

Thermo Scientific

VeriSpray PaperSpray Ion Source

User Guide

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Release history: Rev A, April 2019

Software version: TSQ Series II 3.2 instrument control software and later

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Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable North American and European regulations. Your system meets the applicable requirements in the electromagnetic compatibility (EMC) and product safety standards described in this section.

Unauthorized changes that you make to your system will void regulatory compliance and may defeat the built-in protections for your instrument. Some examples of unauthorized changes include using replacement parts or adding components, options, or peripherals that Thermo Fisher Scientific has not qualified and authorized. Unauthorized changes can also result in bodily injury and/or damage to your system and laboratory.

Ensure continued compliance with regulatory standards:

- Follow all installation instructions provided in the documentation that comes with your system.
- Order replacement parts (as specified in the instrument manual) and additional components, options, and peripherals directly from Thermo Fisher Scientific or an authorized representative.

Low Voltage Directive 2014/35/EU

This device complies with Low Voltage Directive 2014/35/EU safety standards EN 61010-1:2010, UL/CSA 61010-1:2012; EN/UL/CSA 61010-2-081:2015. .

EMC Directive 2014/30/EU and other EMC test standards

This device was tested by TÜV Rheinland and complies with the following EMC standards:
EN 61326-1 and subordinate EMC standards 47 CFR 15, Subpart B, Class A: 2015

Immunity:

- IEC/EN 61326-1:2013
- EN 61000-4-2:2009
- EN 61000-4-3:2006/A2:2010
- EN 61000-4-4:2004+A1:2010
- EN 61000-4-5:2006
- EN 61000-4-6:2009
- EN 61000-4-8:2010
- EN 61000-4-11:2004

Emission:

- IEC/EN 61326-1:2013
- EN 55011:2009/A1:2010
- CISPR11:2009+A1:2010
- AS/NZS CISPR32; FCC Title 47, Part 15 Subpart B, Class A:2017
- ICES-003 Issue 6
- VCCI CISPR 32

RoHS II Directive 2011/65/EU

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In compliance with international regulations: This instrument must be used in the manner specified by Thermo Fisher Scientific to ensure protections provided by the instrument are not impaired. Deviations from specified instructions on the proper use of the instrument include changes to the system and part replacement. Accordingly, order replacement parts from Thermo Fisher Scientific or one of its authorized representatives.

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If this product is located in Europe and you want to participate in the Thermo Fisher Scientific Business-to-Business (B2B) Recycling Program, send an email request to wEEE.recycle@thermofisher.com with the following information:

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

For additional information about the Restriction on Hazardous Substances (RoHS) Directive for the European Union, search for RoHS on the Thermo Fisher Scientific European language websites.

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

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Preface

The *VeriSpray PaperSpray Ion Source User Guide* describes how to install, operate, and maintain the Thermo Scientific™ VeriSpray™ Ion Source and sample handling system.

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- [Accessing Documentation](#)
- [Compatible Mass Spectrometers](#)
- [Special Notices, Symbols, and Cautions](#)
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- [Safety Labels on the VeriSpray Ion Source](#)
- [Contacting Us](#)

❖ To suggest changes to the documentation or to the Help

Complete a brief survey about this document by clicking the button below.
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Accessing Documentation

Thermo Scientific mass spectrometers (MSs) include complete documentation. For system requirements refer to the release notes on the software DVD.

❖ To view the product manuals

- (Windows 7) From the Microsoft™ Windows™ taskbar, choose **Start > All Programs > Thermo Instruments > MS model x.x**, and then open the applicable PDF file.
- (Windows 10) From the Windows taskbar, choose **Start > All Apps > Thermo Instruments > MS model x.x**, and then open the applicable PDF file.
- From the Method Editor view for the MS, choose **MS model > Manuals**.

❖ **To view user documentation from the Thermo Fisher Scientific website**

1. Go to thermofisher.com.
2. Point to **Services & Support** and click **Manuals** on the left.
3. In the Refine Your Search box, search by the product name.
4. From the results list, click the title to open the document in your web browser, save it, or print it.

To return to the document list, click the browser **Back** button.

Compatible Mass Spectrometers

Install the VeriSpray ion source on any of the Thermo Scientific TSQ Series II mass spectrometers.

If you have instrument compatibility questions, contact Thermo Fisher Scientific Customer Service.

Special Notices, Symbols, and Cautions

Make sure you understand the special notices, symbols, and caution labels in this guide. Most of the special notices and cautions appear in boxes; those pertaining to safety also have corresponding symbols. Some symbols are also marked on the API source itself and can appear in color or in black and white. For complete definitions, see [Table 1](#).

Table 1. Notices, symbols, labels, and their meanings (Sheet 1 of 2)








Notice, symbol, or label	Meaning
IMPORTANT	Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the product.
Note	Highlights information of general interest.
Tip	Highlights helpful information that can make a task easier.
	Caution: Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.
	Chemical hazard: Highlights a chemical hazard to humans.

Table 1. Notices, symbols, labels, and their meanings (Sheet 2 of 2)

Notice, symbol, or label	Meaning
	Hot surface: Highlights a hot surface hazard to humans.
	Risk of electric shock: Highlights an electric shock hazard to humans.
	Risk of eye injury: Highlights an eye hazard to humans.
	Trip obstacle: Highlights trip hazards to humans.
	Pinch point: Highlights hazards from moving parts that are accessible to the user. Do not place your hands in the way of these moving parts.

Safety Precautions

Observe the following safety precautions when you operate or perform service on the VeriSpray system.



CAUTION Do not perform any servicing other than that contained in this manual. To avoid personal injury or damage to the instrument, do not perform any servicing other than that contained in this manual or related manuals unless you are qualified to do so.



CAUTION Take care when moving the ion source or the automated plate loader.

Although the ion source and the automated plate loader are light enough for one person alone to lift, they are unwieldy. Use a cart when moving the hardware from one bench to another.



CAUTION Do not touch heated zones. Allow the API interface to cool to room temperature before you service it. The API interface and the mass spectrometer's ion transfer tube can be very hot and can cause severe burns if touched.



CAUTION This ion source uses voltages that can cause electric shock and personal injury. While operating the ion source, keep the covers on. Before removing the ion source from the MS, turn the ion source off and unplug its power supply module.



CAUTION Observe safe laboratory practices and procedures when handling chemicals. Only work with volatile chemicals under a fume or exhaust hood. Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of solvents.



CAUTION Risk of eye damage. Eye injury can occur from splattered chemicals, airborne particles, or sharp objects. Wear safety glasses when handling samples or chemicals.



CAUTION Risk of pinched skin. Take care when working with the automated plate loader.

Never place your hand into the automated plate loader while the elevator magazine is in motion. Wait until its motion ceases before you load or remove a plate.

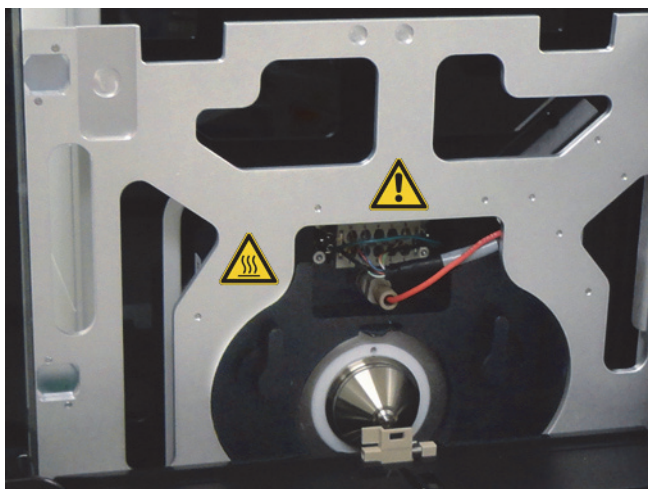


CAUTION Risk of tripping. Be aware of cords, hoses, or other objects located on the floor.

Safety Labels on the VeriSpray Ion Source

Figure 1 shows the two safety labels that appear on the ion source's mounting panel.

Figure 1. Ion source mounting panel



The generic Caution symbol is for the exposed wires.






CAUTION Do not touch the exposed wires. Take care to avoid disturbing the exposed wires above the MS inlet when mounting the VeriSpray Ion Source. If you accidentally loosen or disconnect any of the exposed wires, only a Thermo Fisher Scientific service engineer may repair the damage.

The hot surface symbol warns you that the MS inlet can reach temperatures high enough to cause burns.



CAUTION Do not touch heated zones. Allow the API interface to cool to room temperature before you service it. The API interface and the mass spectrometer's ion transfer tube can be very hot and can cause severe burns if touched.

Contacting Us

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

This chapter provides a basic overview of the VeriSpray system and PaperSpray™ technology.

Contents

- [VeriSpray System](#)
- [VeriSpray Ion Source](#)
- [VeriSpray Sample Handling System](#)
- [Status LEDs](#)
- [PaperSpray Workflow](#)
- [Specifications](#)

VeriSpray System

The VeriSpray system is a batch sampling system that uses PaperSpray technology to generate analyte ions for the Thermo Fisher Scientific TSQ II series of mass spectrometers. The system consists of a 24-count sample plate, a manual plate loader or an optional robotic sample handler, and the ion source.

VeriSpray Ion Source

The ion source consists of two components: a plate transport module with a robotic arm that moves the sample plate into the ion source and aligns the samples with the API source interface and a solvent module that provides the sample rewetting solvent, the spray solvent, and the ionizing voltage.

For information about the ion source components, see these topics:

- [Solvent Module](#)
- [Plate Transport Module](#)
- [Ion Source Power Switch](#)

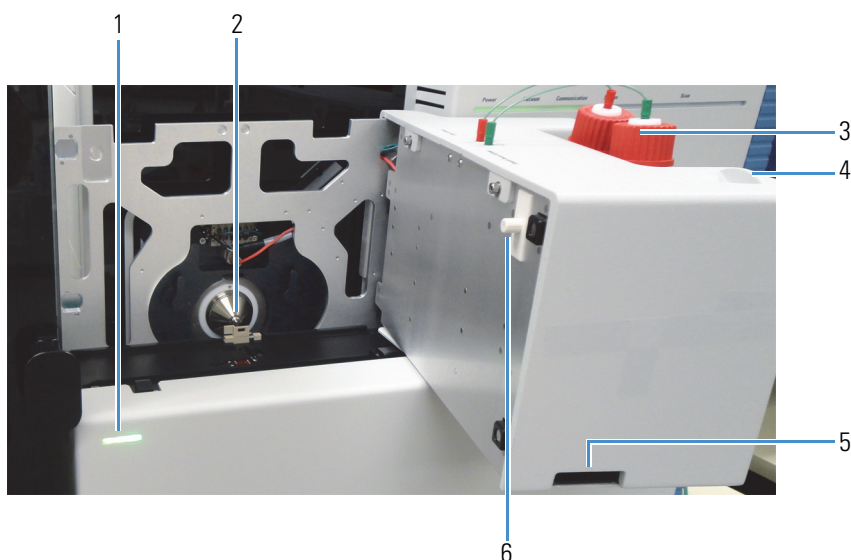
- [Barcode Scanner](#)
- [Safety Interlock System](#)

Solvent Module

The solvent module at the top of the ion source holds two 100 mL solvent bottles (Figure 2). The bottle on the left holds the sample rewetting solvent, and the bottle on the right holds the spray solvent. An integrated tubing assembly connects each solvent bottle to the associated pump inlet inside the solvent module.

The ion source door opens to expose the API source interface. The barcode scanner is visible from the lower left of the door and a safety interlock is visible in the upper right of the door's back panel.

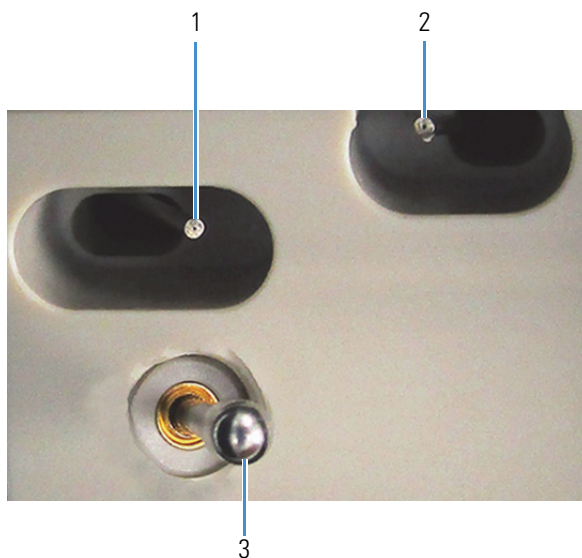
Figure 2. View of the API source interface when the ion source door is opened



No.	Description	No.	Description
1	Status LED (three LEDs)	2	API source interface (MS inlet)
3	Solvent bottles and tubing assemblies	4	Solvent module door handle
5	Barcode scanner window	6	Safety interlock

From the bottom of the door, you can see the high-voltage (HV) probe that provides the spray voltage during a PaperSpray experiment and the two solvent dispense nozzles.

Figure 3. View of the HV probe and solvent dispense nozzles



No.	Description	No.	Description
1	Spray solvent dispense nozzle	2	Rewet solvent dispense nozzle
3	High-voltage probe		

CAUTION To prevent instrument damage, follow these precautions with the solvent module:

- When you install or refill the solvent bottles, take care to avoid crimping the tubing.
- Use only the solvent bottle type provided in the installation kit (Corning product no. 1396-100); the instrument is designed to recognize the solvent level in this bottle type.
- Do not attempt to repair the tubing, the LED, or the barcode scanner, as these components may only be serviced by a Thermo Fisher Scientific service engineer. With the exception of the external solvent bottles, the solvent module contains no user-accessible components.
- Do not place objects on top of the solvent module or lean on the solvent module.
- Only open the solvent module by pulling its handle.
- Avoid opening the ion source door when the system is running a PaperSpray experiment. When the MS is scanning, the high-voltage probe that supplies the spray voltage protrudes from the bottom of the door, so opening the door can break the probe.



Related Topics

- [Filling the Solvent Bottles](#)
- [Replacing the High-Voltage Probe](#)

Plate Transport Module

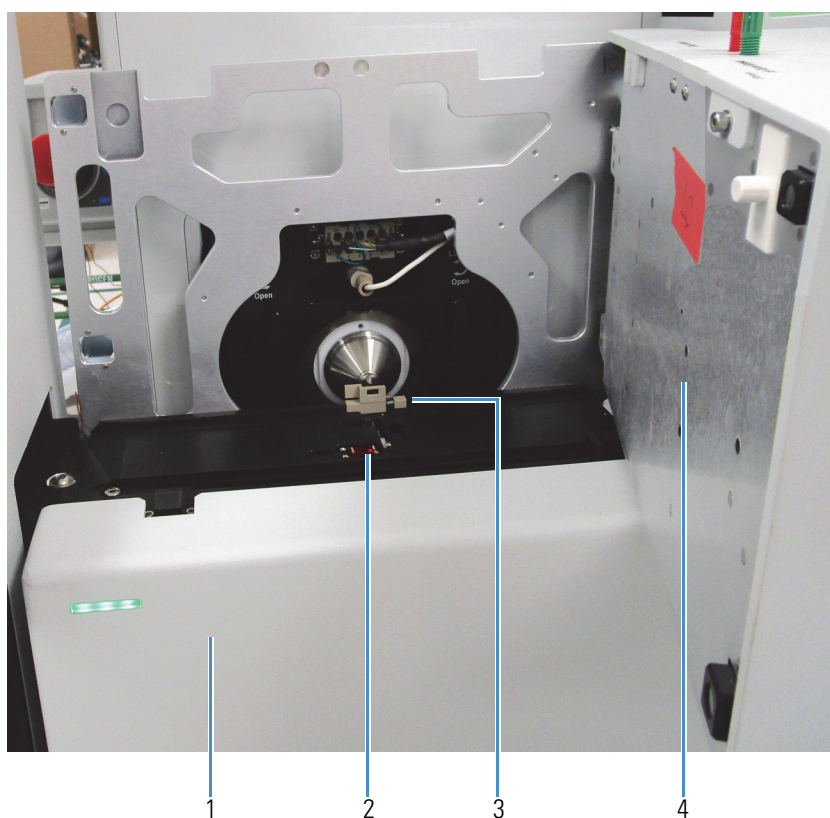
The plate transport module has a robotic arm that draws a sample plate into the ion source, and then aligns the paper strips one by one with the MS inlet.

