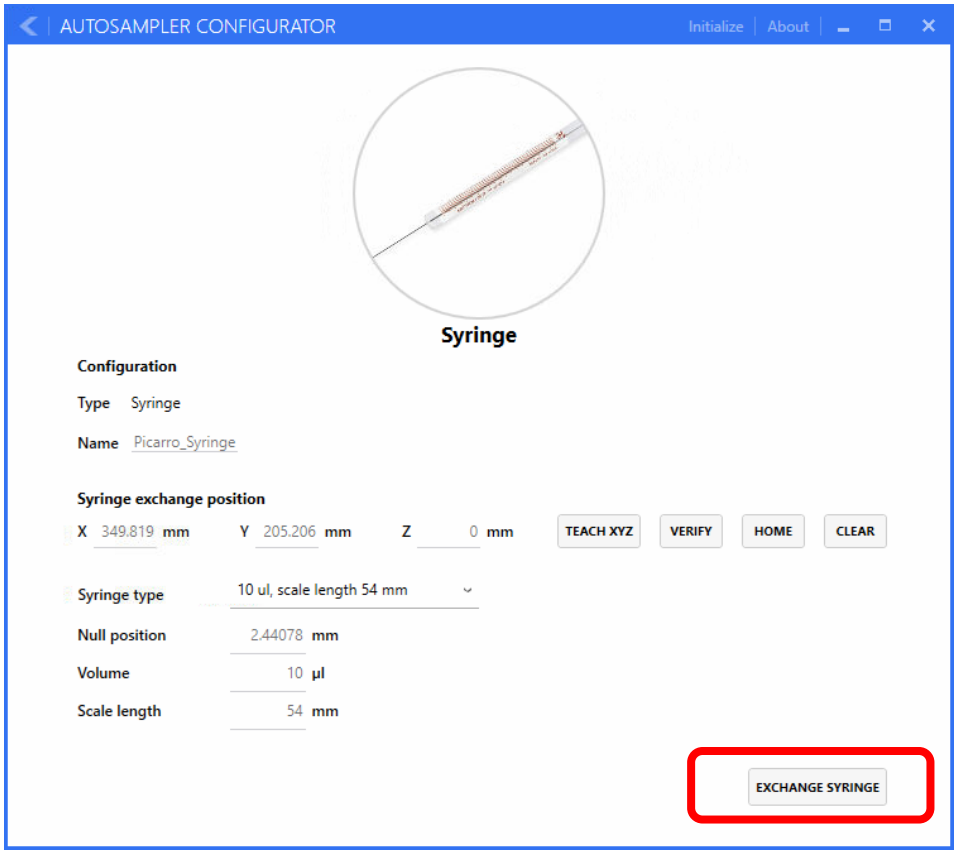


Figure 58: Autosampler Configurator/Exchange Syringe

The tower of the autosampler moves to the taught syringe exchange position and the following message is displays:

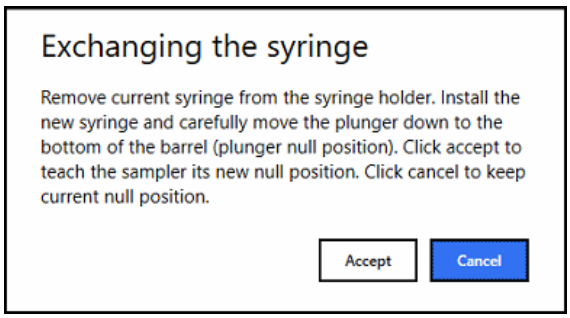


Figure 59: Start Syringe Exchange

WARNING

During the exchange syringe procedure, ensure no force exerts on the tower slide (the part holding the syringe). The tower slide can move downward and might result in serious injuries.

Take care when working with a needle. It is a sharp object which can result in serious injuries or damage.

Removing the Syringe

If no syringe is mounted, see how to install a new syringe in the next section. To remove an existing syringe, perform the following procedure.

1. Unlock the plunger by rotating the plunger lock to the left.
2. Unlock the syringe by rotating the syringe lock counterclockwise.

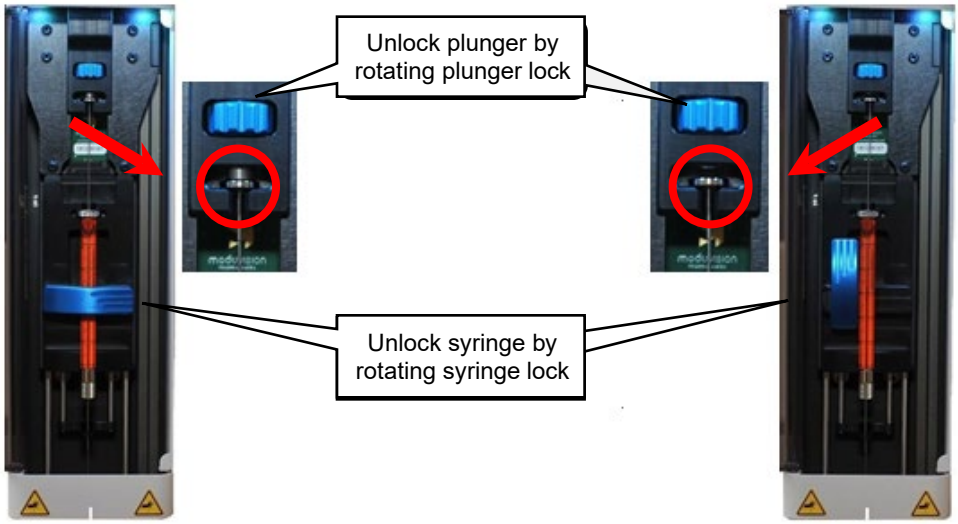


Figure 60: Unlocking the Syringe

When both plunger- and syringe locks are unlocked, remove the syringe carefully, as shown in the pictures below, and move the plunger holder down.

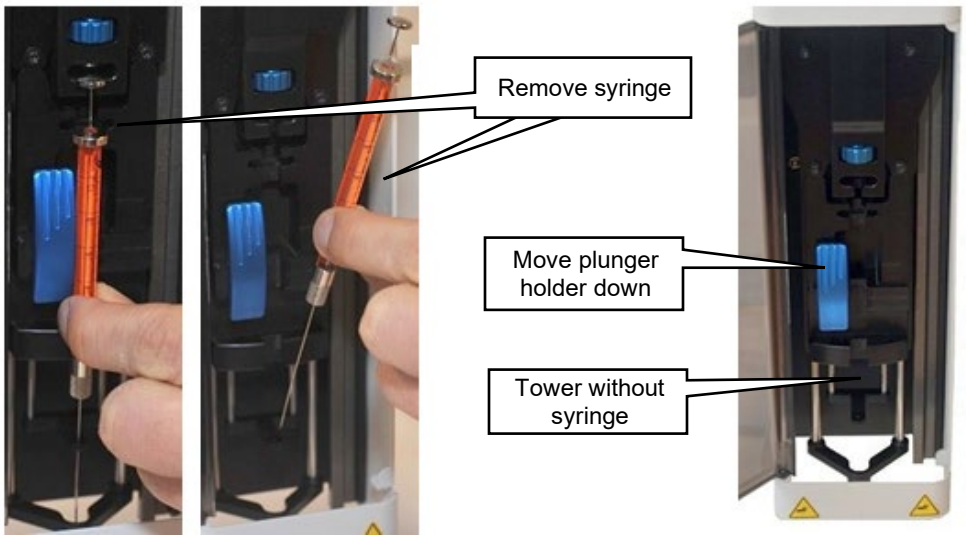


Figure 61: Removing Syringe

Inserting a New Syringe

Check if the installed cradle and plunger adapter support the new syringe type. A syringe is clamped in the cradle, see Figure 62. The syringe outer diameter is critical for correct clamping. Find more information about supported syringes, cradles, and plunger adapters, see section ***10.8 Compatible Syringes***.

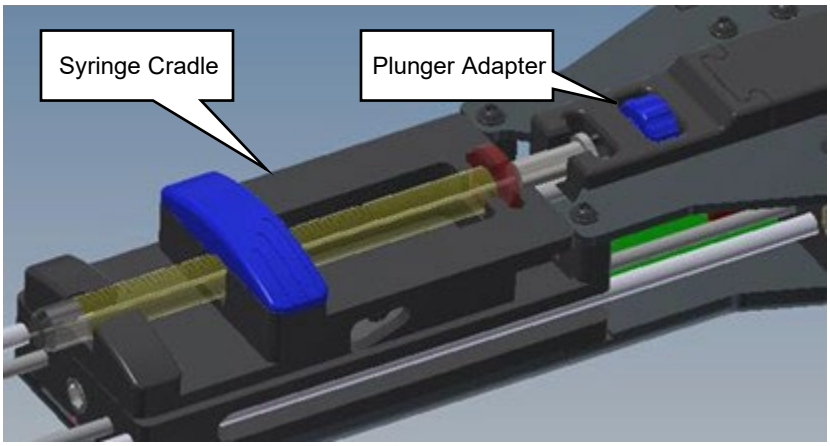


Figure 62: Syringe Cradle

Before placing a new syringe, ensure the plunger and syringe locks are unlocked. The plunger lock rotates left to achieve the unlocked position, and the syringe lock rotates counterclockwise.

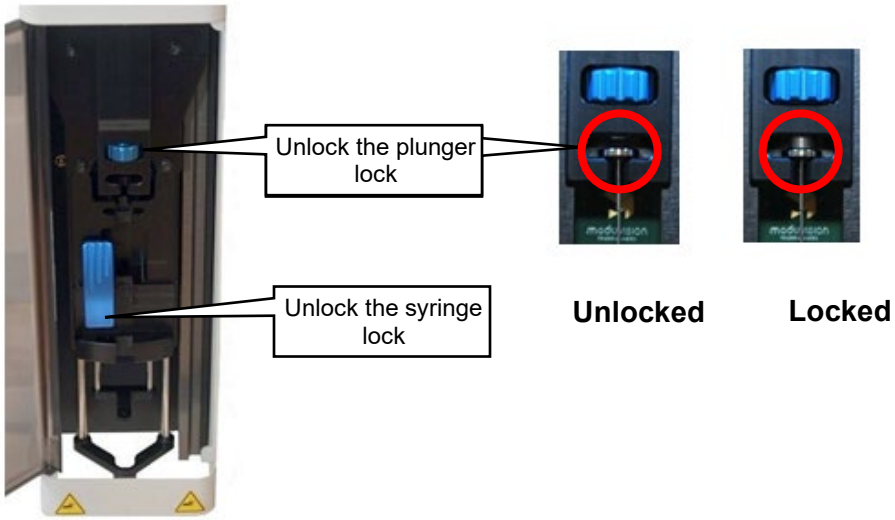
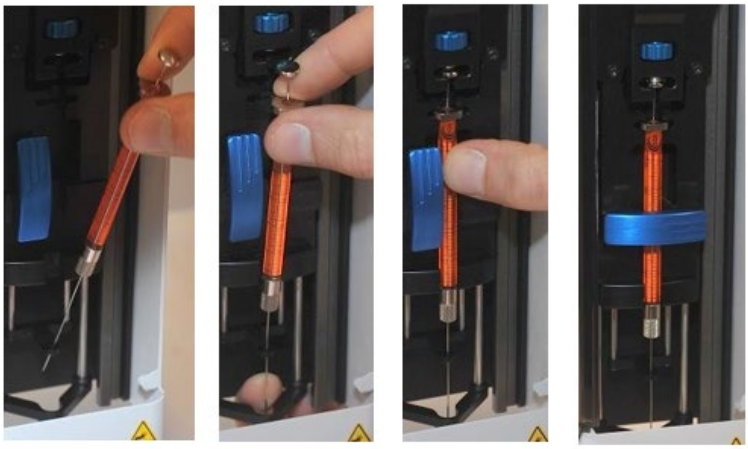


Figure 63: Syringe and Plunger Unlock Positions

Perform the following procedure to place a new syringe:

1. Take the new syringe and guide the needle through the needle support (***Figure 64, Step 1***).
2. Guide the needle carefully through the needle guide (***Figure 64, Step 2***).
3. Place the syringe in the syringe holder and the plunger in the plunger holder (***Figure 64, Step 3***).
4. Lock the syringe lock (rotating clockwise) (***Figure 64, Step 4***).
5. Rotate the plunger lock to the right but do not tighten it yet. The plunger should have some room to move while moving the plunger down in the next step.



Step 1 **Step 2** **Step 3** **Step 4**

Figure 64: Syringe Placement

6. Carefully move the plunger down in the syringe until the tip reaches the bottom of the syringe. This position is called **Plunger Null Position** in the software. See Figure 65.

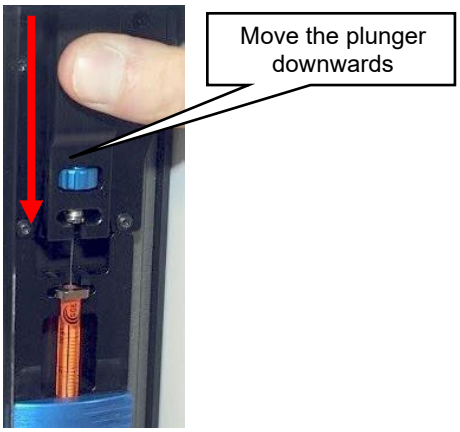


Figure 65: Null Plunger Position

7. Tighten the plunger lock (rotating right) and make sure that the plunger tip is on the bottom of the barrel.
8. When the new syringe is in place, click on the **Accept** button. The configurator accepts this position as the new null position for the syringe.

Figure 66: Accepting New Null Position

7. Autosampler UI Software

7.1 Overview

The Autosampler UI is an intuitive software solution designed to streamline sample processing tasks and empower users to customize processing methods. It features two primary tabs: the Job Queue tab and the Method tab. Note the following terms used in this section.

Table 4: Autosampler Term Definitions

Term	Definition
Method	Describes how each injection is managed.
Job	Method that specifies which samples are selected.
Job Queue	A collection of jobs.

To run the software, click the **Autosampler UI** icon, as shown in the following figure.

Figure 67: Autosampler UI/Desktop Icon

NOTE

The Autosampler UI cannot run simultaneously with the autosampler training software. If needed, stop one of the programs before using the other.

7.2 Job Queue Tab

The Job Queue tab displays by default when launching the Autosampler UI. The Job Queue tab controls the scheduling, configuration, and execution of all sample processing tasks. Jobs are based on a particular method and include the tray used, sample vial, number of injections, and choice of method. Use the Job Queue to add, edit, and remove jobs as needed. The log field provides information about the system's activities, allowing progress monitoring and troubleshooting potential issues as shown in Figure 68. For information about jobs see ***7.3 Creating a Job*** and ***9.3 Running a Job***.