Figure 4 shows the platform that is accessible when and the ion source door is opened. The optical sensor in the middle of the platform senses when a plate is loaded into the ion source.



CAUTION Do not place foreign objects on the plate transport platform, as doing so might damage the ion source.

Figure 4. Plate transport platform



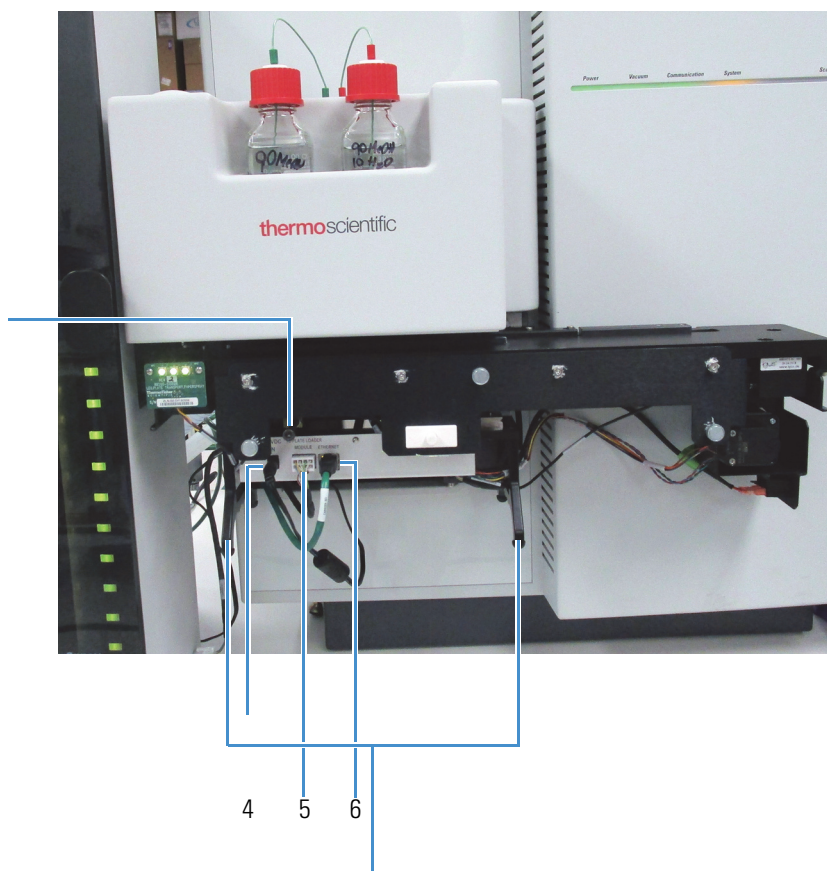
No.	Description	No.	Description
1	Cover	2	Optical sensor
3	Plate target	4	Ion source door

The module's front cover is removable for installing or removing the ion source from the MS. The cover slides onto the rails at each end of the platform, and three magnets secure it to the platform.

Figure 5 shows these components that are located below the platform:

- The z-axis alignment bolt for aligning the platform to the MS inlet
- The Ethernet port that connects to the data system's Ethernet switch
- The power port that connects to the external power supply module
- The communication port that connects to the automated plate loader
- The module's leg grips that you use to lift and move the ion source

Figure 5. Plate transport module with its cover removed XXX



No.	Description	No.	Description
1	Z-axis alignment bolt		
3a–b	Leg grips	4	24 VDC IN from the power supply module
5	8-pin communication port for the automated plate loader	6	Ethernet port

Related Topics

- [Installing the VeriSpray Ion Source on an MS](#)

Ion Source Power Switch

Use the power switch on the lower right side of the ion source to control the power to the ion source and the automated plate loader.

Figure 6. Power switch on the lower right side of the ion source



Barcode Scanner

The ion source has a built-in barcode scanner that reads the barcodes at the ends of the plates. The barcode scanner shines LED light onto the barcode through a window in the bottom left of the ion source door.

IMPORTANT Proper alignment between the ion source and the automated plate loader or the manual plate loader is essential for reading the plate barcodes.

Safety Interlock System

The ion source's safety interlock system prevents contact with high voltages. The source housing has high voltage safety interlock switches that turn off the following voltages:

- All API source and lens voltages, including the ion transfer tube offset voltage
- The voltages on the mass spectrometer ion guides

The following actions turn off the voltages:

- Opening the ion source door
- Removing the plate transport module cover

In addition, opening the ion source door turns off the following:

- The ion transfer tube heater
- The sweep gas if it is in use

VeriSpray Sample Handling System

The basic VeriSpray system comes with a manual plate loader for working with individual 24-count sample plates. For handling sample batches of up to 240 samples, order the automated plate loader.

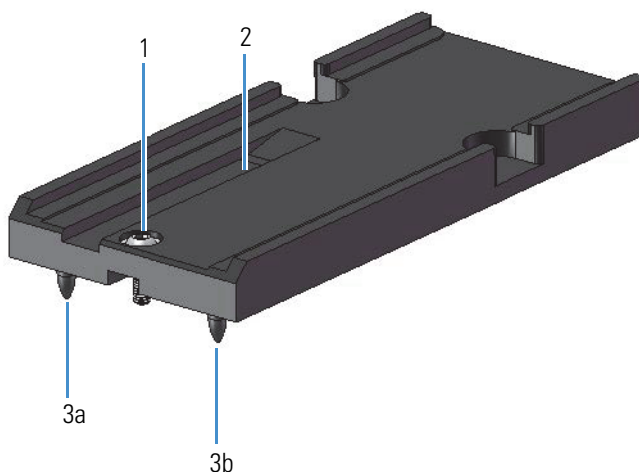
For information about the components of the sample handling system, see these topics:

- [Manual Plate Loader](#)
- [Automated Plate Loader](#)
- [Magazine](#)
- [Sample Plates](#)
- [Alignment Plate](#)
- [Plate Barcodes](#)

Manual Plate Loader

The manual plate loader holds one 24-count sample plate and provides an inexpensive sample-handling system. The two pins on the bottom of the plate fit into the two alignment holes on the left side of the ion source platform. The bolt on the top of the plate secures the plate to the platform.

Figure 7. Manual plate loader



No.	Description	No.	Description
1	Fastening bolt	2	Groove for the robotic arm to retrieve the plate
3	Alignment pins		

Automated Plate Loader

The optional automated plate loader houses a robotic elevator (carousel) that holds a magazine with a 10-plate capacity. The LEDs on the front right of the sample handler indicate the status of each plate, as well as the overall status of the sample handler. The bridge on the right side of the cabinet connects to the ion source. An 8-pin com/power cable, which connects the automated plate loader to the ion source, provides power to the plate loader and coordinates the run-time signals between the plate loader and the ion source.



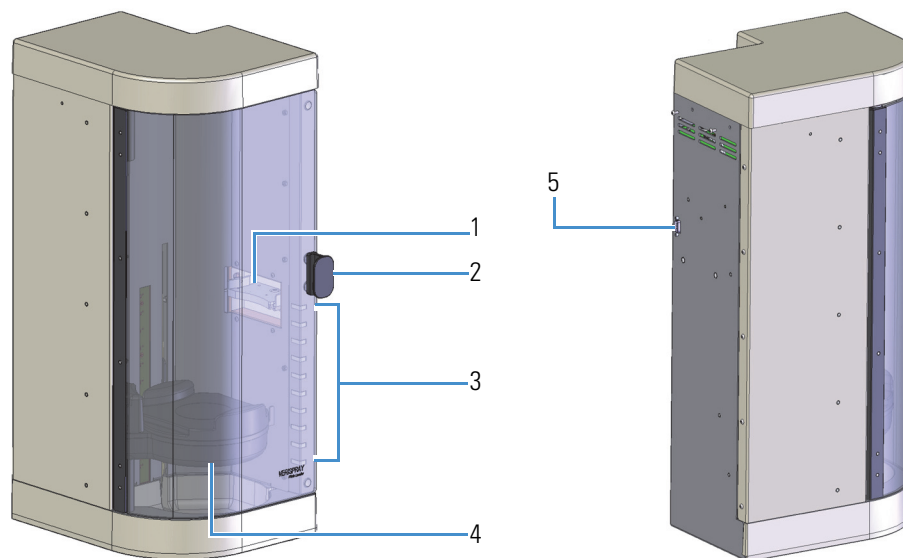
CAUTION To prevent instrument damage, follow these precautions:

- Do not open the door by pulling the plastic molding, as doing so might damage the door. Use the door knob to open the automated plate loader door.
- Do not place foreign objects into the automated plate loader, as doing so can interfere with the movement of the robotic elevator and damage the system. The automated plate loader is designed to hold only the magazine.
- Do not insert objects through the vents on the back panel of the automated plate loader.



CAUTION Although opening the door stops the robotic elevator, the elevator poses a pinch hazard if you attempt to install or remove a plate before it comes to a complete stop.

Figure 8. VeriSpray Plate Loader (front and back)



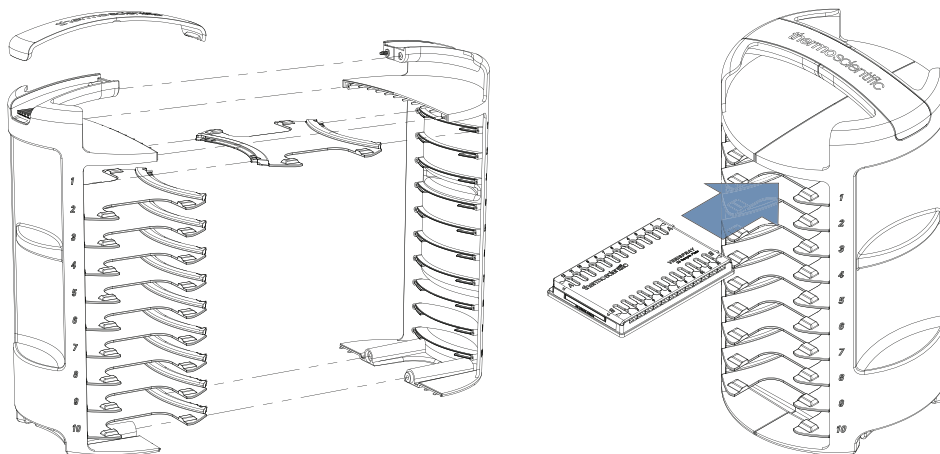
No.	Description	No.	Description	No.	Description
1	Bridge	2	Door knob	3	Status LEDs
4	Elevator (carousel)	5	Serial port for the com/power cable's DE-9 connector		

Magazine

A magazine that holds up to 10 plates ships with the automated plate loader. The magazine fits onto the robotic elevator (carousel) inside the automated plate loader.

Figure 9 shows an exploded view of the magazine on the left where you can see the brackets that secure the corners of the plate and an assembled view on the right.

Figure 9. Exploded and assembled views of the magazine



CAUTION Only load plates designed for use with the VeriSpray system into the magazine. Do not place foreign objects into the magazine, as doing so can damage the ion source.

Sample Plates

To run a PaperSpray analysis with the VeriSpray system, you must use the 24-count sample plates that you can order from Thermo Fisher Scientific.

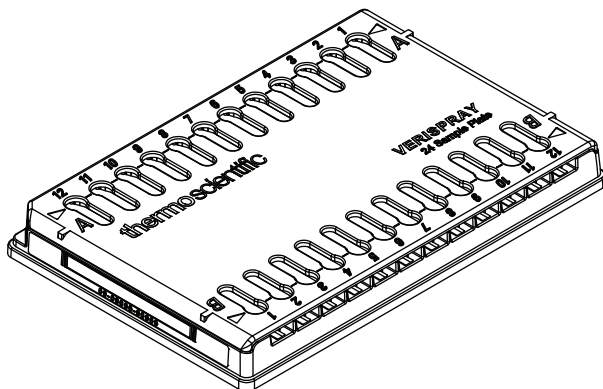
The same barcodes are affixed to both sides of the plate. On side A, the barcode is prefixed by 1A. On side B, the barcode is prefixed by 1B.



CAUTION Take care not to spill solvents on the sample plates, as excessive moisture can damage the barcode labels and the paper strips.

Embossed numbers from 1–12 identify the individual paper strip positions.

Figure 10. 24-count sample plate



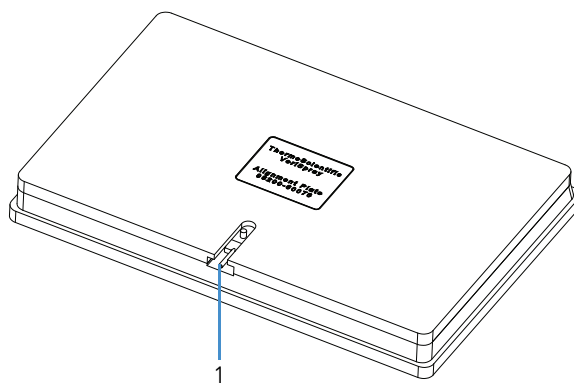
Related Topics

- [Plate Barcodes](#)
- [Preparing the Sample Plates](#)
- [Loading the Sample Plates into the Automated Plate Loader](#)
- [Mounting a Sample Plate onto the Manual Plate Loader](#)

Alignment Plate

Use the alignment plate to adjust the z -axis distance between the ion source and the MS inlet.

Figure 11. Alignment plate



No.	Description
1	Alignment pin

Plate Barcodes

The nomenclature for the plate barcodes is as follows:

TS-Serial number

where:

T = Type (0 = calibration, 1 = 24-count sample, and 2 = optimization)

S = Side (A = side A and B = side B)

Status LEDs

These topics describe the VeriSpray system's LED status indicators:

- [Ion Source LED](#)
- [Automated Plate Loader LEDs](#)

Ion Source LED

The VeriSpray ion source has a three-panel LED on the front of the plate transport module.

[Table 2](#) describes the LED states.

Table 2. Ion source states

State	Meaning
Flashing green	The ion source is initializing.
Partially illuminated green	The ion source is starting (booting) up.
Green	The ion source is ready for operation.
Flashing blue	The robotic arm is in motion.
Blue	A plate is loaded into the ion source, but it is not in motion.
Flashing yellow	The ion source is in an error state.

Automated Plate Loader LEDs

The automated plate loader has 10 LEDs, with one LED for each plate position.

Table 3. Automated plate loader states

State	Meaning
Color cycling (rainbow)	The sample handler is initializing or no magazine is present.
White	The plate position is empty.
Yellow	<p>The plate position is full, but the barcode reader has not scanned the plate or it has tried to scan the plate and failed.</p> <p>Note If you open the plate loader and accidentally misalign the magazine while the system is running, all the LEDs turn yellow with the exception of the LED for the plate position of the plate that is in the ion source. The LED for the loaded plate is blue.</p>
Green	The plate position is full, and the barcode reader has successfully scanned the plate's barcodes.
Blue	The plate from this position is in the ion source.
Flashing yellow	<p>The sample handler is in an error state.</p> <p>Tip Cycle the power to the ion source.</p>
Flashing blue and yellow	<p>The plate from this position is in the ion source, and you have incorrectly loaded another plate into this position.</p> <p>Tip Remove the plate from this magazine position, and then do one of the following:</p> <ul style="list-style-type: none"> • Install the plate in a magazine position that was empty during the last barcode scan. <p>—or—</p> <ol style="list-style-type: none"> 1. Unload the plate from the ion source 2. Remove the plate from the magazine. 3. Then, load the new plate into the magazine and rescan the barcodes.
Purple	All the strips on the plate in this position were run since the last time the ion source read the barcodes.

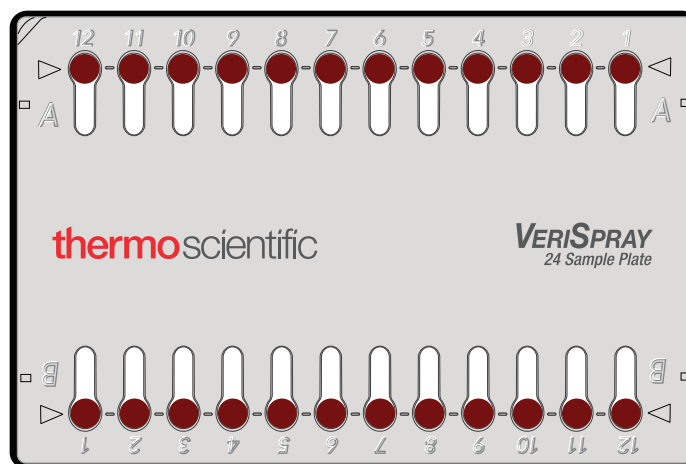
PaperSpray Workflow

These topics describe how to prepare the system and the samples for a PaperSpray analysis and how the VeriSpray system processes the samples:

- [Preparing the System and the Samples](#)
- [Running the Samples](#)

Preparing the System and the Samples

1. Sample setup—To prepare your samples for a PaperSpray analysis, do the following:
 - a. Spot the paper strips on 1–10 sample plates with approximately 5 to 12 μL of sample per strip and allow the spots to dry. Record the sample information for each spotted strip, mark the plate below each spot, or both.