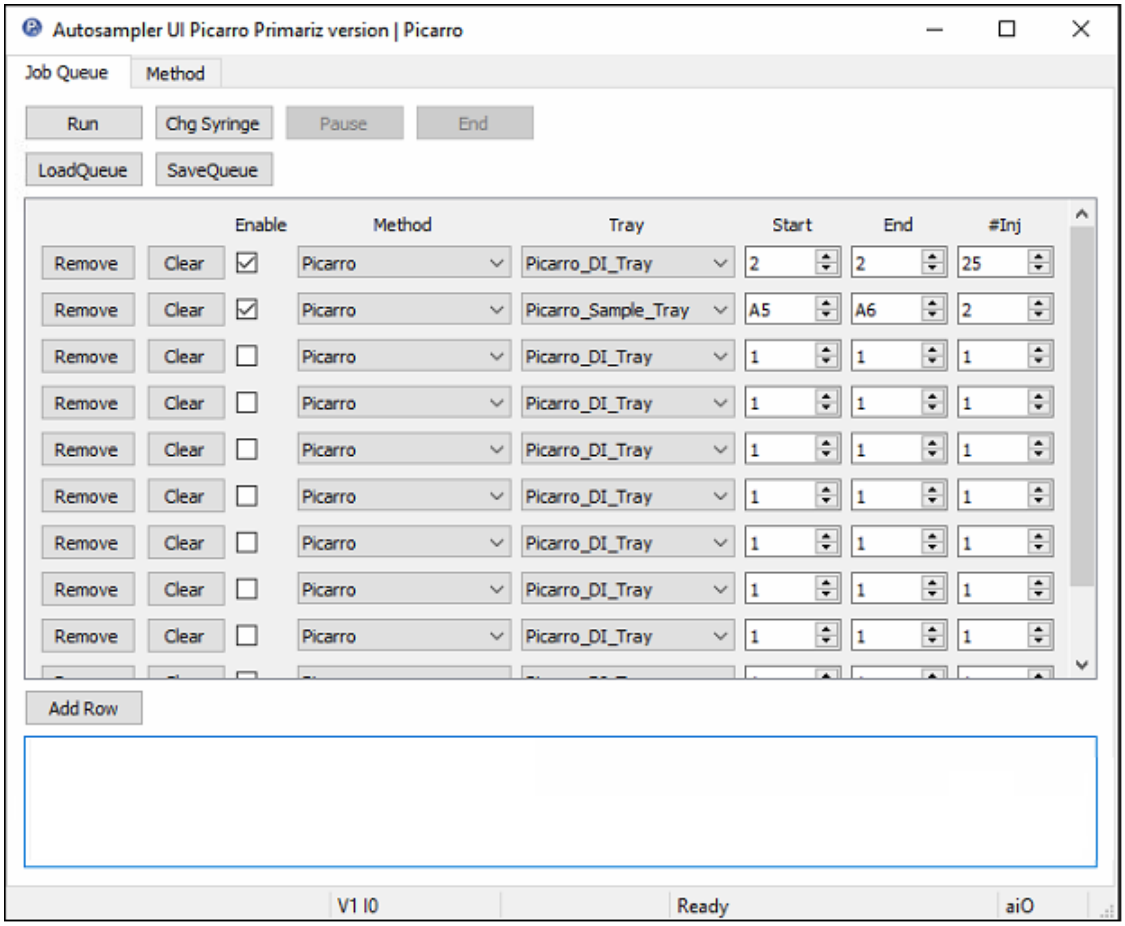


Figure 68: Autosampler Job Queue

The Job Queue tab provides the following options:

- **Run** – Initiates the execution of the queued jobs.
- **Chg Syringe** – Replaces the current syringe with a new one, sending the autosampler arm to the syringe exchange position.
- **Pause** – Pauses the execution of the job queue to adjust or perform any necessary actions.
- **End** – Stops the execution of the job queue.
- **Load Queue** – Loads a previously saved job queue configuration.
- **Save Queue** – Enables saving of the current job queue configuration for future use.

NOTE

Closing the software does not reset the Job Queue, but different Job Queues can be stored and saved by using LoadQueue/SaveQueue buttons.

Each row represents an individual job in the queue and contains editable fields for customization.

- **Remove** – Removes the corresponding job from the queue.
- **Clear** – Resets the fields of the corresponding job.
- **Enable** (Checkbox) – Indicates whether the job is enabled or disabled for execution.
- **Method** – Indicates the desired method for sample analysis.
- **Tray** – Specifies the tray from which the sample is retrieved.
- **Start** – Specifies the starting vial of the Job.
- **End** – Specifies the ending vial of the Job.
- **#Inj** – Indicates the number of injections to be performed for each vial.
- **Add Row Button** – Adds a new job to the queue. Clicking this button creates a new row in the list allowing customization for each field.
- **Log Field** – Displays essential information and status updates related to the job queue and sample processing. It provides real-time feedback on the progress and status of the ongoing tasks.
- **Connection Status** – The bottom frame contains the connection status.

7.3 Creating a Job

Use the following procedure for creating a new job.

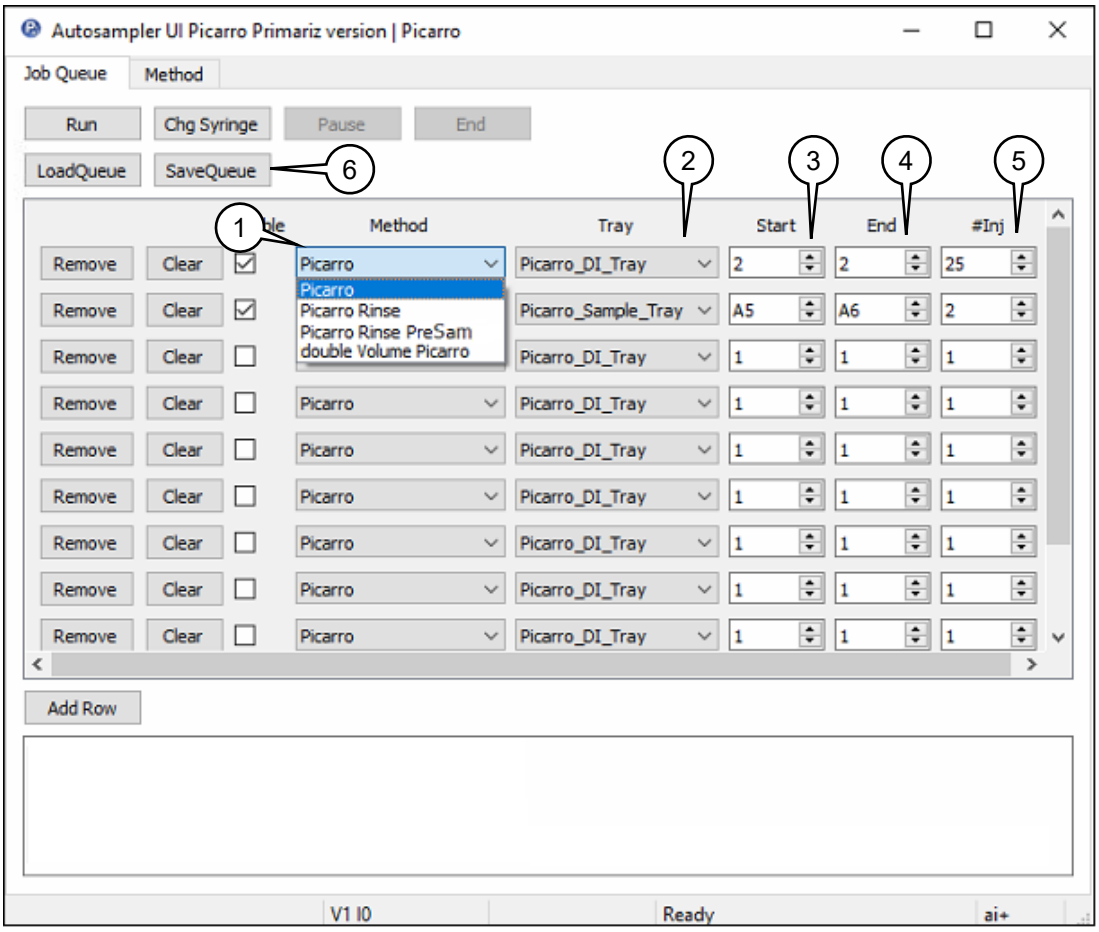


Figure 69: Job Queue/Creating a New Job

1. Select the methods from the **Method** drop-down menu.

   Note descriptions of each method are provided from the **Method Tab**.

2. Select the tray type from the **Tray** drop-down menu.
3. Enter the vial number (based on the tray) for the method starting position in the **Start** field..
4. Enter the number of the vial (based on the tray) for the method ending position in the **End** field.
5. For the **#Inj** field, enter the number of injections per vial.
6. Click the **Save Queue** button to save the new job to the queue.
7. The **Save File** window displays as shown in Figure 70. Specify the desired location, name the file, and click **Save.**

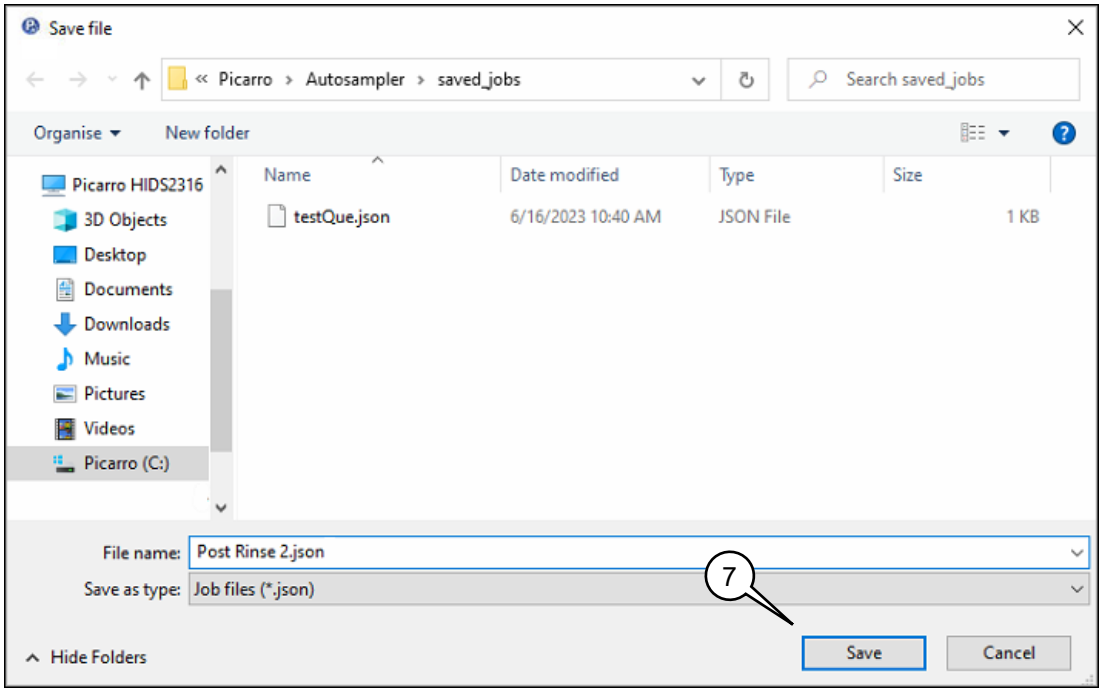


Figure 70: Job Queue/Save File

7.4 Method Tab

The **Method** tab in the Autosampler UI provides users with essential settings to customize their sample processing methods. This tab allows convenient loading, saving, and deleting methods based on your requirements. Adjusting these settings enables fine-tuning the sample processing parameters to meet specific needs and ensures accurate and efficient analyses. By default, the Autosampler UI provides the Picarro and Picarro Rinse methods for use.

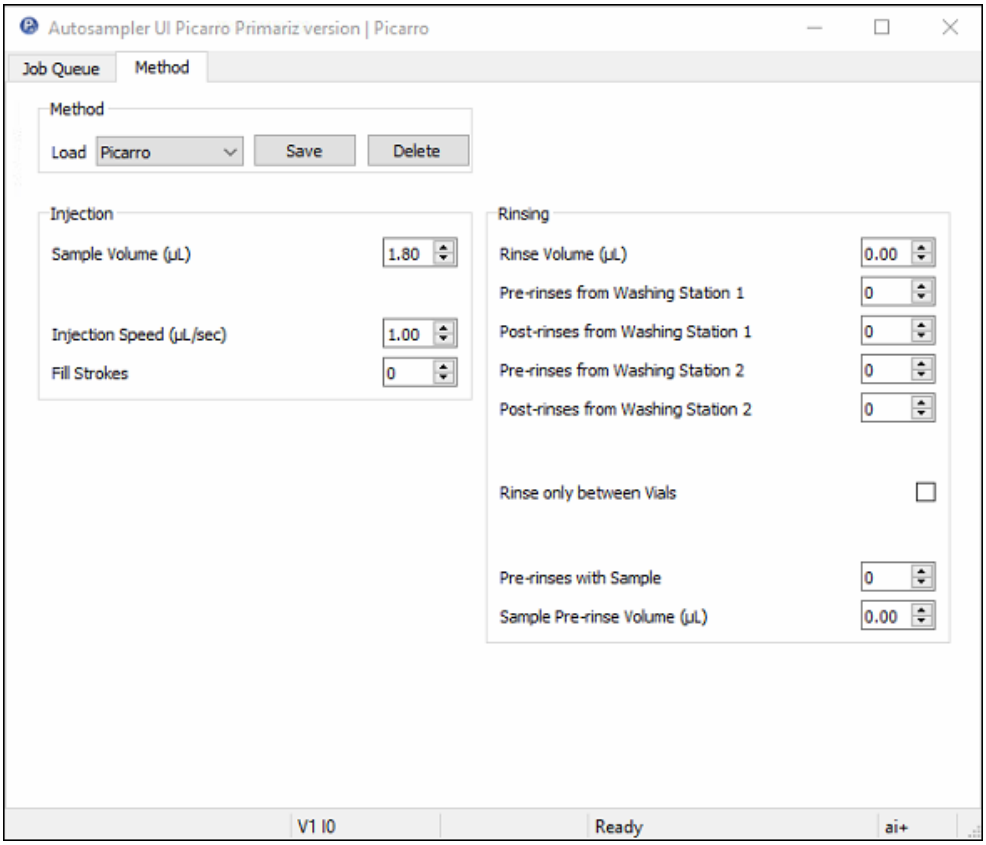


Figure 71: Autosampler Method Tab

The Methods tab provides the following options.

- **Load** – Loads a previously created method.
- **Save** – Saves the newly created method.
- **Delete** – Removes the method selected from the Load drop down menu.
- **Sample Volume (µL)** – Amount of sample to draw for injection into the vaporizer.
- **Inject Speed (µL/sec)** – Speed in µL/sec, the syringe dispenses the sample into the vaporizer.
- **Fill Strokes** – # of times to fill with the sample and dispense back into the sample before drawing the sample to be injected.
- **Rinse Vol (µL)** – Amount of solvent in µL to draw from either rinse station when performing any rinse step
- **Pre-rinses from Washing Stations 1 or 2** – # of rinses from Rinse Station 1 or 2 before an injection or between vials.
- **Post-rinses from Washing Station 1 or 2** – # of rinses from Rinse Station 1 or 2 after an injection or between vials.

- **Rinse only between Vials** – Selecting this option allows the autosampler to only perform rinses between vials, not between individual injections.
- **Pre-rinses with Sample** – # of rinses using sample before an injection or between vials. Dispenses to the waste station.
- **Sample Pre-rinse Volume (µL)** – Amount of sample to use when performing sample rinses.

7.5 Creating a Method

Follow the steps below to create a new method.