- b. Load the sample plate onto the manual plate loader or the sample plates into the automated plate loader.
- c. From the Tune application or the Status page of the Xcalibur™ data system, scan the plate barcodes.

Note For quantitative analyses, Thermo Fisher Scientific recommends the use of isotopically labeled internal standards for all analytes.

2. System setup—Fill the solvent bottles with the appropriate extraction (rewetting) and spray solvents, and then prime the solvent lines.
3. Method development—In addition to the typical settings for an MS analysis, you must set up the solvent dispense programs and the spray voltage program for the PaperSpray experiment.

Tip To generate a chronogram (plot of signal intensity versus time) with a baseline at the beginning of data acquisition and a baseline at the end of data acquisition, set up a spray voltage program that begins and ends with a voltage of 0.

Running the Samples

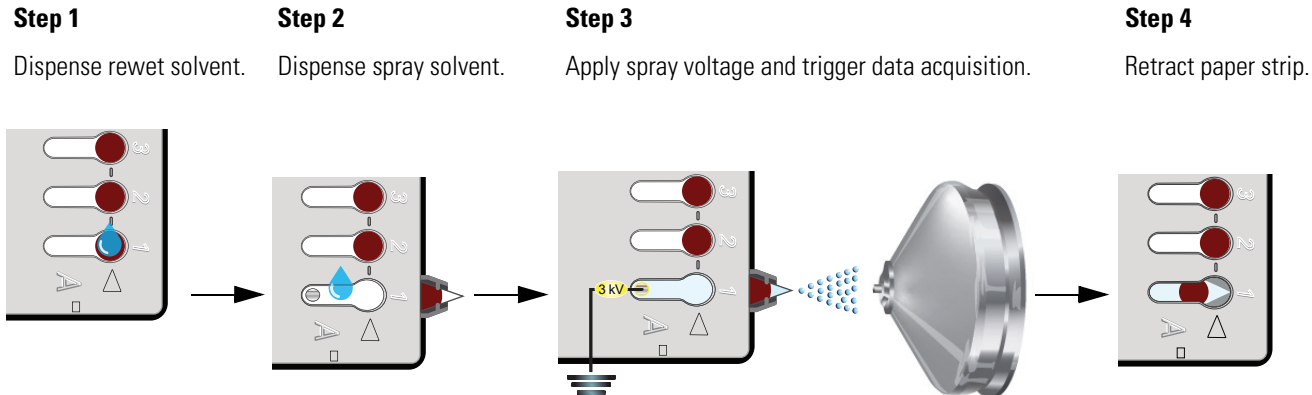
To introduce ions in the gaseous state into the MS inlet, the VeriSpray ion source does the following:

1. Draws the specified sample plate into the ion source, aligns the specified paper strip with the rewetting solvent dispenser, and then dispenses the specified amount of rewet (extraction) solvent in 10 uL increments directly onto the area you spotted on the paper strip.
2. Moves the plate further into the ion source to align the paper strip with the spray solvent dispenser, slides the paper strip forward toward the MS inlet, and then dispenses the specified amount of spray solvent in 10 uL increments behind the sample spot.
3. Triggers data acquisition and applies the programmed spray voltage to the rivet that connects the paper strip to the plate.

IMPORTANT Thermo Fisher Scientific recommends that you program the system to apply a spray voltage of 0 for approximately 0.1 min at the start and end of each run.

4. Retracts the paper strip at the end of the analysis and locks the strip to prevent reuse.

IMPORTANT Once the system retracts a paper strip, you cannot rerun the strip.



Specifications

Table 4 lists the specifications for the VeriSpray system.

Table 4. VeriSpray system specifications

Item	Specification
Sample capacity	<ul style="list-style-type: none">• 24 for a single plate• 240 with the automated plate loader
Recommended sample volume	5–12 μL
Spray voltage control	<ul style="list-style-type: none">• Positive mode: 0–6000 kV• Negative mode: 0–5500 kV
Rewet (extraction) solvent volume	0–30 μL in 10 μL increments
Spray solvent volume	0–300 μL in 10 μL increments IMPORTANT For most solvents, the maximum suggested spray volume is 200 μL . Dispensing too much solvent or dispensing large solvent volumes too quickly can overload the paper strip.
Solvent dispense delay time	0–30 s
Laboratory environment	<ul style="list-style-type: none">• Relative humidity: 20–80%, noncondensing• Temperature: 15–27 °C (59–81 °F) <p>For more information, refer to the MS preinstallation guide.</p>
Maximum drying temperature for the 24-count sample plates	50 °C (122 °F) for up to 30 min
Weight	<ul style="list-style-type: none">• Ion source: 10.7 kgs (23.5 lbs)• Automated plate loader w/o magazine: 13.6 kgs (30.0 lbs)
Power requirements	100–240 V ac nominal, 50/60 Hz, one power outlet
Product certifications	TÜV Rheinland

Laboratory Requirements

This chapter describes the laboratory requirements for a VeriSpray system.

Contents

- [Power Outlet Requirements](#)
- [Workbench Dimensions](#)
- [Workbench Clearance Guidelines](#)
- [Recommended Layout for an MS with a VeriSpray System](#)

Power Outlet Requirements

The ion source uses a 24 V DC power supply that requires a single 100–240 Vac, 50/60 Hz electrical outlet. The TSQ Series II mass spectrometer and each forepump requires a separate 230 Vac electrical outlet. The data system requires three 120 Vac or 230 Vac electrical outlets.

Workbench Dimensions

If you are using the automated plate loader, you must provide a workbench that is long enough and deep enough to hold both the MS and the automated plate loader. The automated plate loader adds an additional 11.5 cm (4.5 in.) to the front of the system and an additional 31 cm (12 in.) to the left of the system.

You can use a separate workbench for the data system computer and monitor. Workbenches must have a load capacity of at least *twice* the combined weight of all expected devices ([Table 5](#)).



CAUTION Heavy object. Never lift or move the MS or a forepump by yourself; you can suffer personal injury or damage the instrument. For additional information, contact your local Thermo Fisher Scientific service engineer.

Table 5. Approximate space and load requirements for the system modules

Equipment	Width (<i>w</i>) cm (in.)	Height (<i>h</i>) cm (in.)	Depth (<i>d</i>) cm (in.)	Weight kg (lb)
MS				
TSQ Series II MS	66 (26)	70 (28)	81 (32)	131 (289)
Ion source (plate transport module and solvent module)	54 (21.25)	N/A	15.25 (6)	10.7 (23.5)
Automated plate loader (w/o magazine)	27 (10.6)	70 (28)	33.5 (13.2)	13.6 (30.0)
Magazine (w/o plates)	N/A	N/A	N/A	1.6 (3.50)
MS with the ion source and the automated plate loader w/magazine	97 (38)	70 (28)	92.5 (36.4)	157 (71.4)
Data system				
Select a workbench that can hold the mini-tower computer, wide-screen monitor, keyboard, Ethernet switch, and optional laser printer.				
Forepumps under workbench				
(oil-sealed forepump) Leybold SOGEVAC each	32 (12.6)	26.4 (10.4)	48 (19)	52 (115)
(dry forepump) Leybold EcoDry 65 plus	32 (12.6)	29 (11)	60 (24)	43 (95)
(dry forepump) Edwards nXL110i dry pump	35 (14)	31 (12)	66 (26)	75 (165)

Workbench Clearance Guidelines

Follow these clearance guidelines for the workbenches (Figure 12):

- Place the data system and MS workbenches close to each other to prevent strain on the interconnecting Ethernet communications cables.

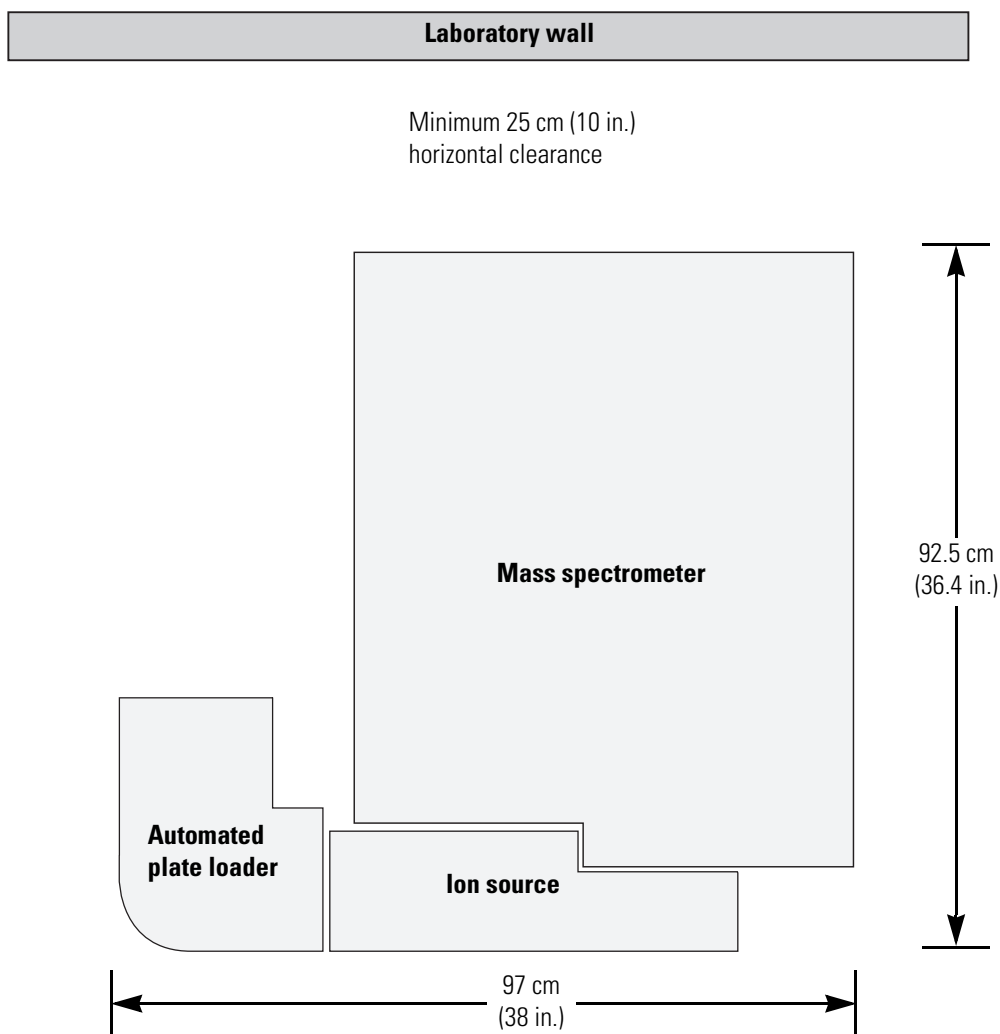


CAUTION Safety and EMC regulations require the use of Category 5e shielded Ethernet communications cables, maximum 3 m (10 ft) long.

- For the MS system and the automated plate loader, allow for a minimum vertical clearance of 92 cm (36 in.) between the top of the system and any shelves above it.

- For the MS system, allow for these minimum horizontal clearances for proper air circulation and for the installed gas lines and tubing:
 - 25 cm (10 in.) behind the instrument
 - 61 cm (24 in.) on the right side of the instrument (between the MS and any solid barrier, such as a wall)
- For the automated plate loader, allow for a minimum horizontal clearance of 25 cm (10 in.) behind the cabinet for air circulation.

Figure 12. Top view (footprint) and recommended placement of the workbench

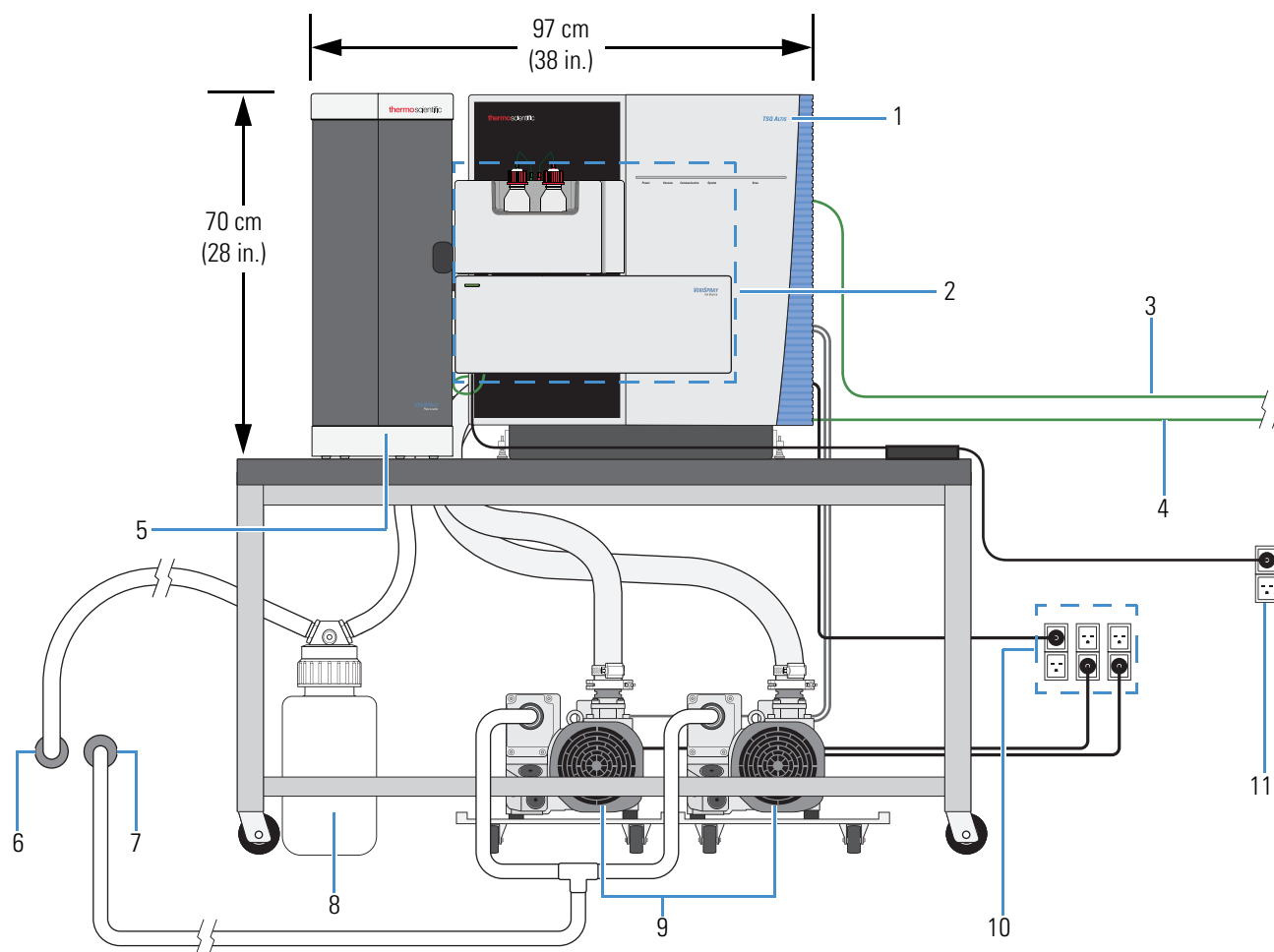


CAUTION Trip hazard. Whenever possible, provide space under the workbench for the forepumps. If placed in front of the MS, the forepumps become a trip hazard.

Recommended Layout for an MS with a VeriSpray System

Figure 13 shows an example of the recommended layout for the TSQ Altis™ MS with the VeriSpray Ion Source and the VeriSpray Plate Loader.

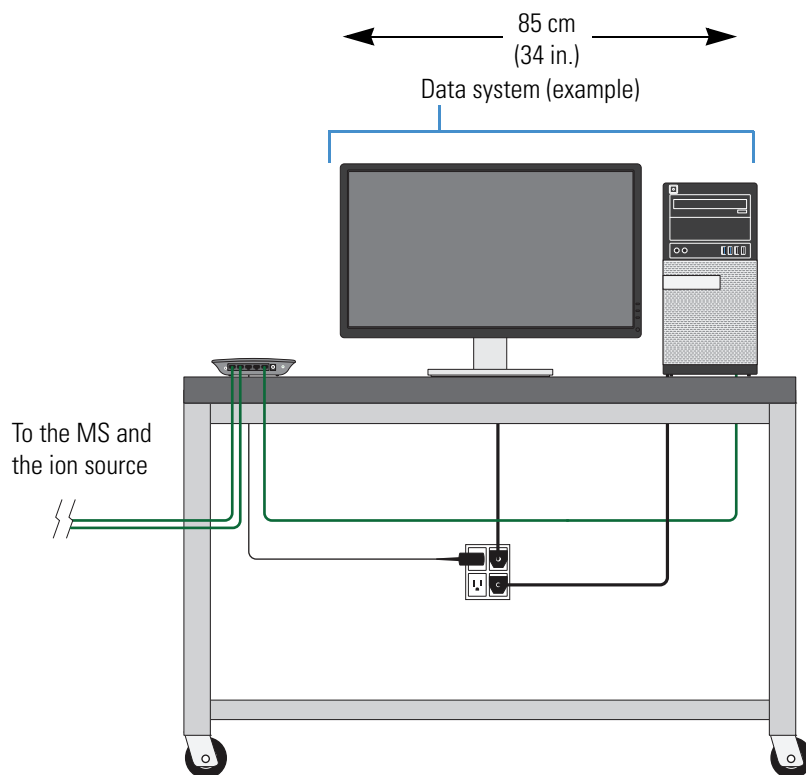
Figure 13. Workbenches for a TSQ Altis MS with the VeriSpray system



No.	Description	No.	Description
1	TSQ Series II MS	2	VeriSpray ion source
3	Ethernet cable from the MS to the Ethernet switch	4	Ethernet cable from the ion source to the Ethernet switch
5	Plate Loader	6	External vent for the solvent waste exhaust
7	External vent for the forepump exhaust	8	Solvent waste container (not required for the paper spray ion source)
9	Forepumps	10	Three electrical outlets (230 Vac) for the MS and the forepumps (circuits A, B, and C)

Figure 14 shows the data system and the Ethernet connections from the data system computer and the MS to the Ethernet switch.

Figure 14. Data System



2 Laboratory Requirements

Recommended Layout for an MS with a VeriSpray System

Installation

This chapter describes how to install the VeriSpray system on a TSQ Series II MS.

Contents

- Installing the VeriSpray Ion Source on an MS
- Installing the Solvent Bottles
- Adjusting the Distance Between the Paper Tip and the MS Inlet
- Installing the Manual Plate Loader
- Installing the Automated Plate Loader
- Installing the Plate Transport Cover
- Removing the Cover from an Installed Ion Source
- Uninstalling the Automated Plate Loader
- Uninstalling the Manual Plate Loader
- Returning the Plate Slider to the Home Position
- Running the Automated Post-Installation Calibration Procedures
- Uninstalling the VeriSpray System


Installing the VeriSpray Ion Source on an MS

Follow these topics in order:

1. [Preparing the MS for the VeriSpray Ion source](#)
2. [Removing the Cover from an Uninstalled Ion Source](#)
3. [Mounting the Ion Source onto the MS](#)
4. [Connecting the Ion Source to the Data System](#)
5. [Connecting the Ion Source to Line Power](#)
6. [Completing the VeriSpray System Installation](#)

Preparing the MS for the VeriSpray Ion source

❖ To prepare the MS for the installation of the ion source

1. From the Tune application, turn off the MS by clicking the **System Off** icon, .
2. If the MS was in operation, wait approximately 20 minutes for the API source interface to cool down before you remove the ion source.



CAUTION The external surface of the API source interface can reach temperatures of 350 °C. Before you remove the ion source, turn off the MS from the Tune application, and allow the API source interface to cool to room temperature.

3. Remove the current ion source from the MS.

Note If you have not already turned off the MS, removing the ion source turns off the MS—that is, it turns off the voltages and the API source interface heater.

4. If the sweep cone is installed on the API source interface, do the following:
 - a. Verify that the API source interface is at room temperature.
 - b. If the sweep cone is not needed for running paper spray analyses, remove it.

Removing the Cover from an Uninstalled Ion Source

The VeriSpray ion source ships with the plate transport cover installed. Two rails align the cover to the module, and three magnets secure the cover to the module.

Figure 15. Back view of the front cover showing the alignment rails and magnets



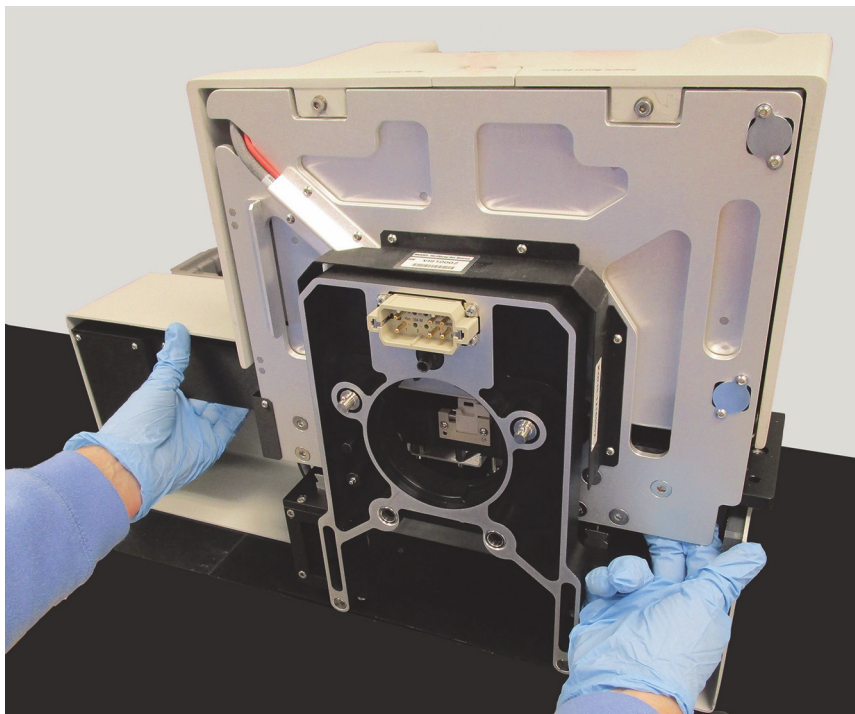
❖ To remove the cover from an uninstalled VeriSpray ion source

From the front of the module, pull the cover forward until it clears the alignment rails.

—or—

From the back of the module, use both hands to pull the back panels of the plate transport module and the solvent module forward as you push against the cover until you feel the magnets release the cover. Then, push the cover off the alignment rails.

Figure 16. Removing the plate transport cover



Mounting the Ion Source onto the MS

❖ To mount the ion source onto the MS

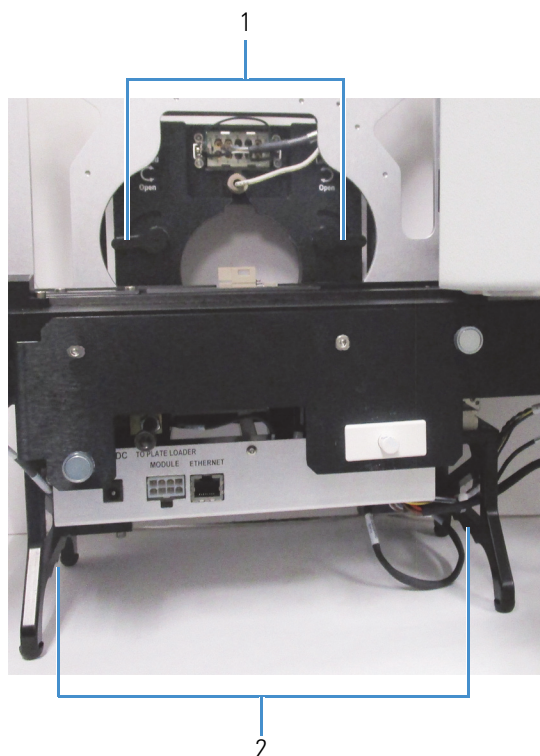
1. Prepare the MS for the installation process.
2. If the plate transport cover is installed, remove it and set it aside.
3. To mount the ion source onto the MS, do the following:
 - a. Open the ion source door so you can see the API interface mounting rails above the plate transport platform.
 - b. Open the ion source locking levers.

[Figure 17](#) shows the locking levers in the open position. It also shows the leg grips below the platform.

3 Installation

Installing the VeriSpray Ion Source on an MS

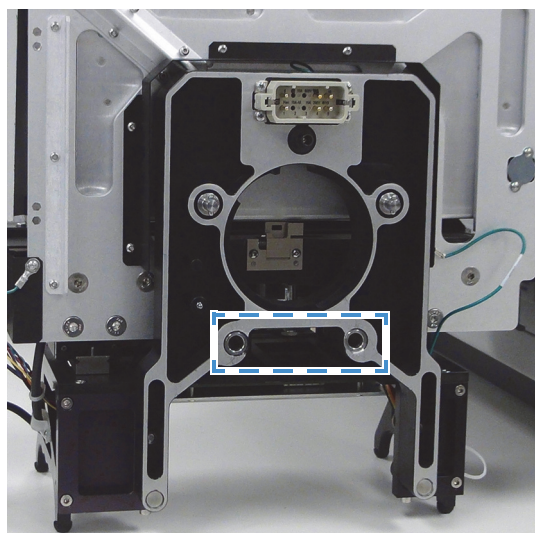
Figure 17. Locking levers in the Open position



No.	Description	No.	Description
1	Locking levers in the open position	2	Leg grips

- c. With the front of the ion source facing you, lift it by its leg grips.
- d. Align the holes in the back of the ion source with the API source interface mounting rails.

Figure 18. Back of the ion source with a view of the mounting holes

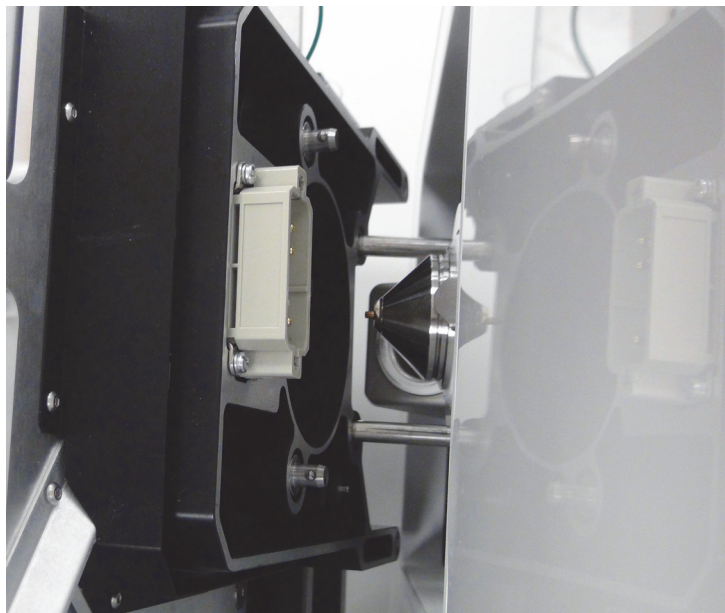




CAUTION As you mount the ion source on the MS, take care to avoid dislodging any of the visible wires. If you accidentally dislodge a wire, only a Thermo Fisher Scientific engineer may repair the damage.

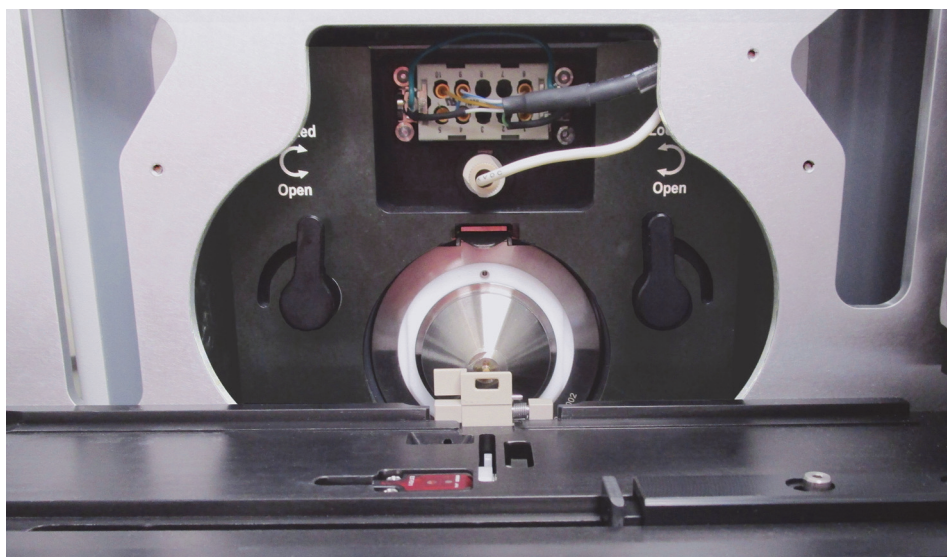
- e. Keep the ion source upright as you slide it onto the mounting rails until the mounting rails are supporting its weight.

Figure 19. Mounting the ion source onto the mounting rails



- f. Use one hand to hold the back panel of the ion source in place. Use the other hand to turn the locking levers to the Locked position.

Figure 20. Locking levers in the Locked position

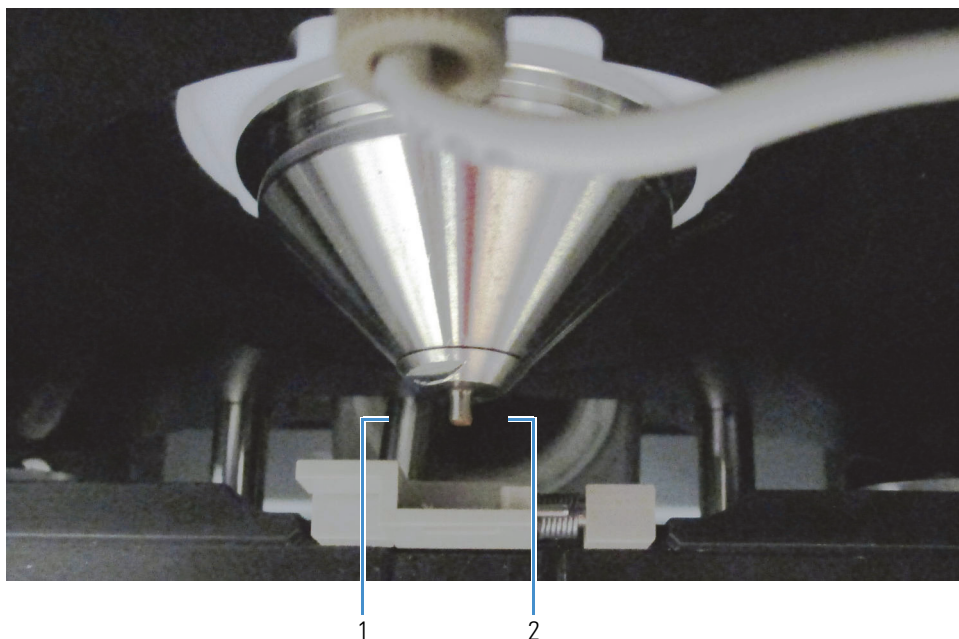


3 Installation

Installing the VeriSpray Ion Source on an MS

4. Make sure that the ion source drain pipe is positioned over the MS drain port.

Figure 21. Drain pipe over the drain port



No.	Description	No.	Description
1	Drain pipe from the ion source	2	MS drain port

5. Close the ion source door.

As you close the door, you feel a slight resistance from the interlock and hear a click as the safety interlock engages.

To connect the ion source to the data system and line power, follow the related topics.

Related Topics

- [Connecting the Ion Source to the Data System](#)
- [Connecting the Ion Source to Line Power](#)

Connecting the Ion Source to the Data System

After you mount the ion source onto the MS, connect it to the data system.

❖ To connect the ion source to the data system

Use the Ethernet cable provided in the installation kit to connect the Ethernet port on the front of the plate transport module to the data system's Ethernet switch. Route the cable through the upper slot in the left leg grip.