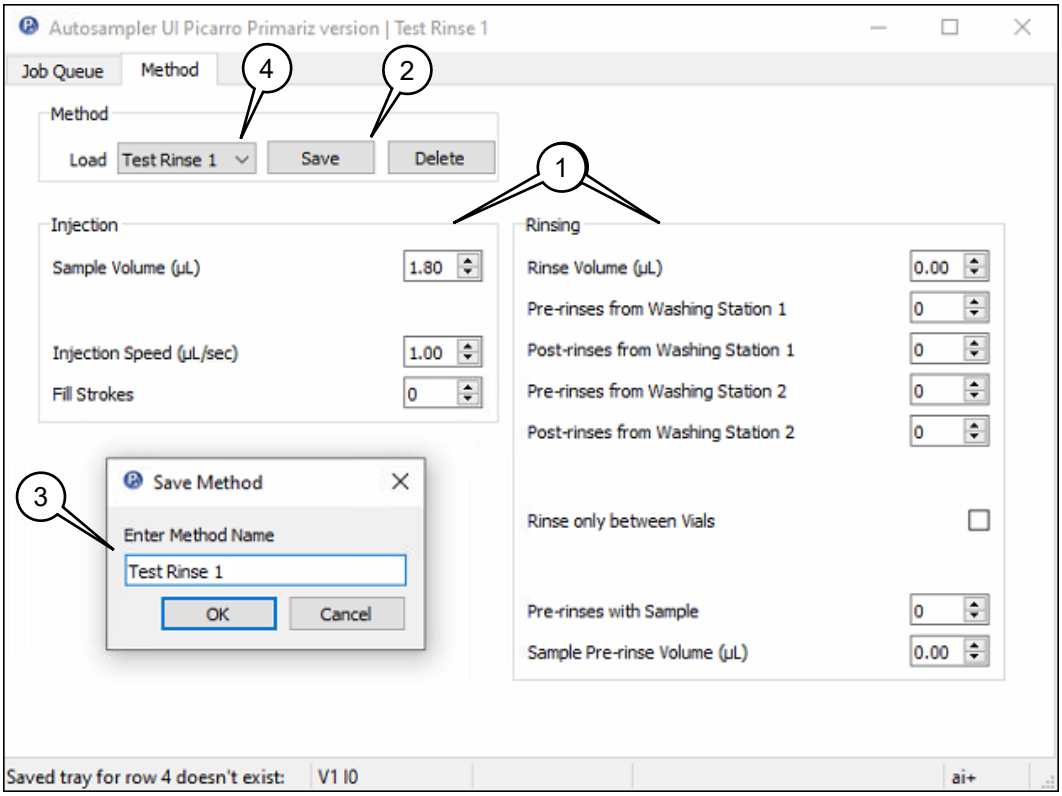


Figure 72: Method Tab/Creating a New Method

1. Click on the **Method** tab. From this tab, characterize the desired method. See Figure 71 and descripton of features.
2. To save a method, click the **Save** button.
3. Enter a name for the new method in the **Method Name** field.

   Choosing an already existing name allows overwriting an existing method, with additional pop-up confirmation window.
4. The new method displays in the **Method** drop-down menu as shown in Figure 72.

7.6 Deleting a Method

Deleting a method is accomplished by following the steps in Figure 73.

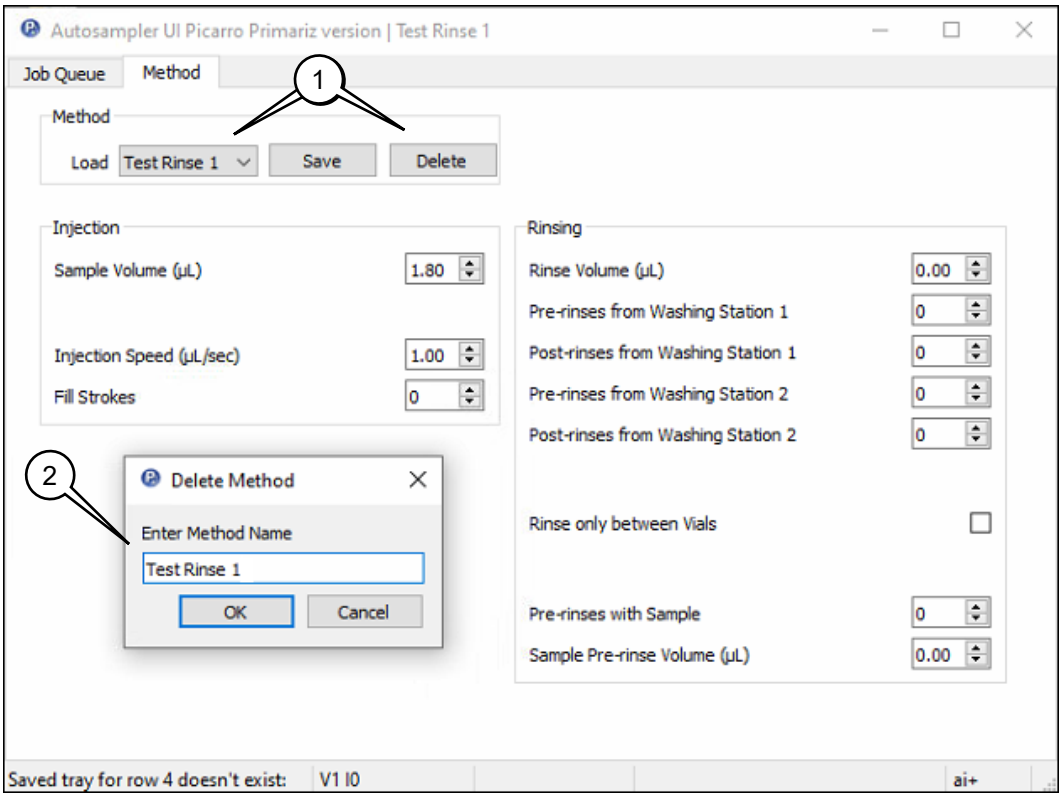


Figure 73: Method Tab/Deleting a Method

1. Find the name of the method to delete from the **Load** menu and click the **Delete** button.
2. In the **Delete Method** window enter the name of the method to delete and click **OK**.

   The name of the method is now removed from the **Load** menu.

7.7 Editing a Method

To edit a method, select the name of the method from the **Load** menu, introduce necessary changes, click **Save** and enter the same name in the **Save Method** window.

8. Sample Preparation

Maximizing the autosampler, vaporizer, and analyzer for reliability is ensured by removing particulates, suspended solids, or other materials. To achieve reliability, pass water samples thru a particulate filter (2-10 microns) before filling the sample vials or manual injection.

Particulates will generally first clog the syringe needle. Although they can build up in the vaporizer, the volume of the vaporizer cell allows a significant number of dirty samples to be injected before cleaning is required. However, if you inject samples that repeatedly cause the syringe to require cleaning, the vaporizer should be visually checked (remove the septa and look for build-up on the inside). The vaporizer can be cleaned by rinsing it with water. Contact Picarro for the vaporizer cleaning procedure and software.

Samples containing dissolved ionic solids (salts) can generally be injected into the vaporizer. A rinse step after each injection is recommended to prevent syringe needle clogging—in the case of high salt concentration (>5 %), the use of larger syringes (10 microliters) will significantly extend the syringe's lifetime. Salts will build up in the vaporizer; these can be flushed out using the vaporizer cleaning procedure if they do not decompose and are sufficiently water-soluble at room temperature.

Picarro recommends including a Salt Liner (C0354) beneath the injection port septum if you are running water samples with significant salt content (brackish-saline). The salt liner captures dissolved solids as the water sample vaporizes to prevent the solids from building-up on the inside surfaces of the vaporizer. Swap out the liner every time you change the septum, about every 200 to 300 injections. To purchase additional salt liners, visit store.picarro.com and enter C0354 in the keyword search pane.

Use caution when analyzing water samples containing organic compounds. Depending upon the nature of the organic, it may build up a permanent layer inside the vaporizer that cannot be removed. Samples containing particulates such as fruit juice should be filtered (an in-line polypropylene Luer lock filter disk can be attached to a large syringe and used to fill the autosampler vials).

CAUTION

Certain compounds (the lower molecular weight compounds) interfere with the spectroscopic measurement and affect the measured isotopic ratios. The ChemCorrect software package detects and flags these situations. See Appendix E for operational details. Many organic compounds are removed by sample pre-treatment; however, some types of pre-treatment cause isotopic fractionation – thus, control experiments with the specific method chosen should be performed.

Due to the broad range of organics and types of interactions, Picarro cannot assume responsibility for measurements made using or damage caused by organic compounds.

9. Starting the Autosampler

To operate the autosampler, you must create a job from the Autosampler UI software for each run. This chapter describes the process of defining methods and jobs to start an autosampler run.

9.1 Overview

A single injection is defined by a sample method. An injection is repeated multiple times on each sample, and multiple samples can be queued in a single job. Various jobs can be added as rows in the Autosampler UI software. A job must be in the queue to start an autosampler run. The job has to specify at least one method and can have several. See the following prerequisites and procedures for running a job.

9.2 Prerequisites

Before proceeding, verify the following prerequisites are complete to ensure the autosampler is installed correctly and connected to the analyzer. See the following sections in this manual:

- **4.6 System Connections** – Make the cable connections between the analyzer, vaporizer, and autosampler as shown in Figure 22 or Figure 23 if utilizing the A0214 MCM.
- **4.7 Solvents Wash Station Set-Up**
- **4.8 Sample Tray Set-Up**
- **6.13 How to Exchange a Syringe**

9.3 Running a Job

This procedure utilizes the factory default job and Picarro method. For isotopic data post-processing, see the ***L21x0-i user manual***.

1. Verify that the **Picarro GUI** indicates that the instrument is taking measurements and that the **Autosampler Control** Window is open. Also, make sure the **Autosampler Configurator** window is closed.

NOTE

The instrument will not run samples when the Autosampler Configurator is open simultaneously with the Autosampler UI software.

2. Click on the **Autosampler UI Icon** on the desktop. The **Job Queue** tab displays. Follow the procedure described in Figure 74.

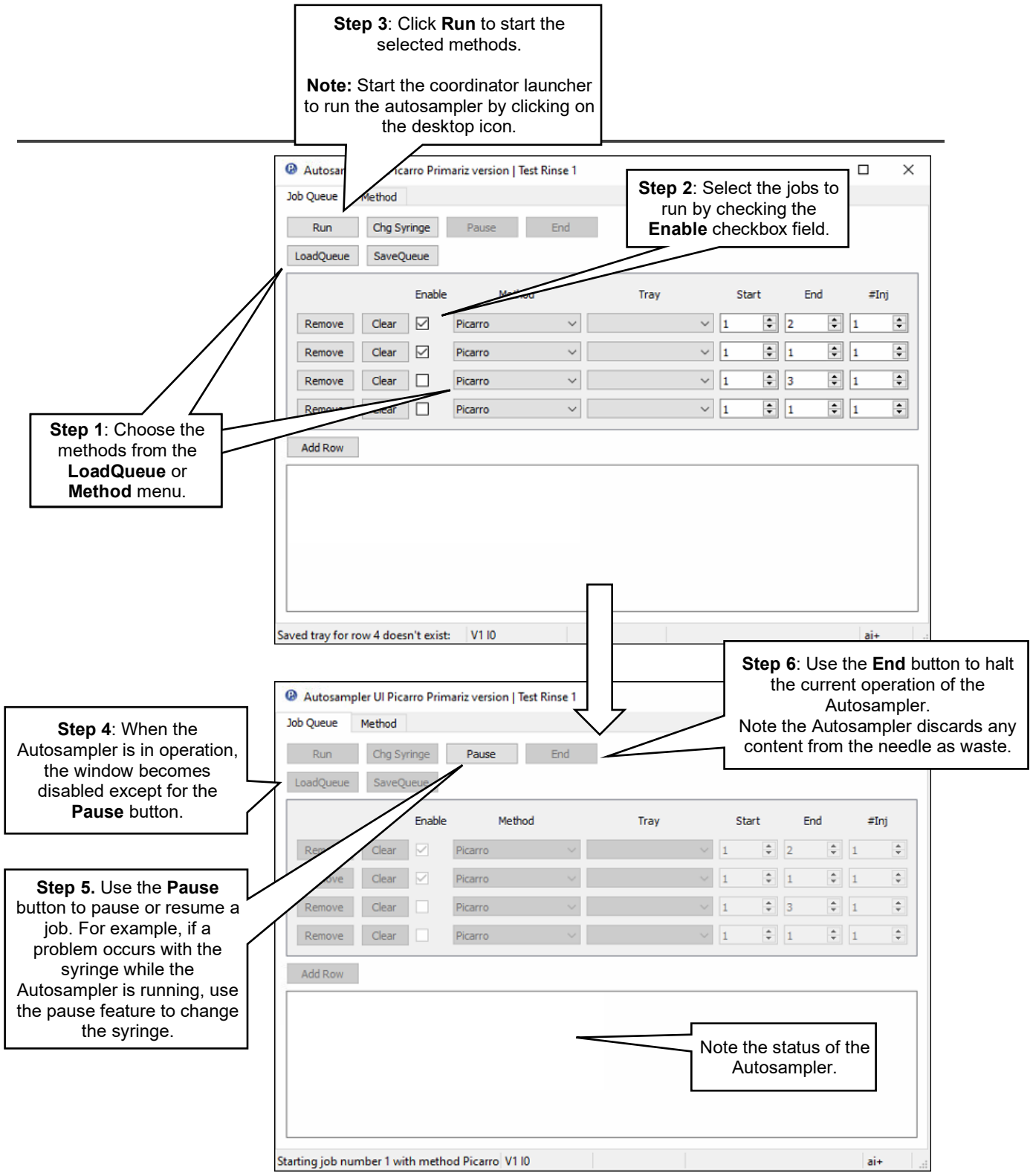


Figure 74: Running a Job

3. The autosampler waits for a start command from the Picarro coordinator software. As soon as it gets an order, the methods will start.
4. Start the **Coordinator Launcher** by double-clicking on the desktop icon. Select the desired coordinator from the drop-down menu.

Figure 75: Coordinator Launcher

CAUTION

Do not start the Picarro Coordinator before the instrument starts showing measurements on the GUI.

5. After clicking on the **Launch** button, the coordinator window (Figure 76) displays. From the Coordinator window, the results from sample analysis display.

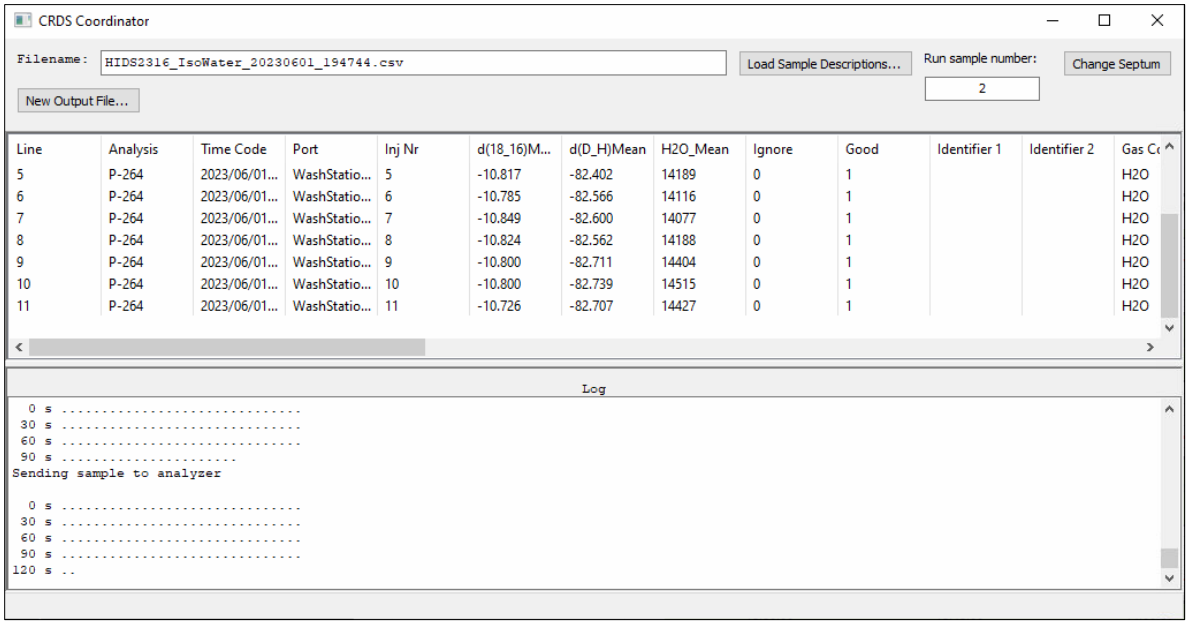


Figure 76: CRDS Coordinator Window

For more information about the Picarro Coordinator, see L2140-*i* and L2130-*i* Isotopic Water Analyzer and Peripherals Installation and Operation Manual*.*

NOTE

After the job queue finishes, the autosampler stops, and the analyzer waits for a new sample injection. The user can start a new job on the autosampler and select the New Output File button on the CRDS Coordinator window. The user can append more data to the output file by starting a new job queue without pressing the New Output File button.