Connecting the Ion Source to Line Power

❖ To connect the ion source to line power

1. Route the cable from the 24V DC power supply module through the upper slot in the left leg grip, and then connect it to the 24V DC In port on the front of the plate transport module.



CAUTION Only use the Limited Power Supply (LPS) module supplied with the ion source or an equivalent LPS module.

2. Using the supplied power cord, plug the power supply module into a 100–240 V ac electrical outlet.
3. Turn on the ion source by toggling its power switch to the On (1) position.
4. Wait for the ion source to finish starting up. Then, from the Ion Source pane of the Tune application, verify that the data system recognizes the paper spray ion source—that is, make sure that the Ion Source Type readback displays Paper Spray.



5. If the data system does not recognize the ion source, try remounting it to the MS.

Completing the VeriSpray System Installation

After you mount the ion source to the MS, follow this procedure to complete the system installation.

❖ To complete the ion source installation

1. Adjust the z-axis position of the ion source—that is, adjust the distance between the paper strip tip and the MS inlet.
2. Install either the manual plate loader or the automated plate loader.
3. If you have not already connected the Ethernet cable and the power supply module, connect them.
4. Install the plate transport cover.
5. Install the solvent bottles.

Related Topics

- [Adjusting the Distance Between the Paper Tip and the MS Inlet](#)
- [Installing the Manual Plate Loader](#)

- [Installing the Automated Plate Loader](#)
- [Connecting the Ion Source to the Data System](#)
- [Connecting the Ion Source to Line Power](#)
- [Installing the Plate Transport Cover](#)
- [Installing the Solvent Bottles](#)

Installing the Solvent Bottles

When the ion source arrives, there is a protective film on the ends of the solvent lines that connect to the solvent bottle caps. The solvent bottles are packaged in a separate box.



CAUTION Take care to avoid crimping the solvent lines, as only a Thermo Fisher Scientific field service engineer may replace the solvent line assemblies.

❖ To install the solvent bottles

1. Fill the solvent bottles with the appropriate solvents.



CAUTION When handling solvents, wear safety glasses and the appropriate gloves.

2. If the system is new, remove the protective film from the ends of the solvent lines
3. Place the solvent lines into the bottles, and then screw on the bottle caps.

Adjusting the Distance Between the Paper Tip and the MS Inlet

You can adjust the distance (*z*-axis position) between the tip of the paper spray substrate and the MS inlet. Adjusting this distance within the range of 2 to 6 mm can affect the robustness of the instrument.

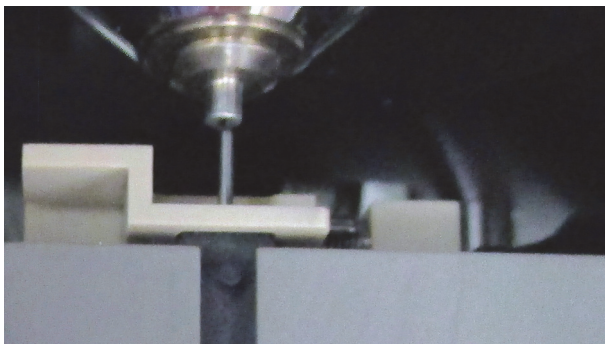
Required tools: 5 mm wrench and 5 mm hex key

❖ To adjust the distance from the MS inlet

1. Turn off the ion source by toggling its power switch to the Off (0) position.
2. Uninstall the automated plate loader if it is installed.
3. Remove the plate transport cover if it is installed.
4. Open the ion source door.

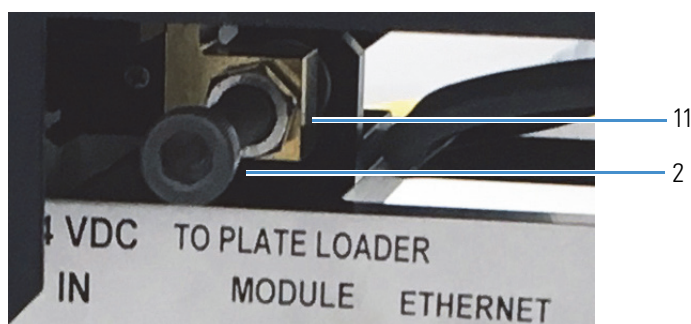
- With the alignment pin retracted, set the alignment plate on the plate transport platform so that you can position the alignment pin within the plate target window. Then, extend the pin into the target window.

Figure 22. Alignment plate with its pin extended into the target window



- Use a 5 mm wrench to loosen the locking nut on the Z-axis adjustment screw.

Figure 23. Z-axis adjustment screw



No.	Description
1	Locking nut (5 mm)
2	Z-axis adjustment screw

- Note the starting position.
- Using a 5 mm hex key, adjust the Z-axis adjustment screw by rotating it clockwise or counterclockwise until the alignment pin contacts the ion transfer tube orifice.

The position at which the alignment pin contacts the ion transfer tube orifice corresponds to the paper strip tip being 4 mm from the ion transfer tube orifice.

Tip Rotating the Z-axis adjustment screw clockwise by one full turn moves the rail 1 mm further from the inlet.

Rotating the screw counterclockwise by one full turn moves the rail 1 mm closer to the inlet.

- Note the change in position and record the final distance.
- Tighten the locking nut.

3 Installation

Installing the Manual Plate Loader

11. Retract the alignment pin into the plate. Then, remove the plate from the platform.
12. Reinstall the plate transport module cover.
13. If you are using the automated plate loader, reconnect it.
14. Run the post-installation calibration procedures.

Related Topics

- [Alignment Plate](#)
- [Installing the Automated Plate Loader](#)
- [Running the Automated Post-Installation Calibration Procedures](#)

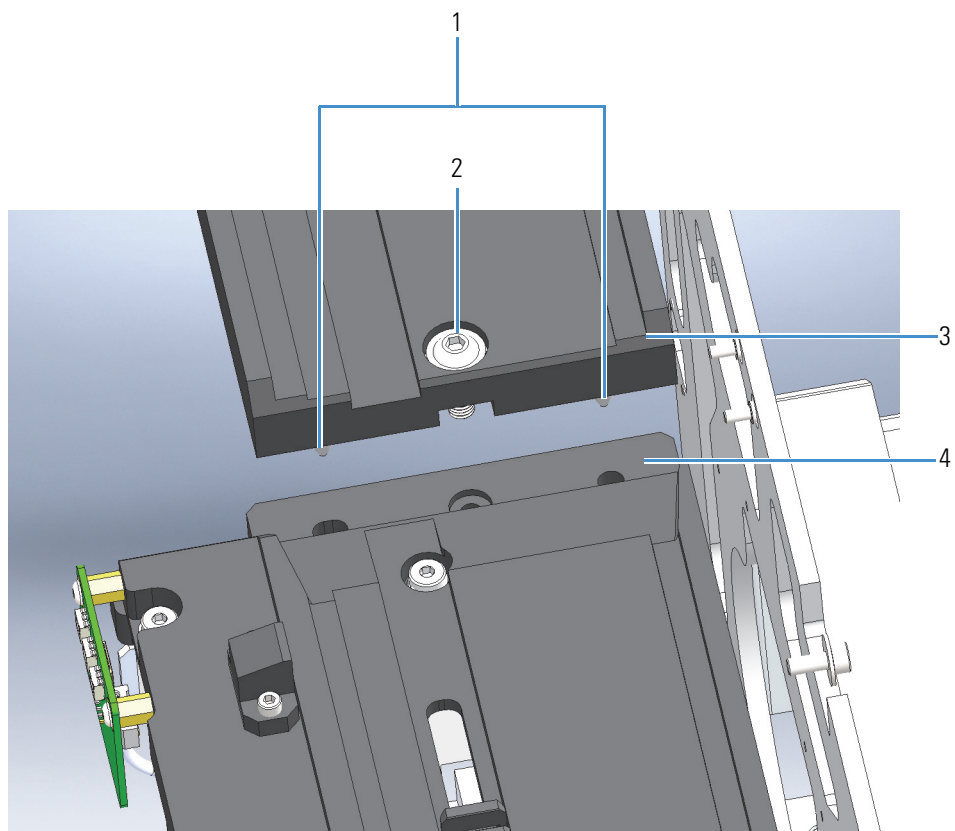
Installing the Manual Plate Loader

The manual plate loader is a platform that holds one plate.

❖ To install the manual plate loader

1. If you are replacing the automated plate loader with the manual plate loader, make sure that the plate slider of the ion source's plate transport module is in the home position.
2. Align the two pins on the bottom of the manual plate loader with the mounting holes in the ion source transport rail.

Figure 24. Aligning the positioning pins to the mounting holes



No.	Description
1	Positioning pins
2	Mounting bolt
3	Manual plate loader
4	Left side of the ion source transport rail

3. Using a 4 mm hex wrench, tighten the mounting bolt.
4. Reinstall the plate transport cover.

Related Topics

- [Manual Plate Loader](#)
- [Installing the Plate Transport Cover](#)
- [Returning the Plate Slider to the Home Position](#)

Installing the Automated Plate Loader

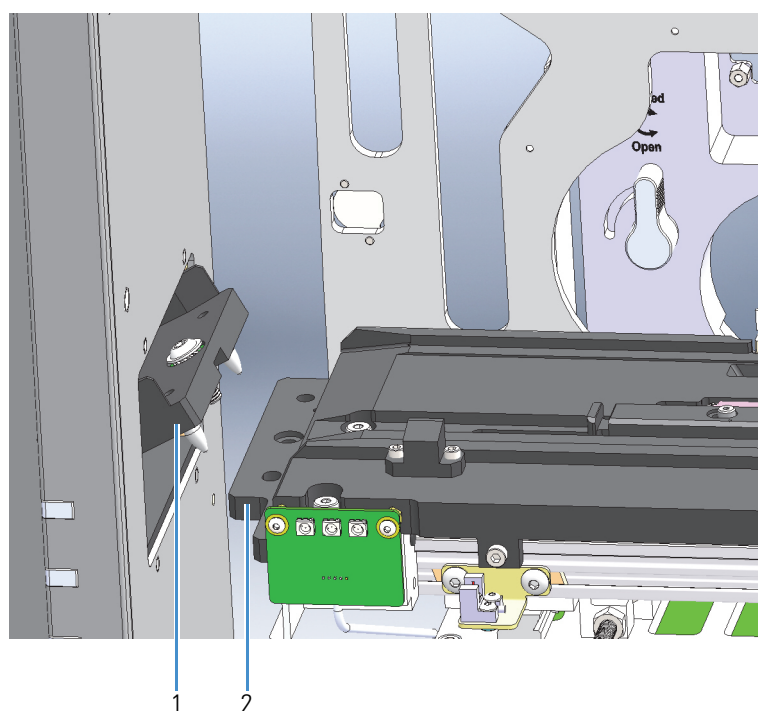
❖ **To install the automated plate loader**

1. If the syringe pump is installed, slide it to the back of the MS.

Tip Before you lift the automated plate loader, make sure that its door is securely closed. The empty module weighs less than 11 kgs (24 lbs), but it is difficult to lift and carry when its door is open. If necessary, tape the door shut before you lift the module.

2. Place the automated plate loader on the workbench to the left of the MS.
3. Open the automated plate loader door and lift the bridge.

Figure 25. Plate loader bridge shown in angled position above the ion source transport rail

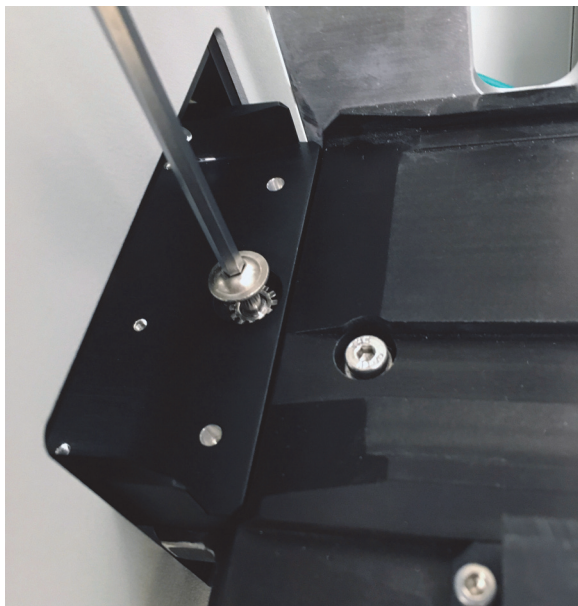


No.	Description	No.	Description
1	Bridge	2	Mounting holes in the left end of the plate transport rail

4. Slide the automated plate loader as close as possible to the ion source so that the positioning pins in the bridge align with the holes in the ion source transport rail.
5. Slide the bridge down so that the positioning pins are fully engaged.

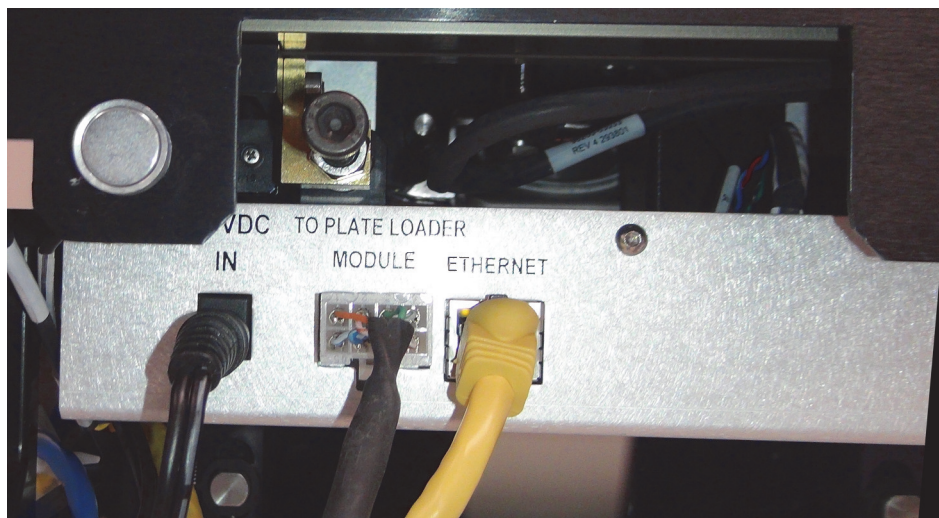
6. Use a 4 mm hex wrench to tighten the mounting bolt.

Figure 26. Tightening the bolt that secures the automated plate loader to the ion source



7. Use the cable provided in the installation kit to connect the serial port on the back of the automated plate loader to the 8-pin com/power port on the front of bottom front of the plate transport module.

Figure 27. Cable connections to the plate transport module

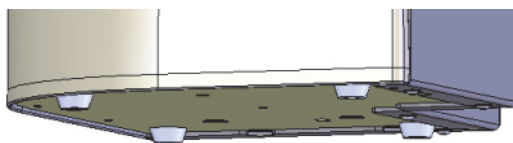


8. Reinstall the plate transport module cover.
9. Check the alignment of the automated plate loader as follows:
 - a. Make sure that the connection between the bridge and the ion source platform is square—that is, make sure that the distance between the bridge and platform is the same from back to front.

3 Installation

Installing the Plate Transport Cover

- b. Make sure that all four legs of the automated plate loader contact the benchtop—that is, make sure that you cannot slide a piece of paper under any of the four legs.



IMPORTANT Proper alignment is critical to the performance of the sample handling system. If the system is not aligned properly, the ion source might fail to read the plate barcodes or fail to load the plates properly.

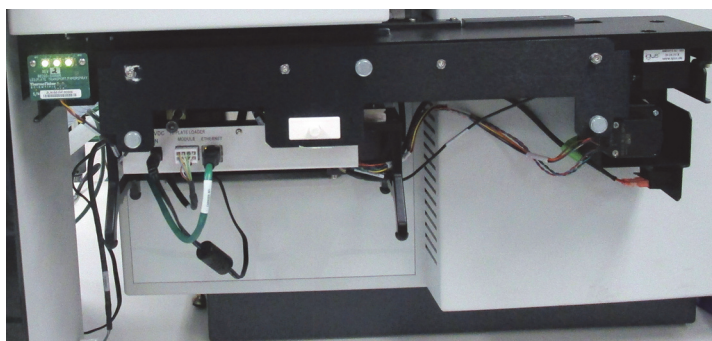
Installing the Plate Transport Cover

After you connect the manual or automated plate loader and the cables to the ion source, reinstall the plate transport cover.

❖ To install the plate transport cover

Slide the cover's alignment slots onto the ion source's alignment rails, and then push the cover forward until it engages with the three magnets that secure it to the ion source.