10. Maintenance

10.1 Overview

The autosampler requires daily maintenance to ensure proper operation. If full sample trays run, many consumable parts will need replacing daily. Keep a minimum of a week's supply of consumables on reserve to ensure uninterrupted operation.

The following subsections describe the consumables listings and replacement instructions.

10.2 Vaporizer Injection Port Septum and Salt Liner

Septum (C0352)

The injector port septum should be replaced every 200-300 injections. The more closely grouped the needle piercings are on the septum, the earlier the septum will need to be replaced. If the septum is not changed, it will be difficult to maintain the vacuum inside the vaporizer, which will degrade the quality of the data. To purchase additional septa, visit store.picarro.com and enter C0352 in the Keyword Search pane.

Salt Liner (C0354)

Picarro recommends including a salt liner beneath the injection port septum if you are running water samples with significant salt content (brackish-saline). The salt liner captures dissolved solids as the water sample vaporizes to prevent the build-up of solids on the inside surfaces of the vaporizer. Swap out the liner every time you change the septum, about every 200 to 300 injections. To purchase additional salt liners, visit store.picarro.com and enter C0354 in the Keyword Search pane.

10.3 Required Tools and Materials

- Tweezers
- New septum
- New or clean salt liner (if used)
- 7/16 wrench (only if needed to remove injection port nut)

10.4 Replacing the Septum and Salt Liner (if used)

1. Is your autosampler running (i.e., actively injecting samples)?

   If **yes**, click the **Change Septum** button in the Coordinator window (Figure 77). This button is used to pause the autosampler and the vaporizer in the middle of an analysis to physically change the septum on the vaporizer.

   If **not**, proceed directly to **Step 3**.

2. Wait for the **Change Septum** button to change to Septum **Changed** (Figure 77). This occurs when the current injection analysis is complete, sometimes taking several minutes.

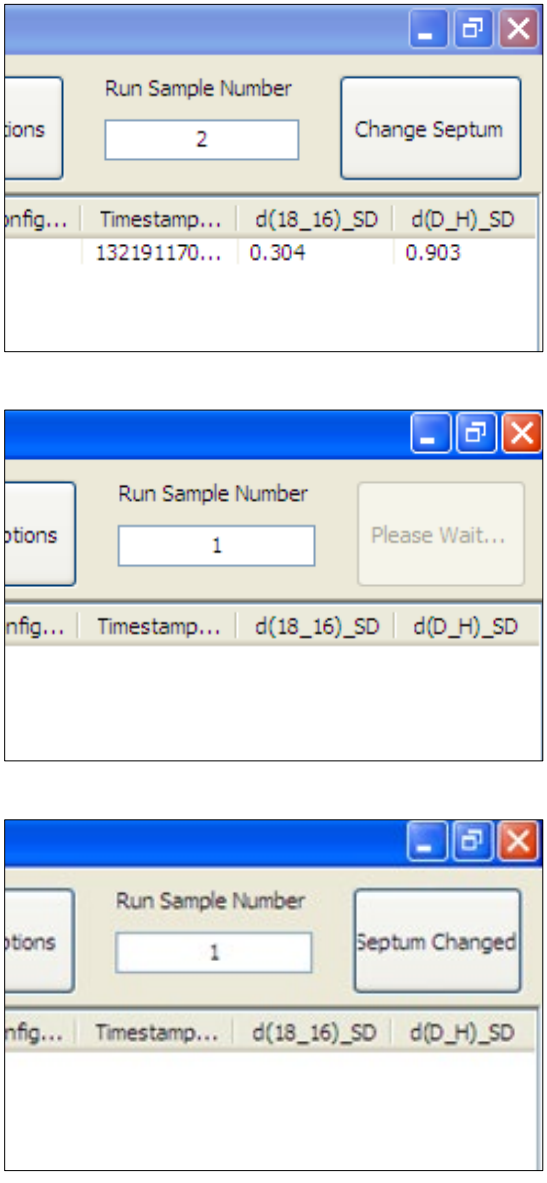


Figure 77: Change Septum Button Status Modes

3. Remove the protective metal cover from the injection port. There is a piece of insulation foam attached to the cover plate. Ensure that it stays attached to the plate. See Figure 78.

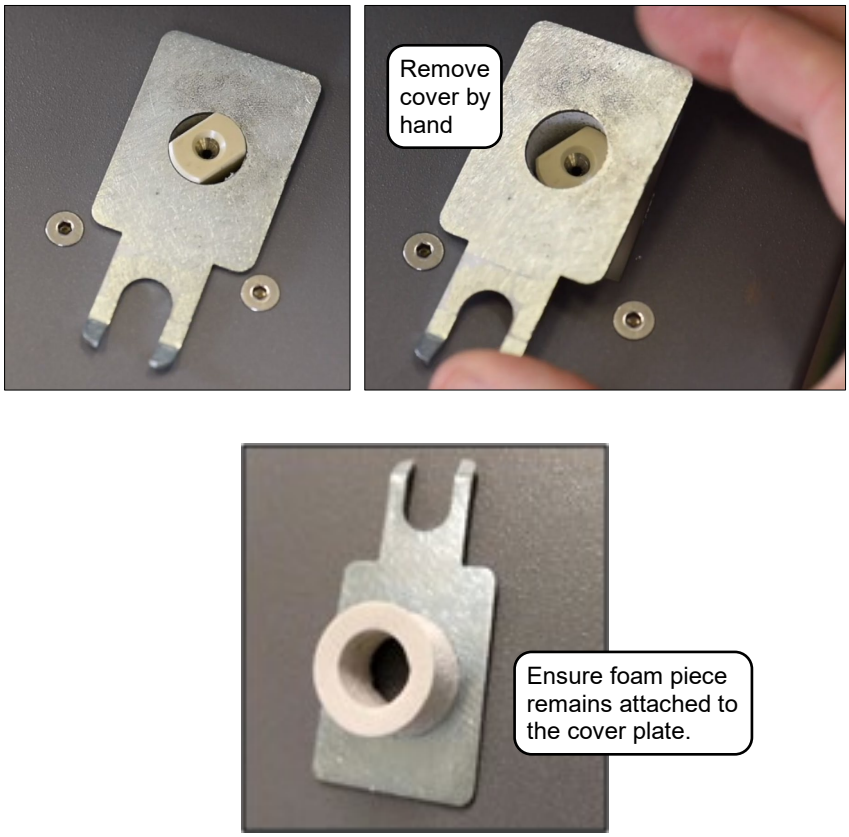


Figure 78: Injection Port Septum Cover Removal

4. Unscrew the cap of the port. If unable to unscrew by hand, loosen it with a wrench (but do not use the wrench when reinstalling).

WARNING

The bottom of the cap is hot. Avoid direct contact to prevent burn injury.

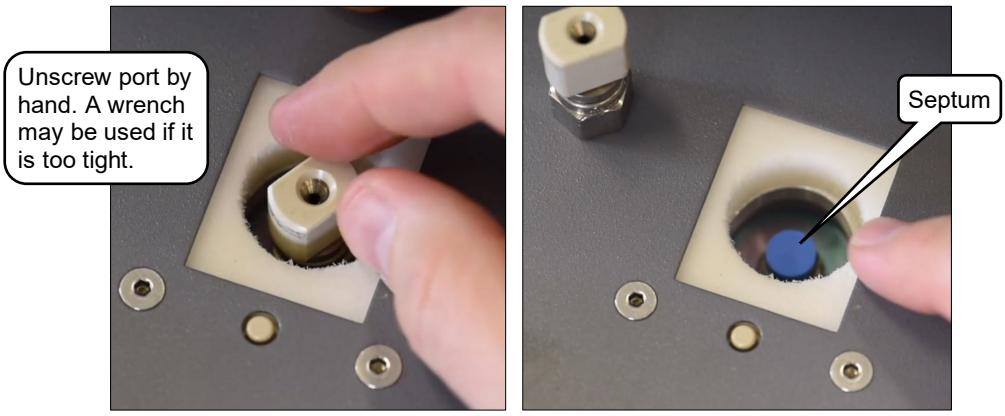


Figure 79: Port Cap Removal Exposing Septum (Blue)

5. The old septum will usually stick to the port, but if it is in the cap, use tweezers or a pick to remove the old septum.
6. If your system uses a salt liner, remove it at this time. Swap out the liner every time you change the septum; about every 200 to 300 injections. Soak it in deionized (DI) water until clean, or sonicate (remove the gasket first) to remove residue.

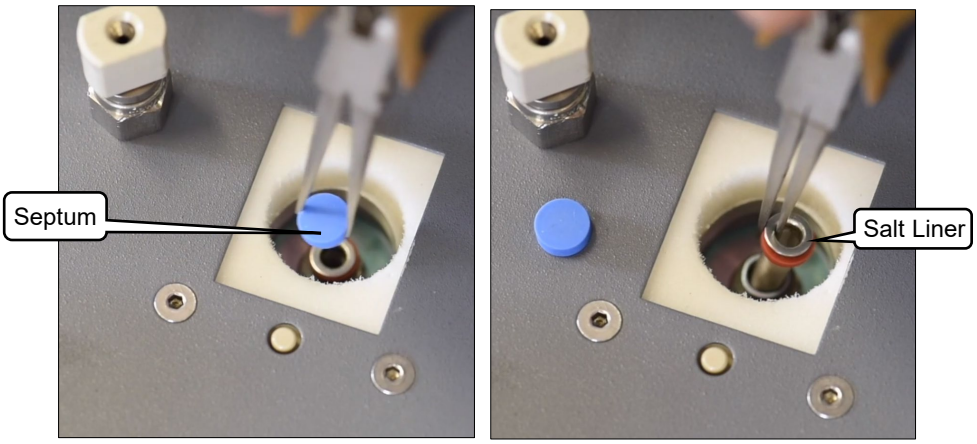


Figure 80: Septum and Salt Liner Removal (if used)

7. Insert a clean salt liner into the port (if used).
8. Insert a new septum into the cap and screw the cap back onto the port by hand until it comes to a hard stop. This should be finger-tightened only. Do not use a wrench to tighten.
9. Replace the metal cover around the injection port.
10. If you did not use the Change Septum Button in the Coordinator window to change the septum, proceed to **Step 11**. Otherwise, click the Septum Changed button. The analyzer will restart the vaporizer purge cycle and then wait for the next sample injection.

11. Press **Continue** on the user interface; the analyzer will restart the vaporizer purge cycle and then wait for the next sample injection.

CAUTION

When using the coordinator Change Septum button in the middle of a run, try to do so before the first injection of a new sample. If performed on subsequent injections, the sample should be flagged, as ambient air memory effects may bias one or more injections.

10.5 Changing Waste Port Septa and Glass Wool

The waste port can have one of two configurations.

Configuration 1

The waste port is sealed with a septum and attached to a vacuum pump (not included). This configuration requires additional hardware. Also, there have been reports of septa material clogging the syringe needle.

The waste port septa requires replacing every 200-300 injections at the same time as changing the injector port. The following procedure assumes this is done simultaneously with the injector port septa.

1. Pull the cap by hand to remove it from the waste port. Press up from the bottom of the cap to remove it.
2. Use tweezers to remove the old septa.
3. Place the new septa into the cap and replace the cap

NOTE

Additional waste port septa are purchased by ordering part number C0323, a single package containing 20 units of red PTFE septa.

Configuration 2

The waste port is filled with glass wool and a small positive pressure pump (such as an aquarium air pump). The pump helps evaporate the water, and the large mass of the glass wool serves as a reservoir. This configuration requires minimal hardware and is what Picarro uses. No septa are used in this configuration; the top of the waste port is left open to speed evaporation.

10.6 Changing Sample Vials

Improper sealing of the sample vial is the most common cause of accidental isotopic fractionation. The caps of the vials can easily be threaded incorrectly. Ensure the cap is level on the vial. See Figure 81 for example.

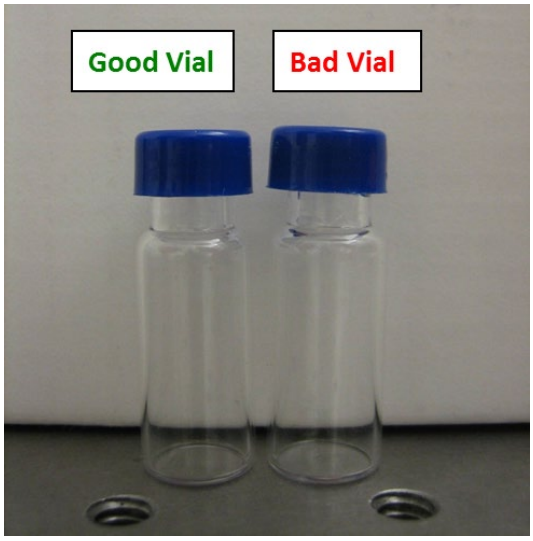


Figure 81: Vial Caps Showing Improper Cap Placement

Purchase additional sample vials by ordering part number C0322, a single package containing 100 units of clear glass, 2 mL, 12 x 32 mm screw-top vials with a 9 mm thread finish.

Purchase additional caps and septa by ordering part number C0321, a package containing 100 units of 9mm thread PTFE/Silicone septa to fit a 2 ml vial.

10.7 Syringe Maintenance

Replace the syringe only when the coordinator software is not running, and no job runs on the autosampler. Error during sample analysis is often caused by damaged or clogged needles. Always pause the analysis by clicking the Chg Syringe button in the Autosampler UI Software. If no analysis is running currently, use the Exchange Syringe option from the Autosampler Configurator. Use the procedure described in section 6.13 How to Exchange a Syringe.

Cleaning the Syringe

The syringe should be removed and cleaned by hand daily. Multiple rinses with DI water are sufficient. If needed, use a diluted solvent, but it is essential to flush the syringe with water afterward. If the plunger does not move smoothly in either direction, replace the syringe. The best way to store a syringe is to soak it in DI water.

10.8 Compatible Syringes

This section lists compatible autosampler syringes from various manufacturers available for purchase from Picarro.

NOTE

This list is not comprehensive. Additional syringes and adapters may also be compatible. Contact Picarro support for more information.

Table 5: Syringe Part Numbers

Syringe Volume	Mfg. Name	Part Number	Description
5 µL	SGE	001982	5F-C/T-5/0.47C
5 µL	SGE	001700	5F-CTC-5/0.47C
5 µL	SGE	001981	5F-C/T-5/0.63C
5 µL	ILS	2106302	5µLN/F/0,47(26s)/c/51/CTC
5 µL	ILS	2106335	5µLN/F/0,63(23s)/c/51/CTC
5 µL	Hamilton	204051	75 N Cem NDL, 26s ga, 50, AS
10 µL	SGE	002700	10F-CTC-5/0.47C
10 µL	SGE	002980	10F-CTC-5/0.47C
10 µL	SGE	002981	10F-C/T-5/0.63C
10 µL	SGE	002977	10F-C/T-GT-5/0.47C
10 µL	SGE	002987	10F-C/T-GT-5/0.63C
10 µL	ILS	2106416	10µL SYR N FN 0,47(G26s) c51 CTC
10 µL	ILS	2106403	10µL SYR N FN 0,64(G23s)c51 CTC
10 µL	ILS	2606407	10µL SYR H FN 0,47(G26s)c51 CTC
10 µL	ILS	2606403	10µL SYR H FN 0,64(G23s)c51 CTC
10 µL	Hamilton	204052	701 N Cem NDL, 26s ga, 50,AS
10 µL	SGE	002982	10R-C/T-5/0.47C
10 µL	SGE	002984	10R-C/T-5/0.63C
10 µL	SGE	002985	10R-C/T-GT-5/0.47C

Syringe Volume	Mfg. Name	Part Number	Description
10 µL	ILS	2120407	10µL SYR N RN 0,47(G26s)c51
10 µL	ILS	2106408	10µL SYR N RN 0,64(G23s)a51
10 µL	ILS	2606405	10µL SYR H RN 0,47(G26s)a51
25 µL	SGE	003980	25F-C/T-5/0.47C
25 µL	SGE	003700	25F-CTC-GT-5/0.47C
25 µL	SGE	003987	25F-C/T-GT-5/0.63C
25 µL	ILS	2620506	25µLSYRHo6,5 FN 0,47(G26s)c51 CTC
25 µL	ILS	2620503	25µLSYRHo6,5 FN 0,64(G23s)c51 CTC
25 µL	ILS	2620513	25µL syringe H ø6,5 RN 0,47(G26)d51 PTFE-seal
25 µL	ILS	2620514	25µL syringe H ø6,5 RN 0,72(G22s)d51 PTFE-seal
100 µL	SGE	005700	100F-CTC-GT-5/0.47C
100 µL	SGE	005335	100F-C/T-GT-0.63C
100 µL	ILS	2620719	100µL SYR H ø6,5 FN 0,47(G26s)c51 flat button
100 µL	ILS	2620721	100µL SYR H ø6,5 FN 0,64(G23s)c51 flat button
100 µL	SGE	005333	005333 100R-C/T-GT-0.47C
100 µL	ILS	2620736	100µL syringe H ø 6,5 8 mm button FN0,72(G22)d51

10.9 Removing and Assembling Covers

The autosampler's housing covers are removable to access internal components such as the X and Y beam linear guides. Removal of these covers is required for routine maintenance of the linear guides, including proper cleaning and lubrication, as discussed in section ***10.10 Lubrication***.

The following housing covers are removable:

1. Tower top plate
2. Tower front cover
3. Tower rear cover
4. X-beam side covers left and right
5. X-beam front cover
6. X-beam rear cover

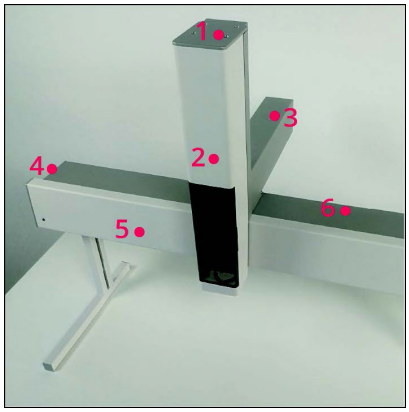


Figure 82: Autosampler Removable Covers

WARNING

Disconnect all cords from the back of the autosampler before removing any covers. This includes the power cable, USB, and LAN). Additionally, ensure the autosampler is grounded to prevent electrostatic discharge (ESD).

CAUTION

Remove the syringe to avoid any injury or damage before removing any covers.

The following tools are required to remove and assemble the autosampler covers.

- Wrist grounding strap
- Torx Tx10 screwdriver

Removing Front Tower Cover

Follow the procedures outlined in this section for removing the front tower cover of the autosampler.

1. Using a Torx Tx10 screwdriver, remove the tower top plate by removing the four screws.

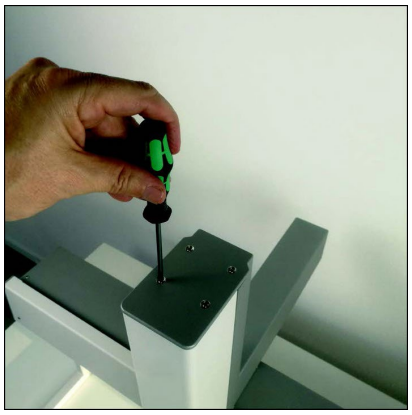


Figure 83: Front Tower Cover Top Screws

2. Before removing the tower front cover, it is necessary to open the tower door in a 90-degrees angle. Keep the front door in this position while removing the front tower cover. See Figure 84.
3. Use two hands to push the front tower cover upwards. The required vertical displacement is approximately 4mm. Use gentle hand force to dislodge the front tower cover, as shown in Figure 84.

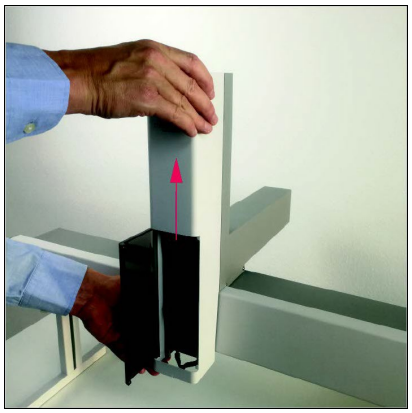


Figure 84: Front Tower Cover Displacement and Door

4. Verify that the top of the tower is displaced by 4 mm, as indicated in Figure 85.

Figure 85: Front Tower Cover Removal 1

5. Gently pull the lower side of the front tower cover outward until the hooking elements become visible and the cover is released. See Figure 86.

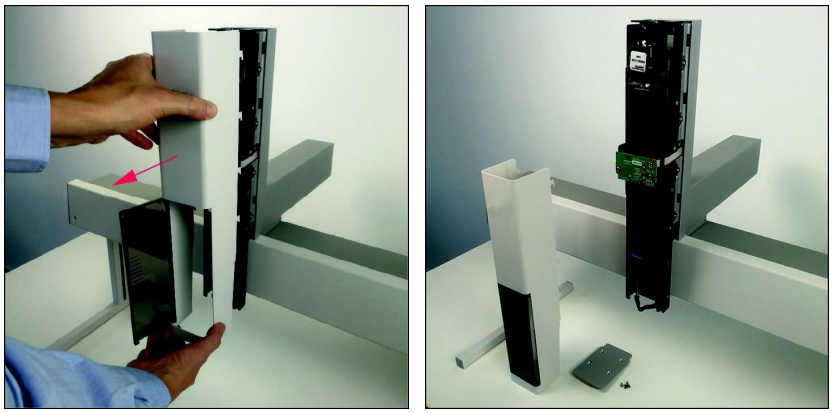


Figure 86: Front Tower Cover Removal 2

6. Store the front tower cover, top plate, and screws together in a safe place.

Removing Rear Tower Cover

Follow the procedures outlined in this section for removing the rear tower cover of the autosampler.

1. Using a Torx Tx10 screwdriver, loosen four screws at the right and left sides of the tower (eight screews total). See Figure 87.

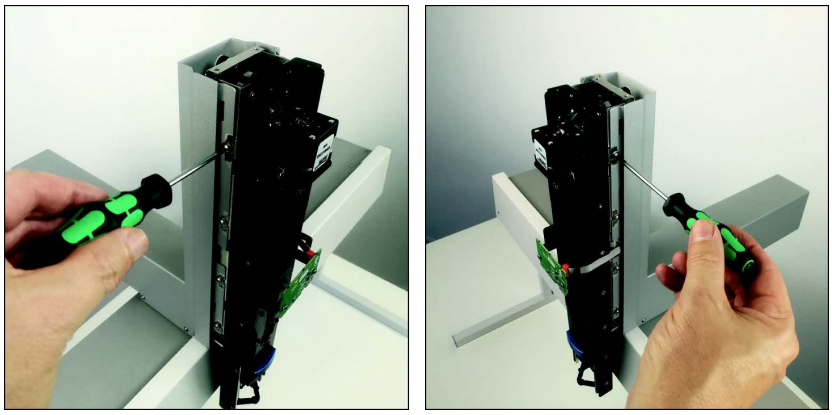


Figure 87: Rear Tower Cover Screws

2. Using gentle hand force, use two hands to pull the L-shaped rear tower cover backward. The required horizontal displacement is approximately 15 mm until the screw slots release from the screw holes. See Figure 88.

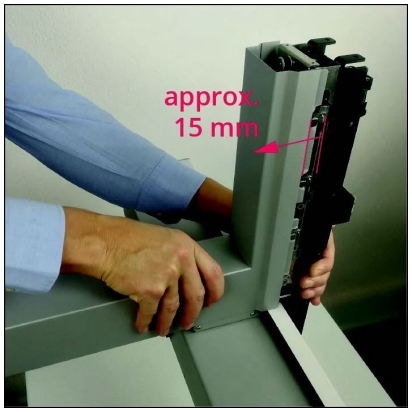


Figure 88: Rear Tower Cover Removal 1

3. Lift the L-shaped tower rear cover upwards to release it from the tower base, as shown in Figure 89.

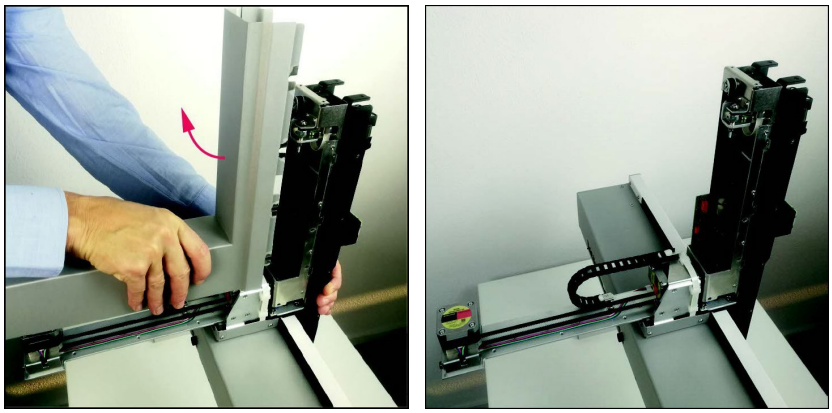


Figure 89: Rear Tower Cover Removal 2

4. Store the removed tower cover in a safe place.

Assembling Rear Tower Cover

Follow the procedures outlined in this section to assemble the rear tower cover of the autosampler.

1. Lower the L-shaped rear tower cover in a vertical direction. Ensure that the vertical tower's widened profile is in line with the small flat cable (A) in the tower base. See Figure 90.
2. Lower the L-shaped tower rear cover until the top of the body matches the height of the vertical tower construction. Note that the rear tower cover cannot be lowered any further in this position. See Figure 90.

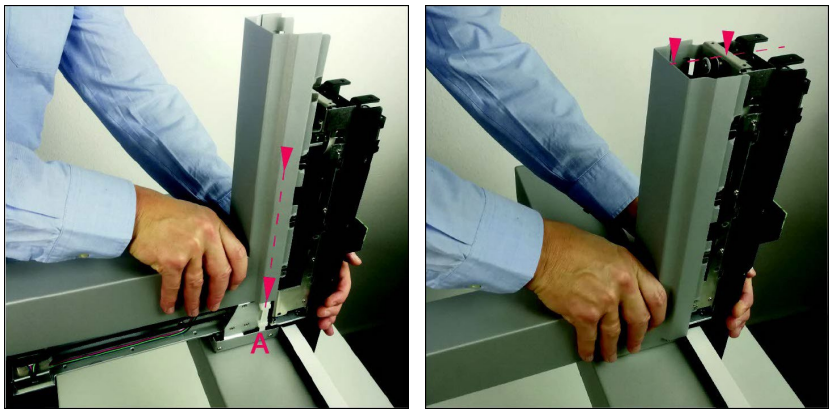


Figure 90: Rear Tower Assembly 1

3. Gently push the L-shaped rear tower cover towards the front until the screw slots are neatly docked around the screws. The cover cannot moved any further in this position and stands vertically. See Figure 91.

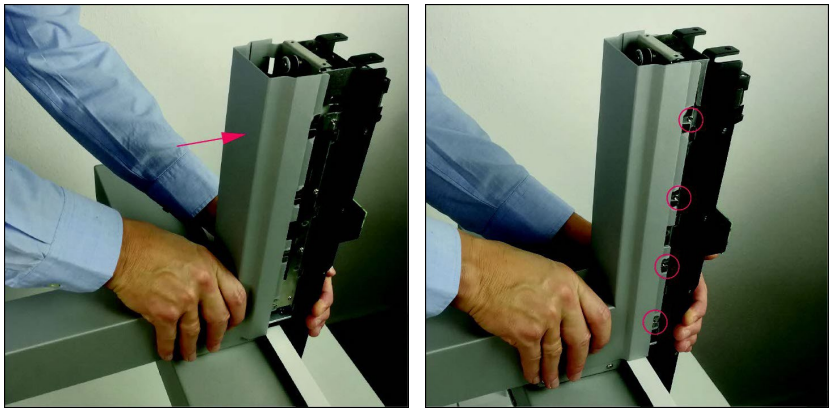


Figure 91: Rear Tower Assembly 2

4. Using a Torx Tx19 screwdriver, fasten the left and the right side of the tower rear cover with four screws per side (eight total) along the length of the vertical tower as shown in Figure 92.

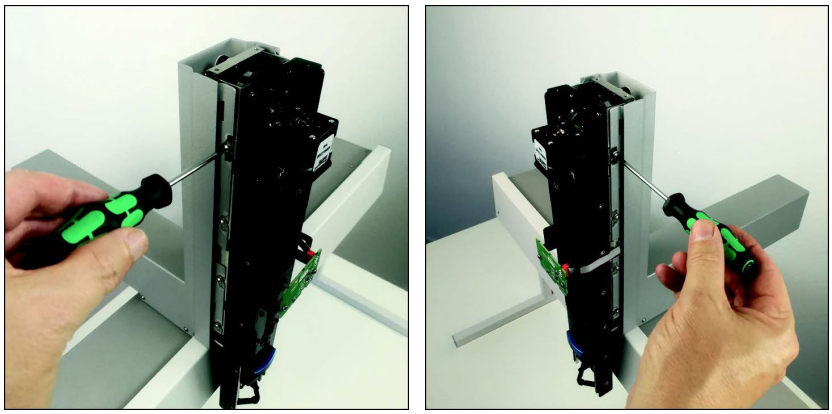


Figure 92: Rear Tower Assembly 3

Assembling Front Tower Cover

Follow the procedures outlined in this section to assemble the rear tower cover of the autosampler.

1. For assembling the front tower cover, the tower's rear cover must be mounted. Check out the side openings (1-4) on each side of the tower rear cover for assembling the tower front cover. See Figure 93.

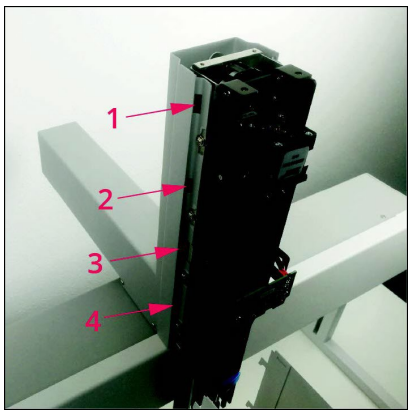


Figure 93: Front Tower Assembly 1

2. Open the door to a 90-degree angle. Position the front tower cover horizontally towards the rear cover as shown in figure Figure 94.
3. Guide the hooks to align with the slots to secure them approximately 1 mm inward. Position and hold the tower front cover about 4 mm higher than the top of the rear tower cover. See figure Figure 94.