Figure 28. View of the mounted ion source without its cover



Related Topics

- [Removing the Cover from an Uninstalled Ion Source](#)

Removing the Cover from an Installed Ion Source

❖ To remove the cover from the ion source when it is mounted to the MS

1. To release the plate transport module cover from the ion source, simultaneously push against the front of the MS with your knuckles and the back of the cover with your fingertips.
2. After the cover is released from the three magnets that secure it to the ion source, pull it away from the ion source and off the alignment rails.

Uninstalling the Automated Plate Loader

If the automated plate loader is installed and you want to install the manual plate loader or a different ion source, you must uninstall the automated plate loader.

❖ To disconnect the automated plate loader from the ion source

1. Place the plate slider of the ion source's plate transport module in the home position.
2. Turn off the ion source by toggling its power switch to the Off (0) position.
3. Remove the plate transport cover.
4. Unplug the cable from the 8-pin port below the ion source platform.
5. Using a 4 mm hex wrench, remove the bolt that secures the plate loader bridge to the ion source.
6. Open the plate loader door, lift the bridge, and push the plate loader away from the ion source.

Related Topics

- [Returning the Plate Slider to the Home Position](#)
- [Removing the Cover from an Installed Ion Source](#)
- [Plate Transport Module](#)

Uninstalling the Manual Plate Loader

❖ To uninstall the manual plate loader

1. Make sure that the plate slider is in the home position.
2. Use a 4 mm hex wrench to remove the bolt that secures the manual plate loader to the ion source.

3. Lift the manual plate loader upward until the two positioning pins on its bottom clear the mounting holes in the plate transport rail.

Related Topics

- [Returning the Plate Slider to the Home Position](#)


Returning the Plate Slider to the Home Position

The plate transport slider moves the plate into the ion source and positions it in front of the inlet. Its home position is all the way to the right.

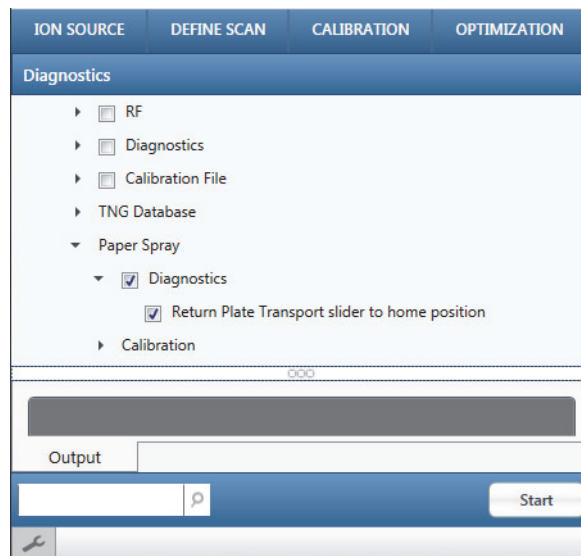
After you connect the manual plate loader to the ion source and cycle the ion source power, the plate transport slider arm extends fully to the left so that you can install a plate on the hook at the end of the arm.

Before you uninstall the manual plate loader, you must move the plate transport slider to the home position.

❖ To return the plate slider to the home position

1. If the ion source is turned off, turn it on by toggling its power switch to the On (1) position.
2. From the data system computer, open the Tune application for your MS.
3. Click the **Diagnostics** icon, , at the bottom left of the window.
4. In the Diagnostics pane, expand the Paper Spray options.
5. Select the **Diagnostics** check box.

Note Selecting the Diagnostics check box automatically selects the Return Plate Slider to Home Position check box.

Figure 29. Diagnostics pane of the Tune application

6. Click **Start**.

Running the Automated Post-Installation Calibration Procedures

After you install the ion source, the automated plate loader, or both, follow this procedure.


❖ To run the automated calibration procedures

1. Turn on the power to the VeriSpray system and wait for it to initialize.

Note During the initialization process, the ion source LED flashes green. If the automated plate loader is installed, its LEDs color cycle.

2. Prepare the system as follows:
 - Make sure that the plate transport cover is installed and that all the system doors are closed.
 - If the automated plate loader is installed, remove the magazine if it is installed.

Note During the automated Calibrate Plate Loader Module procedure, the hook at the end of the robotic arm travels the full distance between where it would pick up a plate from the magazine and the home position on the plate transport platform. If the magazine is installed in the automated plate loader, it interferes with the movement of the robotic arm as it fully extends into the plate loader.

- Make sure that the ion source is empty.
3. From the data system computer, open the Tune application for your MS.
 4. Click the **Diagnostics** icon, , at the bottom left of the window.

5. In the Diagnostics pane, expand the Paper Spray options, and then expand the Calibration options.
6. Run the Calibrate Solvent Module utility.
7. Run the Calibrate Plate Transport utility.
8. If the system includes the automated plate loader, run the Calibrate Plate Loader Module utility.
9. Power cycle the system to ensure proper operation.

Related Topics

- [Calibrating the Solvent Module](#)
- [Calibrating the Plate Transport Module](#)
- [Calibrating the Automated Plate Loader](#)

Uninstalling the VeriSpray System

To install a different type of ion source on your TSQ Series II MS, you must uninstall the VeriSpray system.

❖ To uninstall the VeriSpray system

1. Uninstall the manual plate loader or the automated plate loader.
2. Turn on the ion source by toggling its power switch to the On (1) position.
3. Disconnect the Ethernet cable and the power supply module.
4. While holding the ion source upright, place the locking levers in the Open position.
5. Carefully pull the ion source away from the MS and off the mounting rails.

Automated System Calibration Procedures

This chapter describes how to run the automated system calibration procedures from the Tune application.

Contents

- [Calibrating the Solvent Module](#)
- [Calibrating the Plate Transport Module](#)
- [Calibrating the Automated Plate Loader](#)

Calibrating the Solvent Module

The solvent module calibration utility calibrates the motor that moves the high-voltage probe and the solvent dispense needles.

❖ To calibrate the solvent module motor


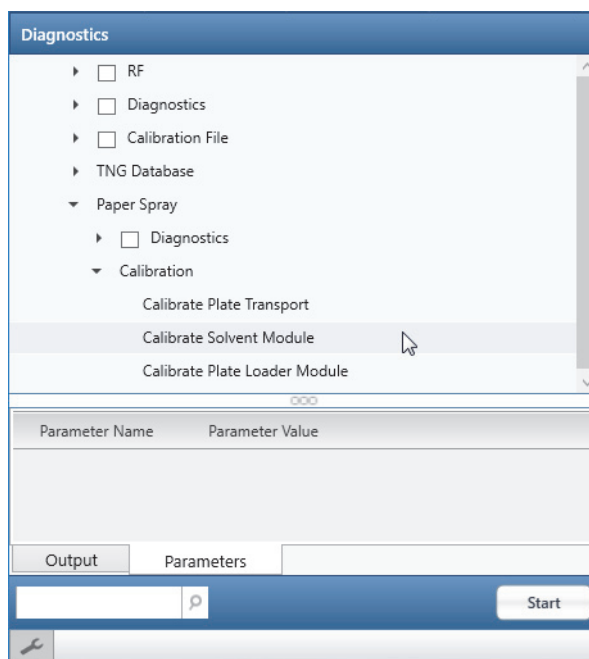
1. Click the **Diagnostics** icon, , in the lower left corner of the Tune window.
2. Expand the Paper Spray options and the Calibration options.
3. Select **Calibrate Solvent Module**.

Figure 30. Calibrate Solvent Module selected



4. Click **Start**.
5. At the prompt, verify that the ion source is empty, and then click **OK**.

Tip To verify that the ion source is empty, check the Plate status, Plate
Empty, in the Tune window.

Related Topics

- [Running the Automated Post-Installation Calibration Procedures](#)
- [Solvent Module](#)

Calibrating the Plate Transport Module

The plate transport calibration utility calibrates the motor that moves the plate left and right and aligns the plate with the inlet of the mass spectrometer.

❖ To calibrate the solvent module motor


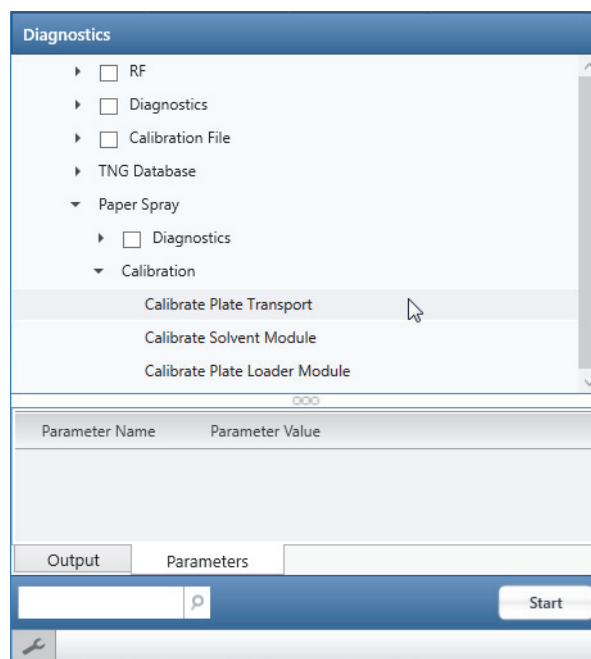
1. Click the **Diagnostics** icon, , in the lower left corner of the Tune window.
2. Expand the Paper Spray options and the Calibration options.
3. Select **Calibrate Plate Transport**.

Figure 31. Calibrate Plate Transport selected




4. Click **Start**.
5. At the prompt, verify that the automated plate loader is empty if it is installed, and then click **OK**.

Note If the automated plate loader contains the magazine, the magazine will obstruct the motion of the robotic arm as the utility attempts to calibrate the number of motor steps between the leftmost position and the home.

Calibrating the Automated Plate Loader

The plate loader calibration utility calibrates the motor that raises and lowers the magazine in the automated plate loader, the motor that rotates the magazine, and the sensors that detect the presence or absence of the magazine and the plates at each position in the magazine.

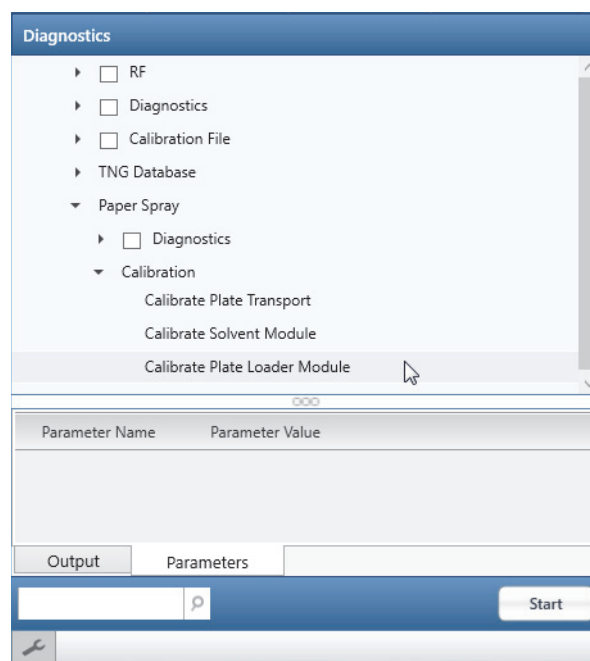
❖ To calibrate the plate loader motors and sensors

1. Click the **Diagnostics** icon, , in the lower left corner of the Tune window.
2. Expand the Paper Spray options and the Calibration options.
3. Select **Calibrate Plate Loader Module**.

4 Automated System Calibration Procedures

Calibrating the Automated Plate Loader

Figure 32. Calibrate Plate Loader Module selected



4. Click **Start**.
5. At the prompt, load five sample plates into the bottom five slots in the magazine, and then click **OK**.

Operation

This chapter describes how to prepare the sample plates, load the sample plates into the ion source, and run either a single paper spray analysis from the Tune application or a sample set from the Xcalibur data system.

Contents

- [Turning the Ion Source Power On or Off](#)
- [Calibrating the Mass Accuracy of the MS](#)
- [Optimizing the MS Parameters for Your Analytes](#)
- [Compatible Rewetting and Spray Solvents](#)
- [Filling the Solvent Bottles](#)
- [Preparing the Sample Plates](#)
- [Loading the Sample Plates into the Automated Plate Loader](#)
- [Mounting a Sample Plate onto the Manual Plate Loader](#)
- [Priming the Ion Source Pumps](#)
- [Reading the Barcodes on the Plates in the Automated Plate Loader](#)
- [Running a Paper Spray Experiment from the Tune Application](#)
- [Setting Up the Solvent Dispense Program in the Tune Application](#)
- [Setting Up the Paper Spray Parameters in an Instrument Method](#)
- [Working with Xcalibur Sequences](#)

Turning the Ion Source Power On or Off

To use the VeriSpray system, you must turn on its power. When the system is not in use, you can turn it off to conserve energy.

Note To run a paper spray analysis, the MS must be ready for operation (in the Operating mode) and turned on, and the ion source must be turned on.

❖ **To turn the ion source power on or off**

- To turn on the ion source, place the On/Off switch in the On (1) position.
- To turn off the ion source, place the On/Off switch in the Off (0) position.

Related Topics

- [Ion Source Power Switch](#)

Calibrating the Mass Accuracy of the MS

To calibrate the mass accuracy of the MS, follow the instructions in the MS hardware manual.

Note At the time of publication (April 2019), the calibration plate for use with the VeriSpray ion source was not released. For updates, check with your local Thermo Fisher Scientific sales representative.

Optimizing the MS Parameters for Your Analytes

To optimize the MS parameters for your analytes, follow the instructions in the MS hardware manual.

Note At the time of publication (April 2019), the optimization plate for use with the VeriSpray ion source was not released. For updates, check with your local Thermo Fisher Scientific sales representative.

Compatible Rewetting and Spray Solvents

Refer to the *Solvent Requirements and Recommendations* topic in your *TSQ MS Preinstallation Guide* for information about compatible solvents.

Filling the Solvent Bottles

You cannot remove the solvent tubing that connects the solvent bottles to the solvent pumps inside the ion source.

Note When the solvent level in solvent bottle A or solvent bottle B falls below the 20 mL mark, the bottle's solvent level indicator in the Tune application toolbar changes from blue to gray.

❖ To fill a solvent bottle and flush its solvent line

1. Place a piece of lint-free tissue on the rim of the solvent module next to the solvent bottles.
2. To avoid crimping the tubing, carefully remove the bottle cap and place it on the lint-free tissue.
3. To avoid spilling solvents on the ion source, remove the bottle from the ion source.



CAUTION Because the ion source housing does not prevent solvents from entering the ion source through the back panel, spilling solvents on the ion source can cause irreparable hardware damage.

4. Fill the solvent bottle with additional solvent or a different solvent.



CAUTION When handling solvents, wear safety glasses and the appropriate gloves.

5. Reconnect the bottle cap to the bottle.
6. Open the Tune application and click **Prime Pumps**.

Preparing the Sample Plates

Note You can continue to use a sample plate as long as it has unused sample strips.

❖ To spot the paper strips

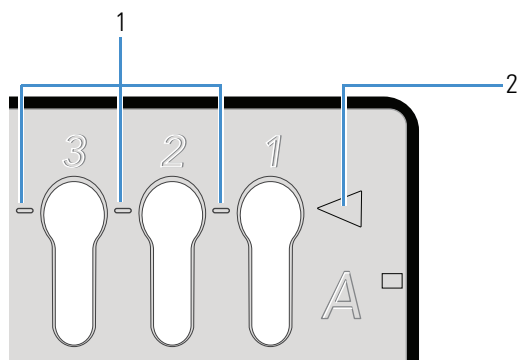
1. Try a test spot with the sample solution as follows:
 - a. Draw a 5 to 12 μL sample aliquot into a pipettor with a disposable tip.

IMPORTANT The optimal sample volume depends on the sample viscosity and surface tension. Thermo Fisher Scientific recommends the following sample volumes:

- Whole blood samples: 6–12 μL
- Urine, food matrices, or neat samples: 5–10 μL

- b. Gently touch the disposable tip to the paper strip at the center of the circular cutout area, as indicated by the dash markings and arrows on the top surface of the plate.