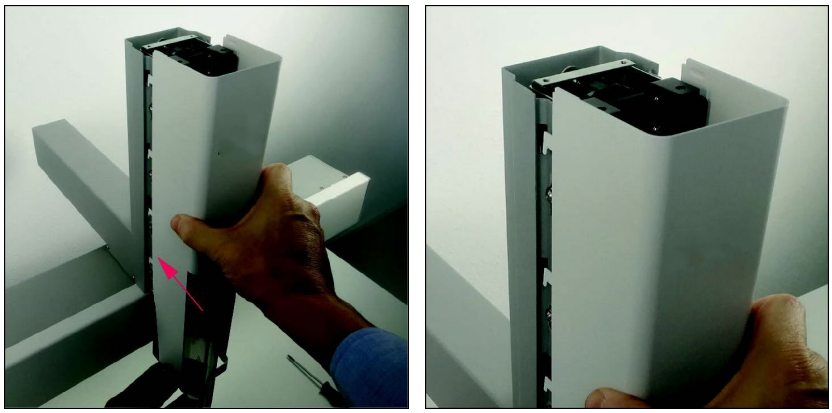


Figure 94: Front Tower Assembly 2

4. Guide the lower hooks first into the slots, followed by the upper clips. See Figure 95.
5. When all hooks are seated, push the front tower panel downward until the top of the front tower cover matches the height of the rear tower cover. Note that the front tower will not move any further in this position. See figure Figure 95.

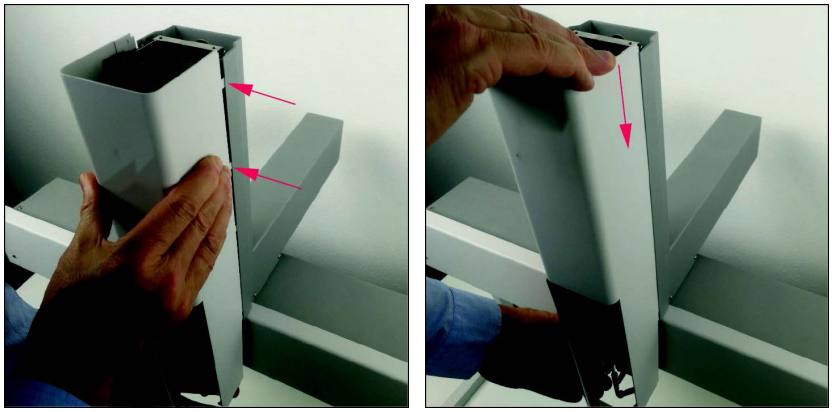


Figure 95: Front Tower Assembly 3

6. Ensure that the top of the front tower panel matches the height and aligns with the rear tower cover. Gentle hand force may be required to move the rear tower cover downward, as shown in figure Figure 96.

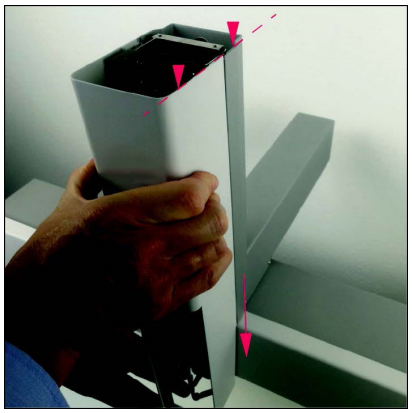


Figure 96: Front Tower Assembly 4

7. Position and dock the tower top plate on top of the tower.

NOTE

Place the four screws in the tower top plate before placing the top plate on the tower assembly.

8. Using a Torx Tx10 screwsriver, tighten the four screws of the top plate as demonstrated in Figure 97.

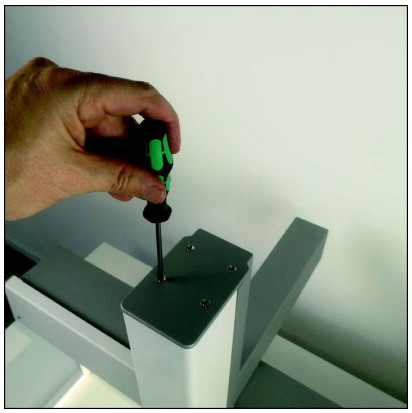


Figure 97: Front Tower Assembly 4

Removing X-beam Front Cover

Follow the procedures outlined in this section to remove the X-beam front cover of the autosampler.

1. The X-beam front cover (A) can be removed while the X-beam rear cover (B) stays in place. See Figure 98.

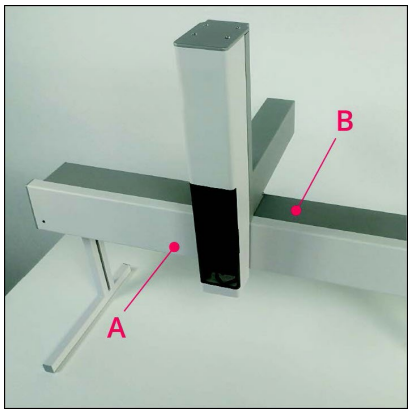


Figure 98: X-beam Front Cover Removal 1

2. Using a Torx Tx10 scewdriver remove the left and right side cover by inscrewing two screws per side (four total). See figure Figure 99.

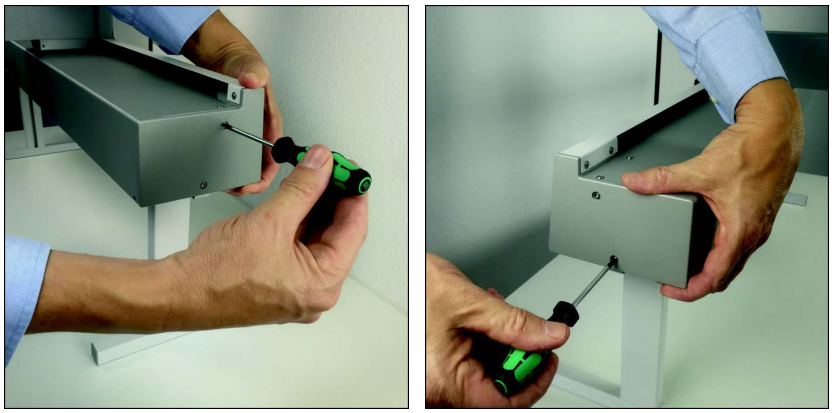


Figure 99: X-beam Front Cover Removal 2

3. Store the side covers and four screws in a safe place.
4. Using a Torx Tx10 screwdriver, unscrew the X-beam front cover from the left and right sides, as show in Figure 100.

Figure 100: X-beam Front Cover Removal 3

5. Using a Torx Tx10 screwdriver, unscrew the inner screw of the X-beam front cover from the left and right sides, as show in Figure 101.

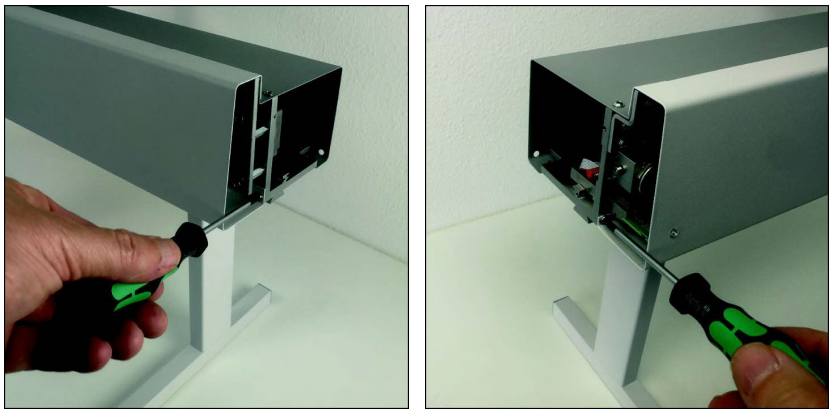


Figure 101: X-beam Front Cover Removal 4

6. Gently move the tower front cover sideways towards the right. Displacement to the right must be at least 80 mm. See Figure 102.
7. Pull the tower a few centimeters away from the X-beam. Angle the full X-beam front cover towards the front and lower the part under the sampler tower. See figure Figure 102.

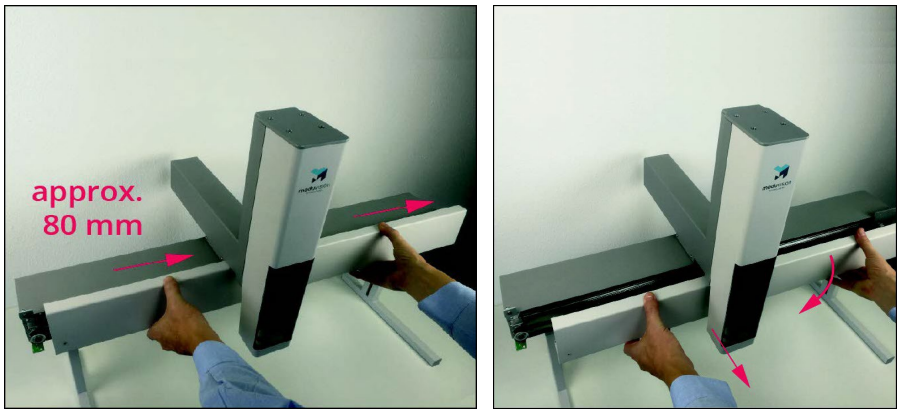


Figure 102: X-beam Front Cover Removal 5

8. The X-beam front cover is now removd from the autosampler.

Removing X-beam Rear Cover

Follow the procedures outlined in this section to remove the X-beam rear cover of the autosampler.

NOTE

Note that the X-beam front cover must be removed first to begin removal of the rear cover.

1. Using a Torx Tx10 screwdriver, unscrew the two screws from the right side and one screw on the left as shown in Figure 103.

Figure 103: X-beam Rear Cover Removal 1

2. Using a Torx Tx10 screwdriver, unscrew the inner screw from the left and right side. Note that the screw is reachable using the hole in the cover. See Figure 104.

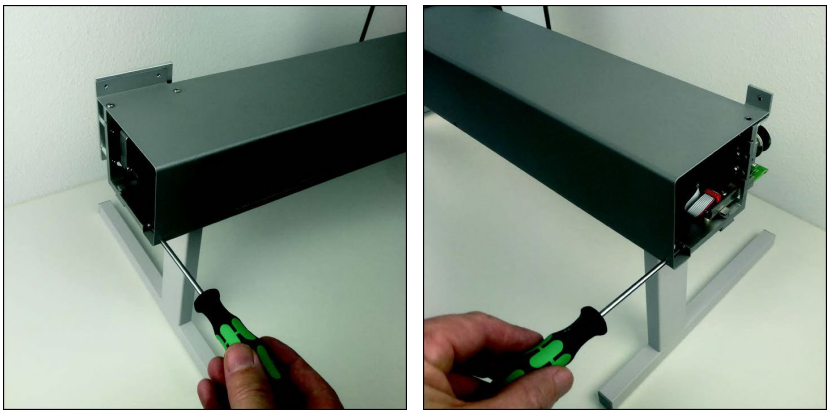


Figure 104: X-beam Rear Cover Removal 2

3. Using a Torx Tx10 screwdriver, loosen the screws on the back side of the cover. See Figure 105.

WARNING

Do not turn the screws for more than two turns. Do not fully unscrew!

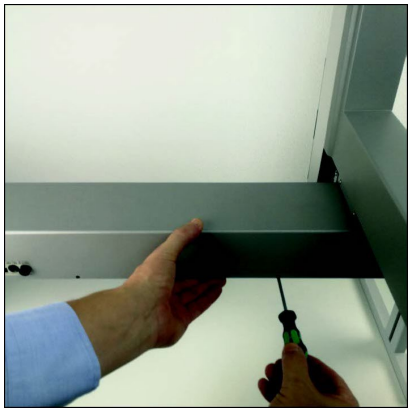


Figure 105: X-beam Rear Cover Removal 3

4. Using two hands, pull away the X-beam rear a few millimeters from the assembly and gently angle the cover backward and downwards to dislodge, as demonstrated in Figure 106.

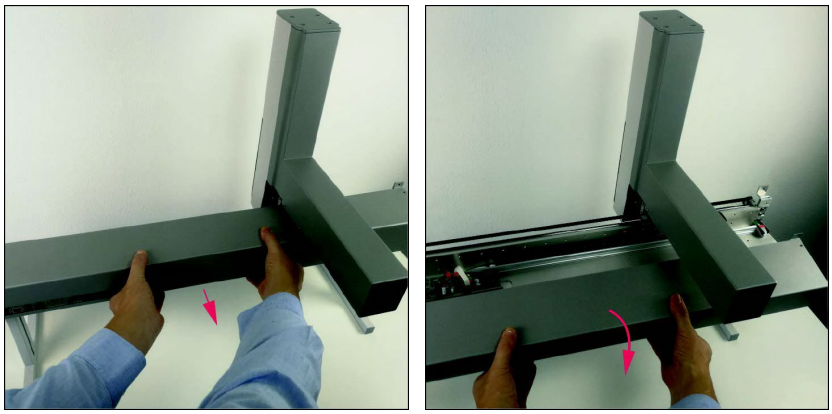


Figure 106: X-beam Rear Cover Removal 4

5. The X-beam rear cover is now off. The motor, belt, and motherboard are now accessible. Store all parts together in a safe place.

Assembling X-beam Rear Cover

Follow the procedures outlined in this section to assemble the X-beam rear cover of the autosampler.

1. Locate the mid screw positions on the X-rail frame. Depending on the length of the X-rail, locations are found at 1, 2, or 3 middle screw positions. Allow a minimum of 5 mm of thread for all the mid screws. This is the required distance to attach the rear cover. See Figure 107.

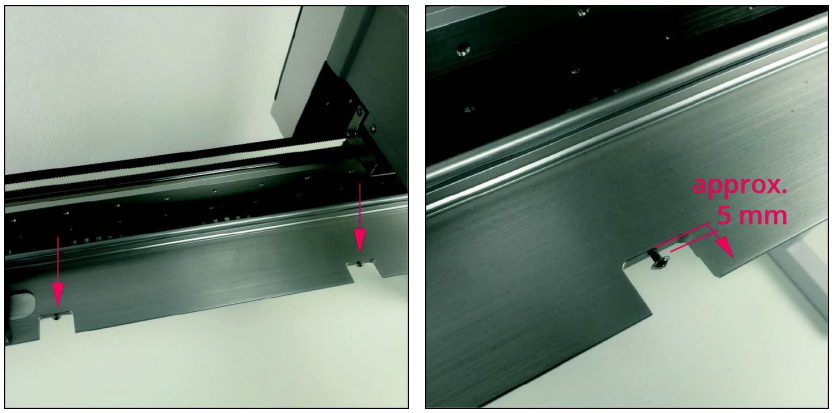


Figure 107: X-beam Rear Cover Assembly 1

2. Gently angle the rear cover onto the X-Rail frame. Confirm that the mid hooking tabs on the rear cover nest behind the middle screw positions. See Figure 108.