Figure 33. Closeup of the target area markers



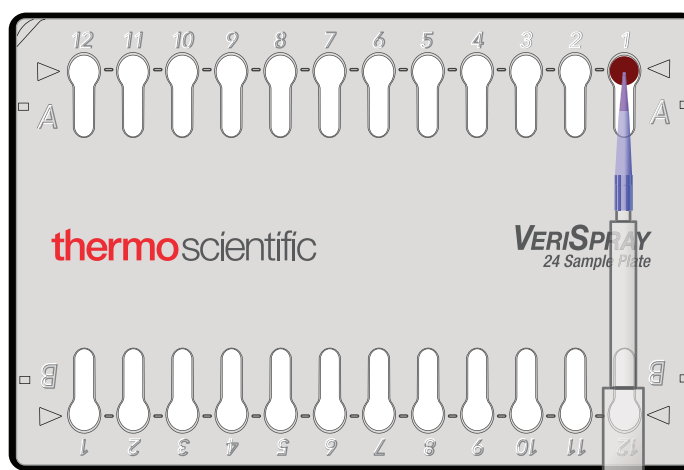
No.	Description	No.	Description
1	Dash marks	2	Arrow

- c. Make sure that the sample spot touches both the left and right edges of the strip. If possible, make sure that the sample spot does not spread to the tip of the strip. For example, if the sample solution has some coloration, check the tip of the strip from the side window.

IMPORTANT The placement of the sample spot on the paper strip can affect the analysis:

- If the sample spot does not touch the left and right edges of the paper strip and the sample matrix forms a relatively impenetrable barrier, the spray solvent might pass around the sample spot rather than through it.
- If the sample spot spreads to the tip of the paper strip, the spray solvent might pull more of the matrix compounds into the spray.

Figure 34. Spotting a paper strip



- d. If necessary, adjust the sample volume for the next strip as follows:
 - If the spot does not cover the strip from edge to edge, increase the volume.
 - If the sample solution spreads to the tip of the paper strip or overflows the paper strip, reduce the volume.
2. As you spot the paper strips, do one or both of the following:
 - Enter a description for each sample in a laboratory notebook. Record the plate's barcode ID and the paper strip position.
 - On the sample plate itself, write a description above each paper strip that you spotted.
3. Allow the sample spots to dry.

You can air dry the spots or place the sample plates in an oven at 50 °C for approximately 30 minutes.



CAUTION Do not use a heat gun to dry the sample spots. Heat guns can generate air temperatures that far exceed the maximum temperature that the sample plates can tolerate.

Loading the Sample Plates into the Automated Plate Loader

You can insert sample plates into the magazine before or after you load the magazine into the automated plate loader.

❖ To load the sample plates into the automated plate loader

1. Open the plate loader door by its door knob.

Note If the ion source is turned on, its LED goes from green to flashing yellow and a message that prompts you to close the door appears. The LED returns to green when you close the door. If you open the door during a sequence run, the system completes the current sample run.



CAUTION Do not open the door by pulling the plastic molding, as doing so might damage the door.

2. With an open face of the magazine facing you, place the magazine on the elevator.

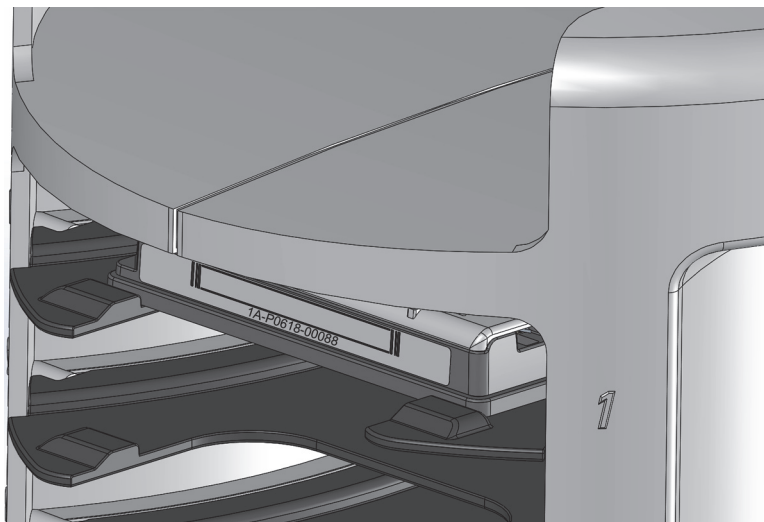
Note When in operation, the robotic elevator turns an open face of the magazine toward the ion source and moves the magazine up and down so that the barcode scanner can read the plate barcodes. The elevator also moves the magazine up and down so that the robotic arm of the plate transport module can retrieve the specified plate.

3. Insert either end of the sample plate into a magazine slot. Then, make sure that the plate is positioned between the slot brackets ([Figure 35](#)).

Tip As you insert the plate, take care to avoid tipping the magazine.

If you accidentally tip the magazine, all the plate loader LEDs turn yellow, with the exception LED for the plate position of the plate that is currently in the ion source. The LED for a loaded plate is blue.

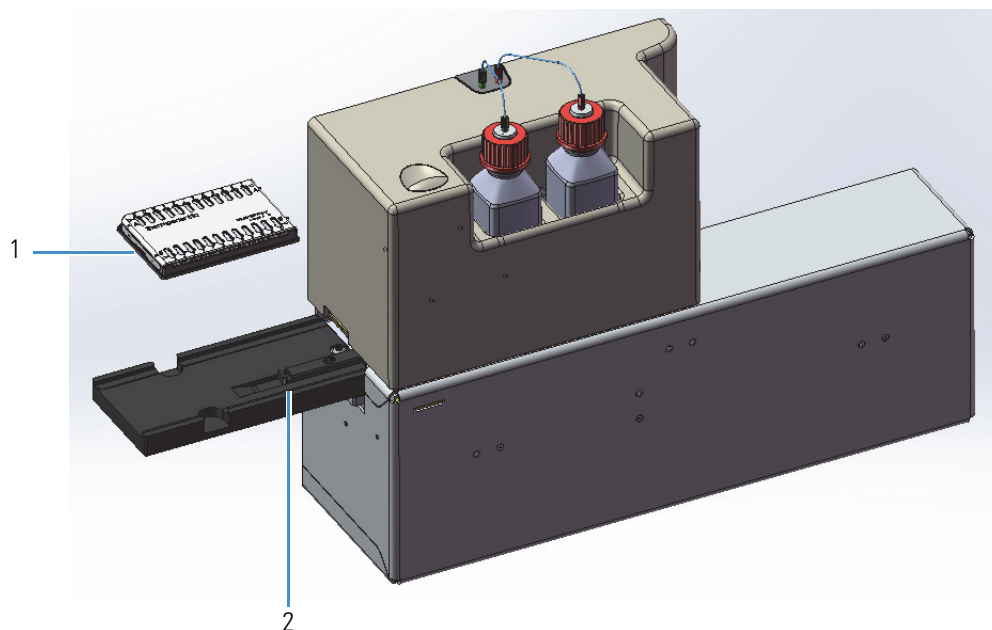
To remedy this error condition, click **Read Barcodes**. The system homes the magazine and erases the memory of the samples run since the last time the system read the barcodes.

Figure 35. Sample plate installed in slot 1

Mounting a Sample Plate onto the Manual Plate Loader

❖ To mount a plate onto the manual plate loader

Mount the end of the plate to the hook at the end of the plate transport slider.

Figure 36. Installing a sample plate on the manual plate loader

No.	Description	No.	Description
1	Sample plate	2	Hook at the end of the plate transport slider

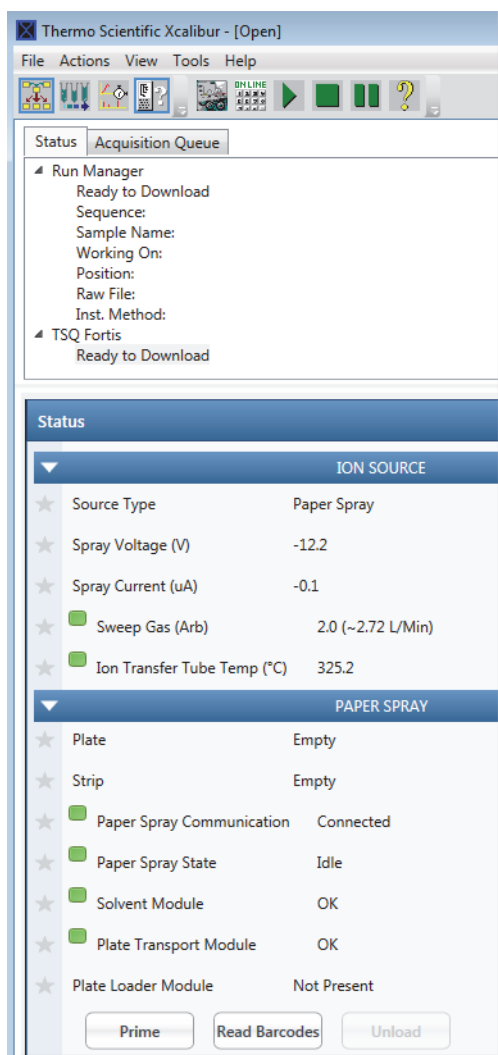
Priming the Ion Source Pumps

When you cycle the power to the ion source or when the ion source is idle for more than 6 hr, the “Priming is Needed!” message appears. You must prime the pumps before you can run samples.

Note Priming the pumps draws and dispenses 1 mL of the wetting solvent in solvent bottle A through the wetting solvent line and 1 mL of the spray solvent in solvent bottle B through the spray solvent line.

❖ To prime the ion source pumps

1. Make sure that the solvent bottles contain the appropriate solvents.
 2. If the ion source is turned off, turn it on.
 3. Do one of the following:
 - From the Tune application, click **Prime Pumps** in the toolbar ribbon.
- or—
- From the Status page of the Xcalibur data system, under Paper Spray, click **Prime**.

Figure 37. Xcalibur Status page

Reading the Barcodes on the Plates in the Automated Plate Loader

After the barcode scanner reads the plate barcodes, the system repopulates the Plate list in the Tune application, and the Xcalibur data system stores the plate information. Each time the barcode scanner reads the barcodes, the system loses the plate information from previous barcode scans, as well as any information about which sample strips you used between barcode scans.

❖ To scan the plate barcodes

1. Load the magazine with the plates that you want to run.
2. In the Tune application or the Xcalibur Status page, click **Read Barcodes**.

Tip When you create a new sequence and populate the position column with the appropriate plate and strip positions, the Xcalibur data system validates the positions against its stored plate information. If you enter an “invalid” position, the data system highlights the entry with a star to the left and a red background.

If the sequence table contains “invalid” positions, click **Read Barcodes** again to revalidate your entries.

Running a Paper Spray Experiment from the Tune Application

You can run a paper spray analysis and acquire data to a raw data file from the Tune application.

❖ To run a paper spray experiment from the Tune application


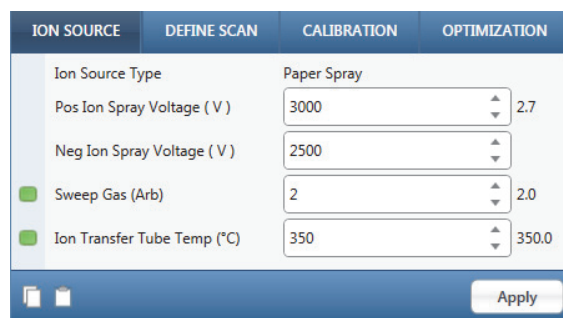
1. Prepare the sample plates. Then, load the sample plates into the automated plate loader or mount a plate on the manual plate loader.
2. Make sure that the ion source door is closed and that its cover is installed. If you are using the automated plate loader, make sure that its door is closed.
3. From the Tune window, turn on the MS, , to turn on the system voltages.
4. In the Ion Source pane, do the following:
 - a. Set the Ion Transfer Tube Temperature to warm up the ion transfer tube.
 - b. If you are not using a sweep cone, set the sweep gas to **0**.
 - c. Set the spray voltage to **0**.
 - d. Click **Apply**.

Figure 38. Ion Source pane of the Tune application



ION SOURCE	DEFINE SCAN	CALIBRATION	OPTIMIZATION
Ion Source Type		Paper Spray	
Pos Ion Spray Voltage (V)		3000	2.7
Neg Ion Spray Voltage (V)		2500	
<input checked="" type="checkbox"/>	Sweep Gas (Arb)	2	2.0
<input checked="" type="checkbox"/>	Ion Transfer Tube Temp (°C)	350	350.0

Apply

5. To prepare the system for operation, do one or more of the following as necessary:
 - a. If the VeriSpray system is off, turn it on by placing the On/Off switch in the On (1) position.

If you cycled the power or the system was idle for more than 6 hr, the “Priming is Needed” message appears. You must prime the pumps before you can run samples.

- b. If necessary, click **Prime Pumps**.

Note The default data acquisition mode is Continuous Acquisition. This mode uses the solvent program that you set up in the Tune window.

6. Depending on the data acquisition mode, set up the solvent dispense programs in the Tune window or an instrument method.
7. To change the data acquisition mode, do one of the following:
 - a. To change the data acquisition mode from Continuous Acquisition to Instrument Method, click **Continuous Acquisition** to open the data acquisition pane.
 - b. Select the **Instrument Method** check box.
 - c. Select an instrument method.

—or—

- a. To change the data acquisition mode from Instrument Method to Continuous Acquisition, click **Instrument Method** to open the data acquisition pane.
- b. Select the **Continuous Acquisition** check box.
- c. Select one of these options: **Manual Stop**, **Scans**, or **Minutes**.
- d. For the Scans option, type the number of scans to acquire. Or, for the Minutes option, type the number of minutes to acquire data.

Figure 39. Default settings for the Continuous Acquisition mode

The screenshot shows a software window for data acquisition settings. At the top, there are buttons for 'Record' and a status indicator. Below these, the 'Continuous Acquisition' mode is selected from a dropdown menu. The 'Sample Name' and 'Comment' fields are empty. The 'Instrument Method' section has a dropdown menu and a 'Start Mode' section with 'Immediate' selected. The 'Continuous Acquisition' section has 'Manual Stop' selected, with 'Scans' and 'Minutes' options available. The 'Go to standby when finished' checkbox is unchecked, and the 'Create raw file' checkbox is checked.

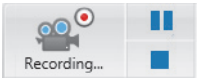
8. If the automated plate loader is installed, click **Read Barcodes**.

The barcode reader reads the bar codes of all the sample plates in the automated plate loader or the sample plate on the manual plate loader and populates the plate list with the plate locations and barcodes.

Note If the manual plate loader is installed, the barcode reader automatically reads the plate barcode when you load the plate into the ion source—that is, when you click Load & Wet.

9. To select a sample strip for analysis, do one of the following:
 - If the automated plate loader is installed, select the plate and the side from the dropdown Plate list, and then select the sample from the dropdown Strip list.
 - If the manual plate loader is installed, select **P1 (Plate A)** or **P1 (Plate B)** from the dropdown Plate list, and then select the sample from the dropdown Strip list.
10. To load the plate into the ion source and start data acquisition, do one of the following:
 - a. For the Continuous Acquisition mode (default), click **Load & Wet**.

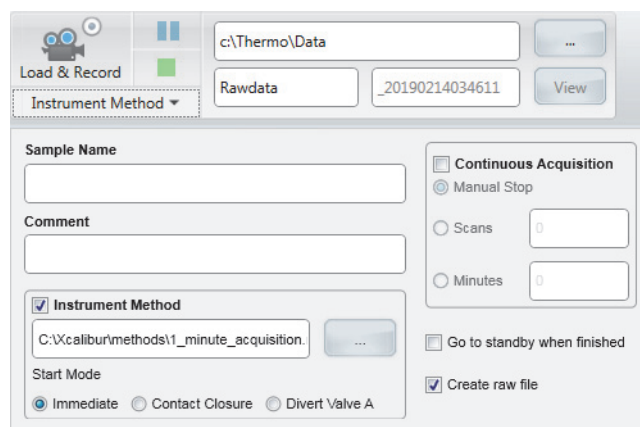
Note When the solvent dispense programs are done, the Record button becomes available.

- b. To start data acquisition, click **Record**.
- c. Within a few seconds, change the spray voltage to an appropriate value and click **Apply**.
- d. Shortly before the end of the run, change the spray voltage to **0** and click **Apply**.
- e. For the Manual Stop option, click the **Stop** icon,  , to end data acquisition.

—or—

- For the Instrument Method mode, click **Load & Record** (Figure 40).