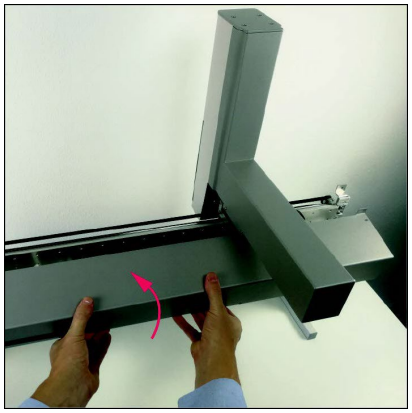


Figure 108: X-beam Rear Cover Assembly 2

3. Using a Torx Tx10 screwdriver, fasten the mid screw positions. Note that the screw is reachable using the hole in the cover. See Figure 109.

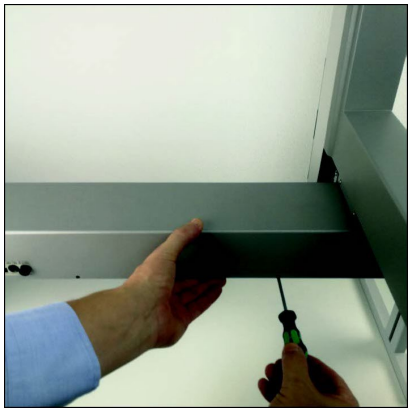


Figure 109: X-beam Rear Cover Assembly 3

4. Using a Torx Tx10 screwdriver, fasten the right and left lower screws a shown in Figure 110.

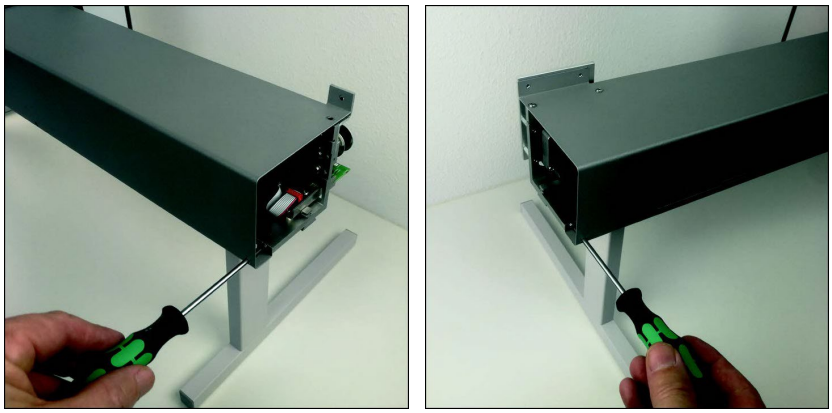


Figure 110: X-beam Rear Cover Assembly 4

5. Using a Torx Tx10 screwdriver, fasten the upper left (one screw) and right (two screws) screw positions. See Figure 111.

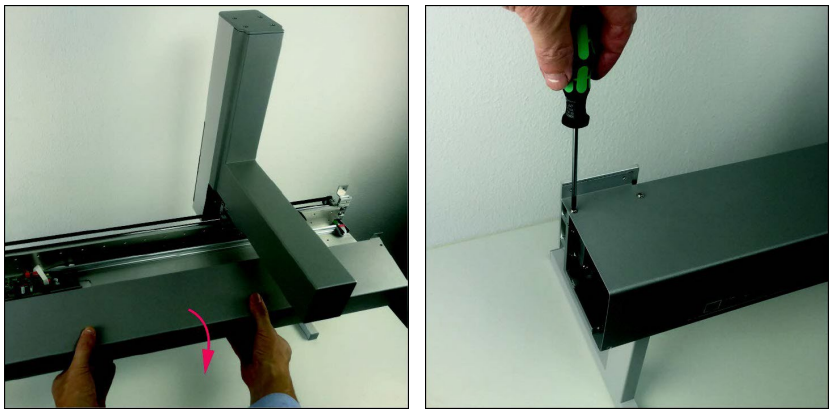


Figure 111: X-beam Rear Cover Assembly 4

NOTE

The X-beam front cover must be assembled before installing the side covers. See the following section, Assembling X-beam Front Cover.

Assembling X-beam Front Cover

Before beginning this procedure, ensure the X-beam rear cover is mounted.

1. Pull the autosampler tower a few centimeters away from the front of the X-rail. Gently angle and move sideways the front cover onto the X-Rail frame. This movement is performed from right to left, as shown Figure 112.

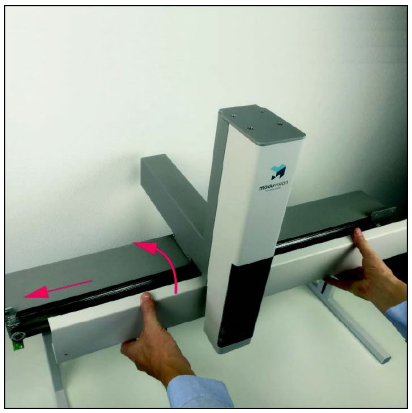


Figure 112: X-beam Front Cover Assembly 1

2. Using a Torx Tx10 screwdriver, fasten the lower right and left screw positions as indicated in Figure 113.

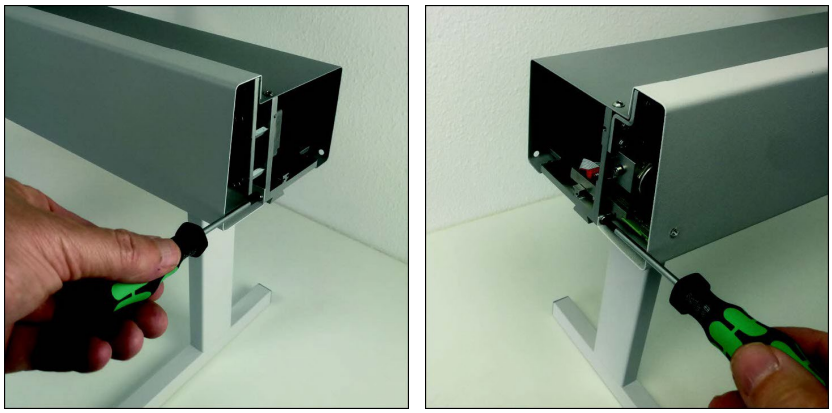


Figure 113: X-beam Front Cover Assembly 2

3. Using a Torx Tx10 screwdriver, fasten the left and right side covers using two screws for each side as demonstrated Figure 114.

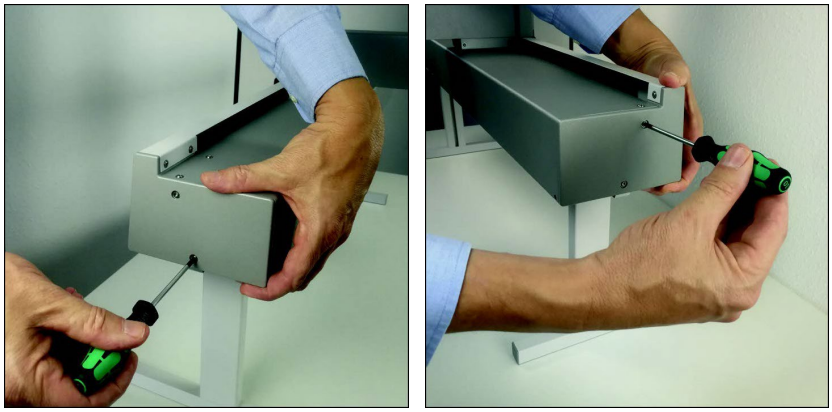


Figure 114: X-beam Front Cover Assembly 3

The front and rear are mounted. Verify the XY-clearance by moving the tower by hand in an X- and Y-direction as shown in Figure 115.

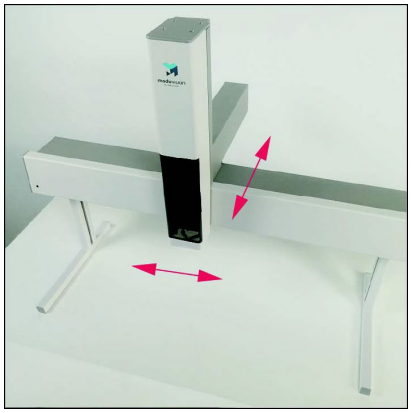


Figure 115: X-beam Front Cover Assembly 4

10.10 Lubrication

For reliable operation, depending on the use of the instrument, it is recommended that the linear guides and various other components be lubricated at least once a year. The following parts require lubrication.

- **X-beam Linear Guide** (Molykote DX paste)
- **Y-beam Linear Guide** (Molykote DX paste)
- **Z-axis Magnetic Lock** (Krytox)

The following tools are required to lubricate the autosampler linear guides and magnetic lock. Note that Molykote and Krytox are available for purchase at: http://store.picarro.com/.

- Molykote DX paste
- Krytox GPL-205 grease
- Wrist grounding strap
- Cotton swap
- Microfiber cloth

Figure 116: Molykote and Krytox Lubrications

Linear Guide Lubrication Overview

The linear guides require minimal Molykote DX grease that can be applied by hand using a microfiber cloth or a cotton swab. Ensure that the grease coating is applied evenly on all surfaces indicated in the pictures described in the following sections.

Tower Lubrication Overview

The guides and bearings in the tower usually don't require lubrication because of the self-lubricating quality of these components. Only the Z-axis home position magnetic lock needs lubrication using Krytox GPL-205 grease and a cotton swab for application.

The autosampler covers require removal to gain access to the linear guides. See section ***10.9 Removing and Assembling Covers***.

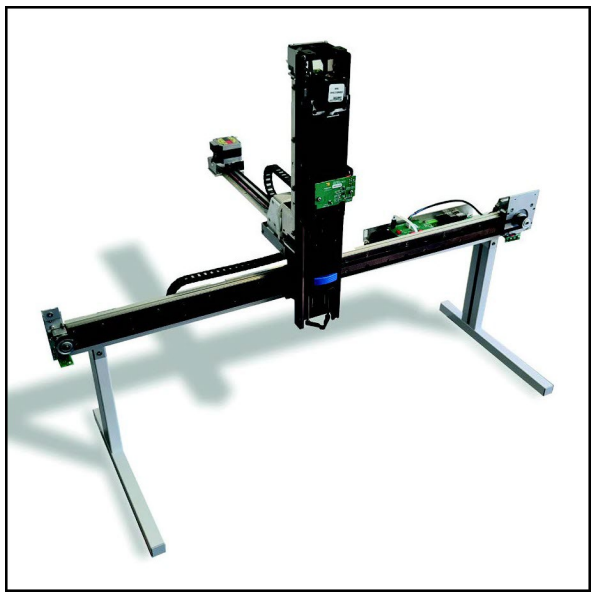


Figure 117: Instrument Covers Removed

Applying Krytox Grease

Make sure you wear protective gloves. Apply a small amount of Krytox onto your fingertip. Distribute the grease onto the cotton swab by rolling it gently.

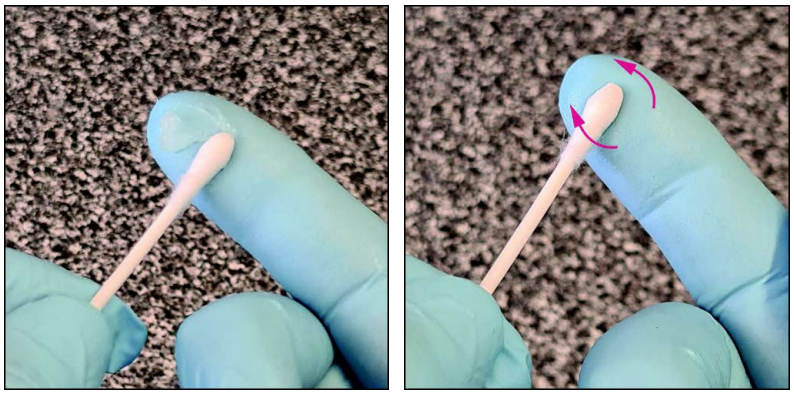


Figure 118: Krytox Grease Application

X-beam Linear Guide Lubrication (Molykote DX Paste)

Clean the X-beam linear guide (including the slide unit) before lubricating. Use a microfiber cloth for large surface areas and a cotton swab for constricted areas.

WARNING

Do not use cleaning solvents on the linear guide, which may cause damage and prohibit the autosampler from working correctly.

X-beam Microfiber Cloth Cleaning

Clean and dry all flat surfaces of the linear guides using a microfiber towel, as shown in Figure 119.

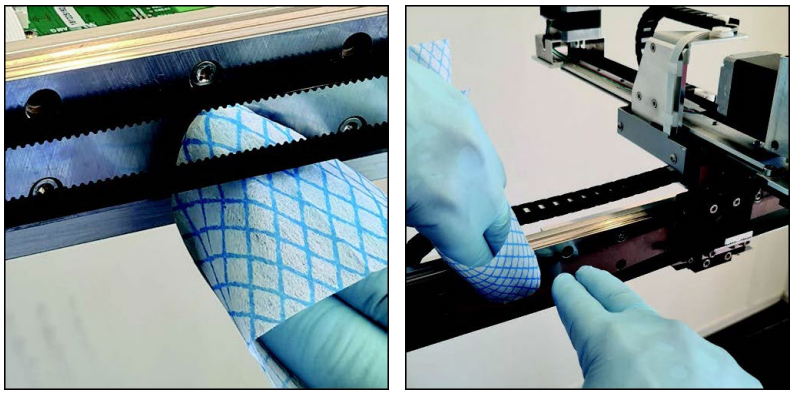


Figure 119: X-beam Linear Guides Cleaning

X-beam Cotton Swab Cleaning

Clean the X-beam upper and lower guiding groove and opening of the bearing construction, as shown in Figure 119.

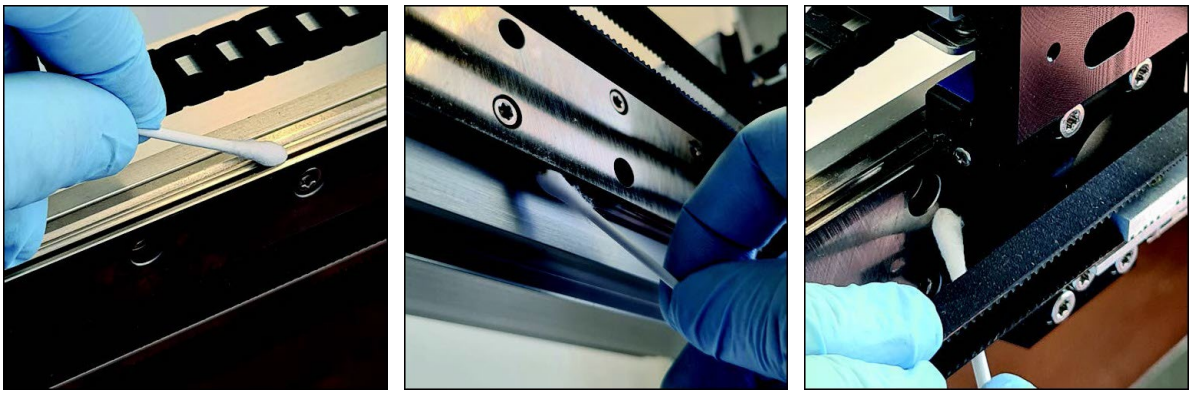


Figure 120: X-beam Upper and Lower Guides Cleaning

X-beam Cotton Swab Lubrication

Lubricate the X-beam linear guides' top and bottom sides using a cotton swab with Molykote DX paste as demonstrated in Figure 121.

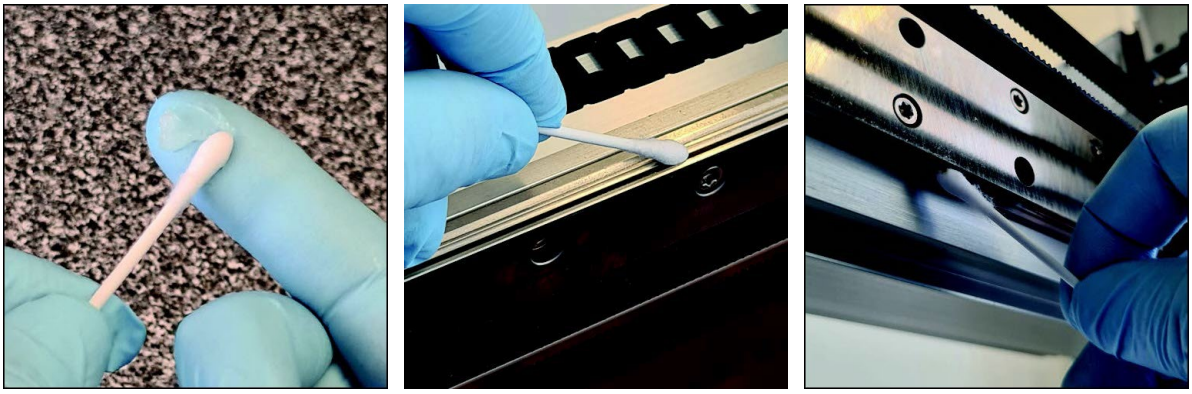


Figure 121: X-beam Linear Guides Cleaning Top and Bottom

After lubricating the X-beam linear guide, move the tower carefully from left to right several times to distribute the grease, as shown in Figure 122. Remove any visible excess paste from the X-beam.

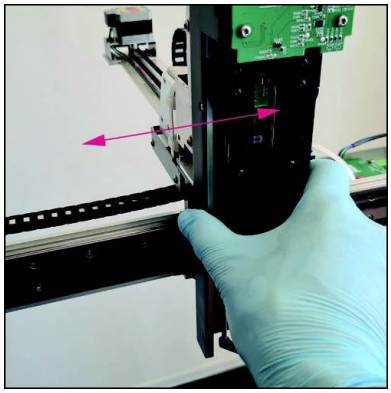


Figure 122: X-beam Grease Distribution

Y-beam Linear Guide Lubrication (Molykote DX Paste)

Clean the Y-beam linear guide (including the bearing construction) before lubricating. Use a microfiber cloth for large surface areas and a cotton swab for constricted areas.

WARNING

Do not use cleaning solvents on the linear guide, which may cause damage and prohibit the autosampler from working correctly.

Y-beam Microfiber Cloth Cleaning

Clean and dry the flat surfaces of the linear guide as indicated in Figure 123.

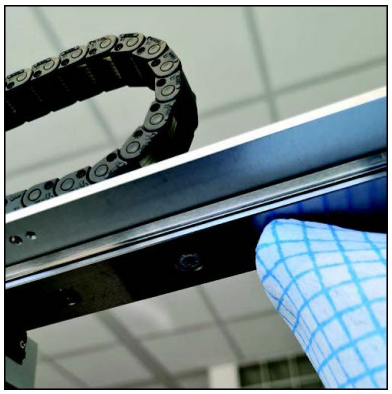


Figure 123: Y-beam Linear Guides Cleaning

Y-beam Cotton Swab Cleaning

Clean the Y-beam left and right side grooves and opening of the bearing construction as shown in Figure 124.

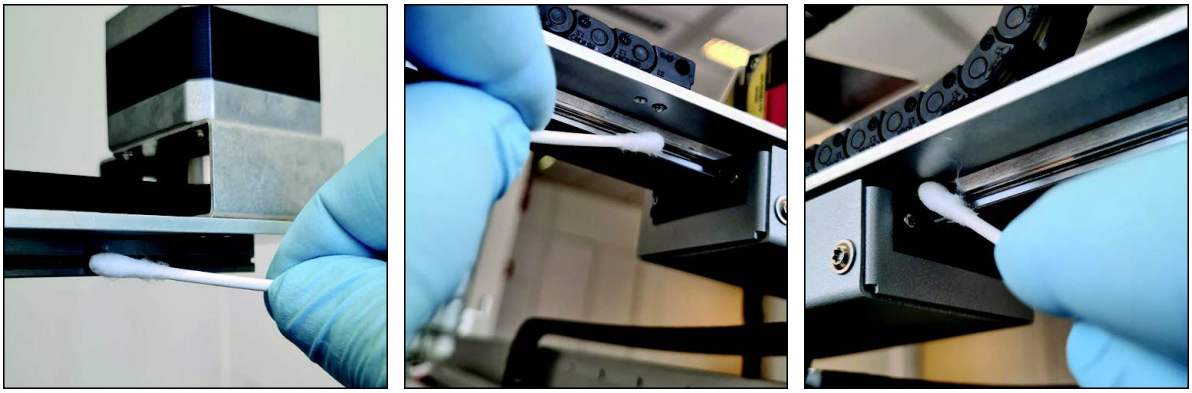


Figure 124: Y-beam Left and Right Grooves of Bearing Construction

Y-beam Cotton Swab Lubrication

Lubricate the left and right grooves of the Y-beam linear guide, as demonstrated in Figure 125.

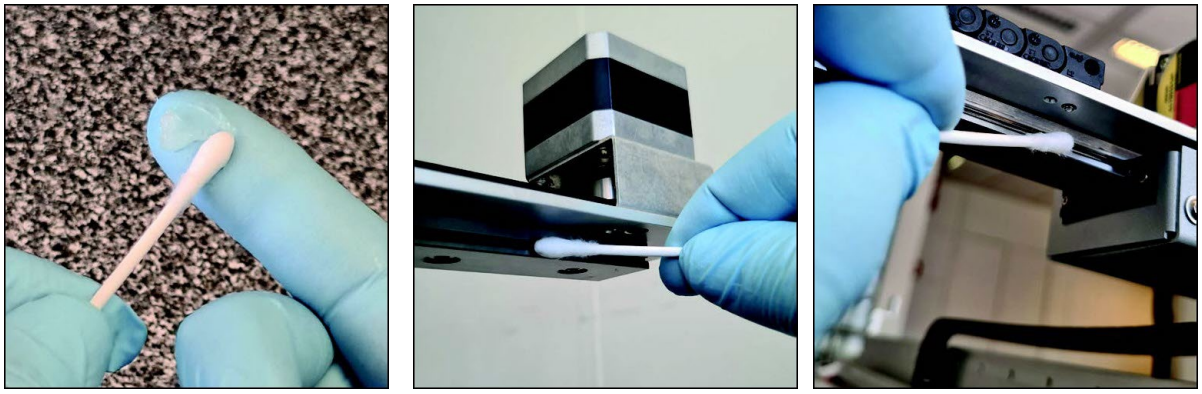


Figure 125: Y-beam Left and Right Grooves of Linear Guide

After lubricating the Y-rail linear guide, move the tower carefully several times to distribute the grease over the Y-beam, as shown in Figure 126. Remove any visible excess paste from the X-beam.

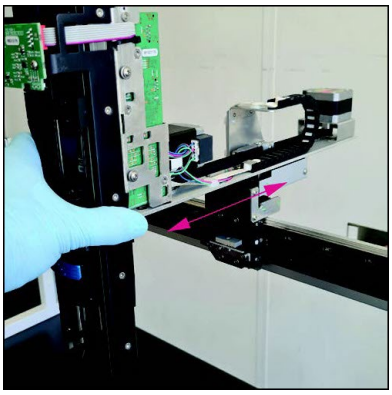


Figure 126: Y-beam Grease Distribution

Z-axis Magnetic Lock Lubrication

Lubricate the Z-axis magnetic lock on the top and bottom sides with a cotton swab. Prevent excess use of Krytox. See Figure 127.

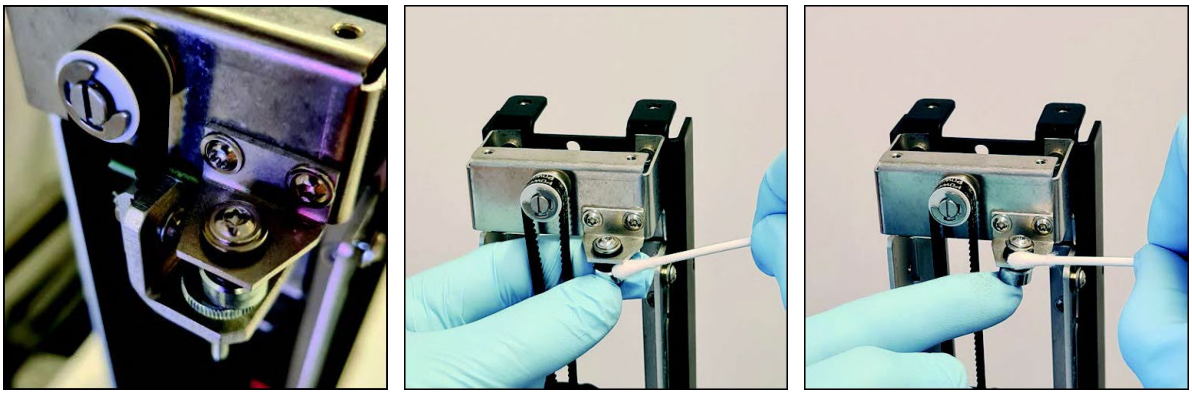


Figure 127: Z-axis Magnetic Lock

No Lubrication Parts: Tower Guides and Spindle

Materials used in the tower guides (Z-guide and needle guide) and the spindle block allow dry guiding. See Figure 128 for parts that do not require lubrication.

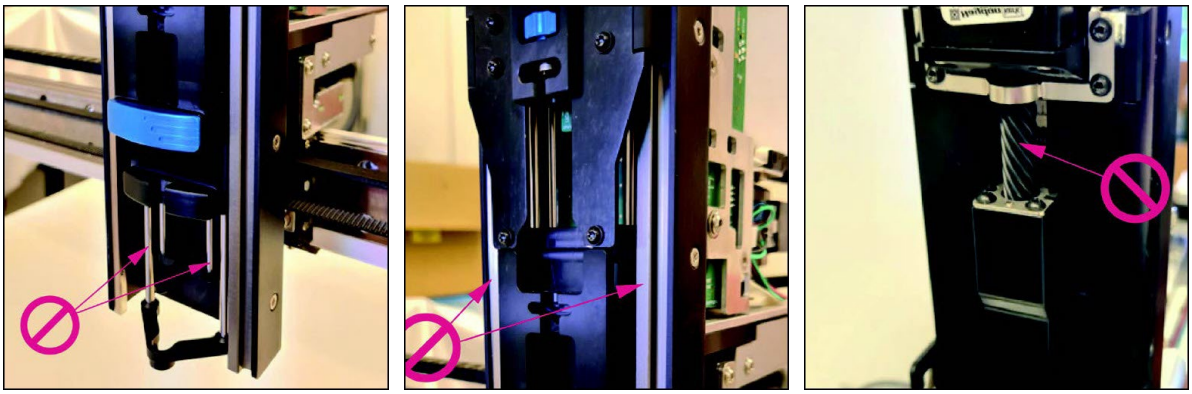


Figure 128: No Lubrication Parts

APPENDIX A – LED and Audible Status

The following section provides descriptions for the LED and audible status alerts.

A.1 LED Status

The front LED on the left side of the x-beam shows the sampler state. The table below describes the different instrument states and the corresponding LED color.

Table 6: LED Status Descriptions

State	Description	Example	LED Color
Boot	Booting the autosampler.		Blinking yellow and blinking green.
NotReady	Booting done, but not all sampler objects are ready.	One or more positions (XYZU) are unknown. RoboticCooler cooling down to setpoint.	Yellow
Ready	All sampler objects which contribute to the ready state are ready.	All positions known. Temperature controlled module is ready.	Green
Running	Running and all sampler objects are in ready state.	Performing a single move, an analytical cycle, or a script.	Blinking blue
RunningNotReady	Running but not all sampler objects are in ready state.	Temperature outside bandwidth during an analytical cycle.	Blinking blue-yellow
Faulted	Faulted, but recoverable.	Vial missing.	Blinking red
Shutdown	Hazardous Fault, no recover possible. Power down and fix the problem is the only option.	Temperature out of range.	Red

A.2 Audible Status

The autosampler generates audible sounds for different states. There are three sound pitches: high, middle, and low. The table below describes the different sound notifications and events.

Table 7: Audible Sound Descriptions

Notification	Sound
Switch power on	low, low (quick)
Autosampler booted ok	middle, high, low (quick)
Autosampler booted with fault	low, high, low, high (slow)
Recoverable fault detected	low
Critical fault detected	low, high, low, high (quick)
Firmware update	low, high, low, high, low, high (during the entire process)
Starting script or analytic function (buzzer on motion is set)	high, low (slow)
Show alive (locate sampler)	High, low (4x, quick)

APPENDIX B – Error Codes

The autosampler can detect and report numerous fault conditions. This chapter lists the most common error codes which can occur when working with Autosampler Configurator software.

Table 8: Error and Fault Codes

Error/Fault Code	Description	Remedy
-101	Failed to connect serial.	Check serial connection and baud rate.
-86	Send or receive failed, connection lost.	Go back to the connection window and reconnect. Close Autosampler Configurator and try again. Make sure that the autosampler is powered and connected.
-100		
-101		
-23	Module rename failed: name already exists.	Choose a different name.
3011	Sampler in use by another control-client.	Check that no other programs are connected to the sampler.
3020	Initialize failed but sampler is not in fault state.	Make sure that: • The wash station is properly taught. • The syringe is properly taught. • The waste vial is not missing. • The tower is not blocked.
12048	General teach error.	
12048 sub 1017	Validation of one or more teach positions failed.	Clear fault: Initialize and try again.
12048 sub 3014	Prepare teach failed: sampler is not ready or in fault state.	Clear fault: Initialize.
12048 sub 5022	Prepare teach failed: sampler is not ready or in fault state.	Vial sensor activated? Clear fault: Initialize
12048 sub 5028	Teach failed: homing XY failed.	Clear fault: Initialize. Check that the tower is not blocked.

Error/Fault Code	Description	Remedy
12048 sub 8031	Validation of depth failed. Make sure to teach beyond the top of the vial.	Needle depth must be beyond the top of the vial.
12048 sub 8032	Validation of sample depth failed. Make sure to teach beyond the top of the vial.	Sample depth must be beyond the top of the vial.
12048 sub 12023	Z position out of range: out of mechanical borders while teaching sample depth.	
12048 sub 12022	Could not detect any vials (Z travel distance out of range).	Check that the reference vial is in place.
12048 sub 12023	Reached mechanical limit while teaching.	Make sure to stay within the range of the axis while teaching.
12048 sub 12028 12048 sub 12029 12048 sub 12033	Invalid X-position: • Too close to 0.0 mm. • Too close to maximum range. Trays: cannot reach all vials for this type of tray.	Do not teach a position too close to the end of the X-axis and for trays check that the correct reference vial is used.
12048 sub 12030 12048 sub 12032	Invalid Y position: • Too close to the X-axis. Trays: cannot reach all vials for this type of tray.	Do not teach a position too close to the X-axis and for trays check that the correct reference vial is used.
12048 sub 12031	Invalid Z position. Vial sensor should not be active.	Check that the vial sensor is not activated when not teaching (sample) depth.
12048 sub 12046	Invalid XY position while teaching syringe exchange position.	Do not teach too close to the X- axis or too close to the ends of the X-axis.

About Picarro

Picarro is a leading provider of solutions to measure greenhouse gas (GHG) concentrations, trace gases, and stable isotopes across many scientific applications, along with the energy and utilities markets. Our patented Cavity Ring-Down Spectroscopy (CRDS) is at the heart of all Picarro instruments and solutions, enabling the detection of target molecules at part per billion or better resolution.

Product Support

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