Figure 40. Data acquisition pane set up to use an instrument method



Related Topics

- [Setting Up the Solvent Dispense Program in the Tune Application](#)
- [Setting Up the Paper Spray Parameters in an Instrument Method](#)

Setting Up the Solvent Dispense Program in the Tune Application

❖ To set up the solvent dispense program in the Tune application

1. In the Tune toolbar, click the down arrow to the right of the solvent level indicators.

2. In the Sample Rewetting A (# dispenses) box, type or select the number of dispenses for the rewet solvent.

Default: 1 (10 µL); range: 0–3 (0–30 µL)

Note The Rewetting Dispense Delay table contains one row for each dispense cycle.

3. In the Spray Solvent B (# dispenses box), type or select the number of dispenses for the spray solvent.

Default: 1 (10 µL); range: 0–10 (0–300 µL)

Note The Spray Dispense Delay table contains one row for each dispense cycle.

IMPORTANT Although the maximum spray solvent volume is 300 µL, Thermo Fisher Scientific does not recommend using a volume greater than 200 µL. At high spray solvent volumes, the paper strip might not be able to absorb all the solvent before it flows off the strip, causing increased variability between samples.

4. Change the delay times in the dispense delay tables as needed.

Note A 1 s delay time between each rewet solvent dispense is usually adequate. As you increase the number of spray solvent dispenses, consider increasing the dispense time between the later dispense cycles.

Setting Up the Paper Spray Parameters in an Instrument Method

❖ To set up the paper spray parameters for an instrument method

1. Open the Global Parameters page of the Method Editor for the MS.
2. In the Method Duration box, type the duration, in minutes, for the data acquisition time.
3. From the Ion Source Type list, select **Paper Spray**.

Note If the VeriSpray Ion Source is installed, Paper Spray is the default ion source.

4. In the Sample Rewetting A (# dispenses) box, type or select the number of dispenses for the rewet solvent.

Default: 1 (10 μ L); range: 0–3 (0–30 μ L)

Note The Rewetting Dispense Delay table contains one row for each dispense cycle.

5. In the Spray Solvent B (# dispenses box), type or select the number of dispenses for the spray solvent.

Default: 1 (10 μ L); range: 0–10 (0–300 μ L)

Note The Spray Dispense Delay table contains one row for each dispense cycle.

IMPORTANT Although the maximum spray solvent volume is 300 μ L, Thermo Fisher Scientific does not recommend using a volume greater than 200 μ L. At high spray solvent volumes, the paper strip might not be able to absorb all the solvent before it flows off the strip, causing increased variability between samples.

6. Change the delay times in the dispense delay tables as needed.

Note A 1 s delay time between each rewet solvent dispense is usually adequate. As you increase the number of spray solvent dispenses, consider increasing the dispense time between the later dispense cycles.

7. From the Spray Voltage list, select **Time Dependent**.

A time-dependent spray voltage table appears. By default, the table contains one row for time 0.

8. For the polarity mode, click **Positive Ion** or **Negative Ion**.
9. In the Positive Ion or Negative Ion table, set up the spray voltage program as follows:
 - a. For each additional time point that you want to add, click **Add**.
 - b. For each time point >0, type the time in the Time (min) column.
 - c. For each nonzero time point, type the spray voltage in the Voltage (V) column.

The Ion Source graphic updates to reflect the spray voltage table (Figure 41).

Figure 41. Global Parameters page of the Method Editor

The screenshot displays the 'Method Editor' window for 'Untitled - Thermo Xcalibur Instrument Setup'. The 'Global Parameters' tab is active. The 'Method Duration (min)' is set to 1. The 'Method Timeline' shows a sequence of events at 0.167, 0.333, 0.500, 0.667, 0.833, and 1 minute. The 'Ion Source' is configured for 'Paper Spray' mode. The 'Ion Source Properties' section is expanded, showing the 'Spray Voltage' as 'Time Dependent'. The 'Spray Voltage' table is as follows:

Time (min)	Voltage (V)
0	0
0.1	3500
0.95	0

Other parameters include 'Sample Rewetting A (# dispenses)' set to 1 (10µL), 'Spray Solvent B (# dispenses)' set to 3 (30µL), 'Sweep Gas (Arb)' set to 0, 'Ion Transfer Tube Temp (°C)' set to 300, and 'FAIMS Mode' set to 'Not Installed'. The status bar at the bottom indicates 'Ready' and 'NOT SAVED'.

Tip For a paper spray experiment, Thermo Fisher Scientific recommends that you set up a spray voltage program that creates a 0 intensity baseline at both the start and end of data acquisition. For example, type a spray voltage of 0 for time 0, a spray voltage of 3500 V for time 0.1 min, and a spray voltage of 0 for the last 0.1 min of the method duration.

10. Save the instrument method.

Working with Xcalibur Sequences

To automate data acquisition for a sample set by creating and running Xcalibur sequences, follow these topics:

- [Specifying the Sample Positions in an Xcalibur Sequence](#)
- [Nomenclature for the Sample Positions in an Xcalibur Sequence](#)
- [Starting a Sequence Run](#)

Specifying the Sample Positions in an Xcalibur Sequence

❖ To specify the sample positions in an Xcalibur Sequence

1. Load your sample plates into the automated plate loader, and then click **Read Barcodes**.
2. Do one of the following:
 - a. In the Xcalibur Sequence Setup view, choose **File > New**.

The New Sequence Template dialog box opens. By default, the Initial Vial Position box specifies strip A1 of the top-most plate, for example, P1:A1. The Number of Samples box specifies 12.

Figure 42. New Sequence Template

- b. In the Initial Vial Position box, keep the default setting or specify another plate and strip position.
- c. In the Number of Samples box, type an integer from 1–240.

Note Because you can run each paper strip only once, the Injection per Sample box and the Re-Use Vial Positions check box are unavailable.

—or—

- In the Xcalibur Sequence Setup view, individually specify the samples positions. For invalid entries, the Position cell has a red background and a star at the left (* P1:C1).

The data system labels the following entries as invalid:

- Duplicate entries: You can only run each strip once.
- Incorrect plate and strip nomenclature: Retype the entry and use the correct nomenclature.
- Unscanned plates: Click **Read Barcodes**.

Figure 43. Xcalibur sequence

The screenshot displays the Thermo Scientific Xcalibur software interface. The top menu bar includes File, Edit, Change, Actions, View, and Help. Below the menu is a toolbar with various icons for file operations and system control. The main window is divided into three sections:

- Run Manager (Left):** Shows the status of the acquisition queue. It indicates the system is "Ready to Download" and lists the sequence name, sample name, working on position, raw file, and instrument method (TSQ Altis).
- Status (Middle):** Displays the current ion source and paper spray settings.
 - ION SOURCE:**
 - Source Type: Paper Spray
 - Spray Voltage (V): -13.1
 - Spray Current (uA): -0.1
 - Sweep Gas (Arb): 2.0 (~2.72 L/Min)
 - Ion Transfer Tube Temp (°C): 350.1
 - PAPER SPRAY:**
 - Plate: Empty
 - Strip: Empty
 - Paper Spray Communication: Connected
 - Paper Spray State: Idle
 - Solvent Module: OK
 - Plate Transport Module: OK
 - Plate Loader Module: OK
- Acquisition Queue (Right):** A table listing the sequence of samples to be analyzed.

	Sample Type	File Name	Path	Inst Meth	Position	Inj Vol
1	Unknown	Test01	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A1	-1.00
2	Unknown	Test02	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A2	-1.00
3	Unknown	Test03	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A3	-1.00
4	Unknown	Test04	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A4	-1.00
5	Unknown	Test05	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A5	-1.00
6	Unknown	Test06	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A6	-1.00
7	Unknown	Test07	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A7	-1.00
8	Unknown	Test08	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A8	-1.00
9	Unknown	Test09	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A9	-1.00
10	Unknown	Test10	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A10	-1.00
11	Unknown	Test11	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A11	-1.00
12	Unknown	Test12	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:A12	-1.00
13	Unknown	Test13	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B1	-1.00
14	Unknown	Test14	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B2	-1.00
15	Unknown	Test15	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B3	-1.00
16	Unknown	Test16	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B4	-1.00
17	Unknown	Test17	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B5	-1.00
18	Unknown	Test18	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B6	-1.00
19	Unknown	Test19	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B7	-1.00
20	Unknown	Test20	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B8	-1.00
21	Unknown	Test21	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B9	-1.00
22	Unknown	Test22	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B10	-1.00
23	Unknown	Test23	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B11	-1.00
24	Unknown	Test24	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P1:B12	-1.00
25	Unknown	Test25	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P2:A1	-1.00
26	Unknown	Test26	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P2:A2	-1.00
27	Unknown	Test27	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P2:A3	-1.00
28	Unknown	Test28	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P2:A4	-1.00
29	Unknown	Test29	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P2:A5	-1.00
30	Unknown	Test30	C:\Xcalibur\data	C:\Xcalibur\methods\EDDP-1min	P2:A6	-1.00

Nomenclature for the Sample Positions in an Xcalibur Sequence

For the VeriSpray system, the nomenclature for the sample positions in an Xcalibur sequence list is as follows:

*P*Plate number:Strip position

Where:

Plate number = 1–10 (for the plates in the plate loader magazine) or 1 (for the plate mounted to the manual plate loader)

Strip number = A1–A12 and B1–B12

You can also add the plate barcode to the sequence list as follows:

Barcode:Strip position


Note The sample position entries are not case sensitive.

Starting a Sequence Run

There is no start instrument for an MS with the VeriSpray ion source and the MS is the only instrument in use.

❖ To start a sequence run for a set of paper spray samples

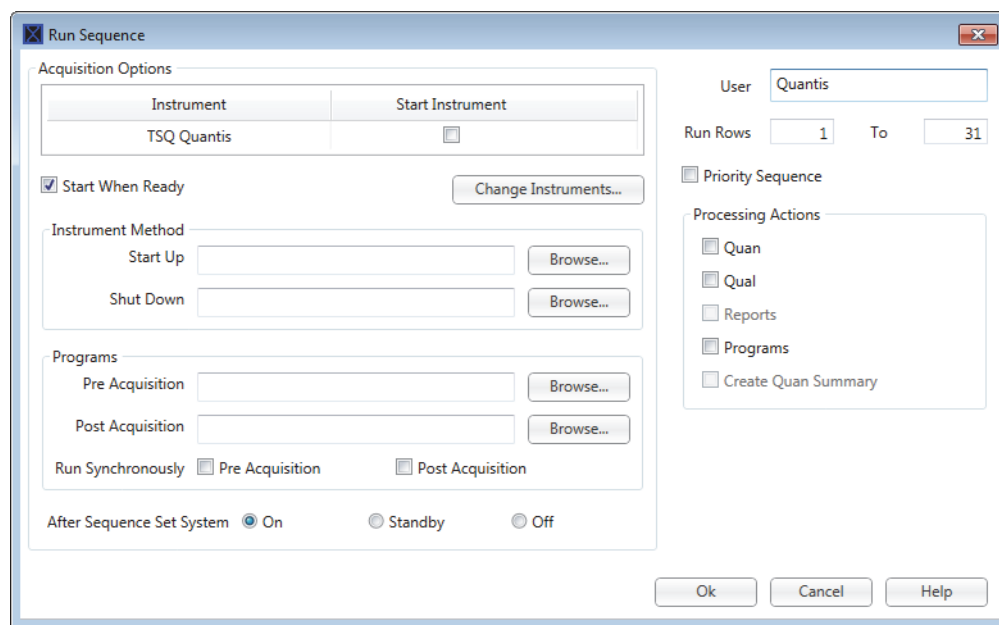
1. Make sure that the ion source door is closed and that its cover is installed. If you are using the automated plate loader, make sure that its door is closed.

2. Select the sequence rows that you want to run and click the **Run Sequence** icon, .

The Run Sequence dialog box opens.

3. Make sure that the Start Instrument check box is clear.

Figure 44. Run Sequence dialog box



4. If the Start Instrument check box is selected, click **Change Instruments**. Then, in the Change Instruments in Use dialog box, clear the Start Instrument check box and click **OK**.

5. In the After Sequence Set System area, select one of these options to specify the state of the MS at the end of the sequence:
 - On—Keeps the mass spectrometer in the On state.
 - Standby—Places the MS in Standby. In addition, the ion source ejects the plate and returns it to the automated plate loader or the manual plate loader.
 - Off—Turns off the MS (turns off the voltages, the API source interface heater, and the gases).
6. Click **OK**.

If the sample positions are valid, the sequence run starts.

Data Review

This chapter describes how to read the sample information in the raw data file from the Qual Browser application or the FreeStyle™ application.

Contents

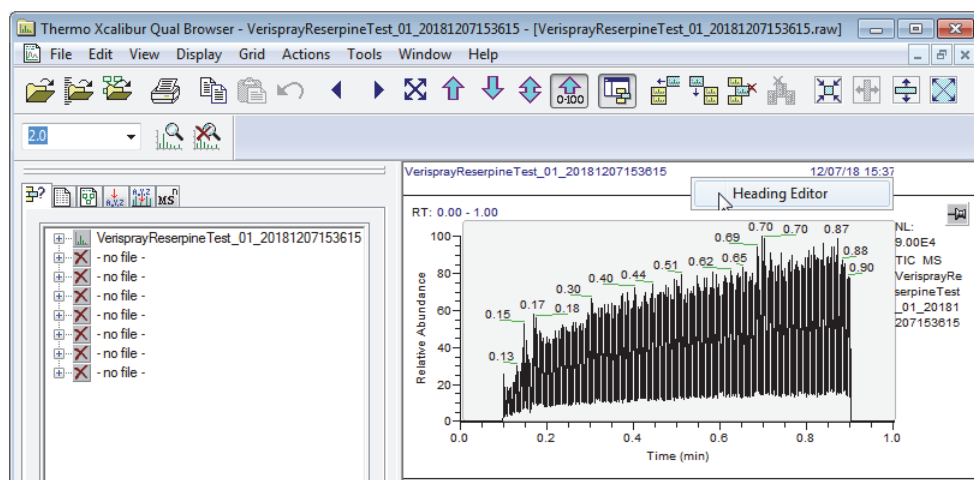
- [Reading the Plate Barcode and Strip Location from Qual Browser](#)
- [Reading the Plate Barcode and Strip Location from FreeStyle](#)

Reading the Plate Barcode and Strip Location from Qual Browser

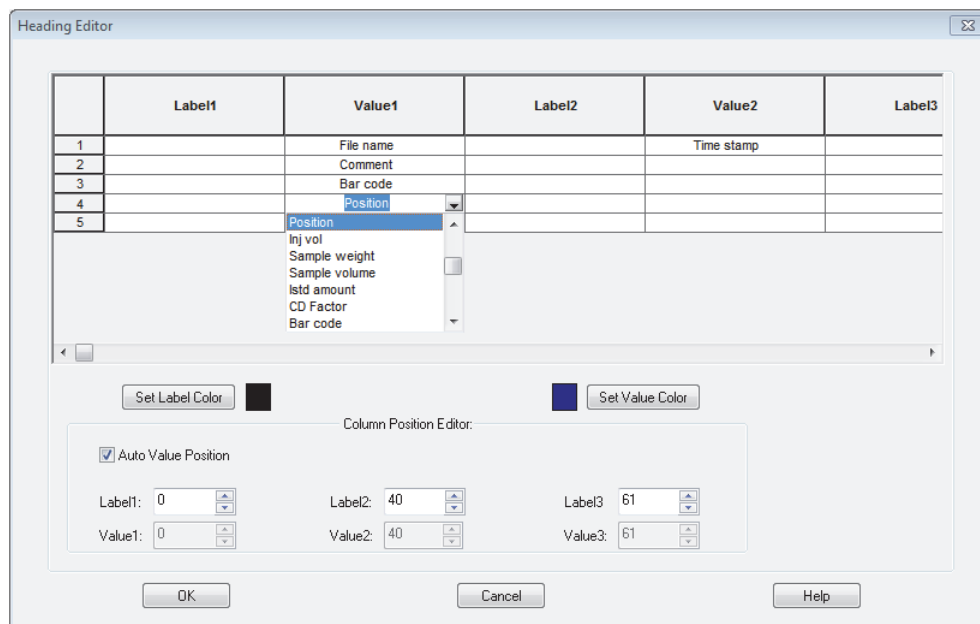
❖ To read the barcode and strip location in the raw data file for a paper spray analysis

1. Open the raw data file in the Qual Browser window.
2. Right-click the file heading and choose **Heading Editor**.

Figure 45. Raw data file opened in Qual Browser

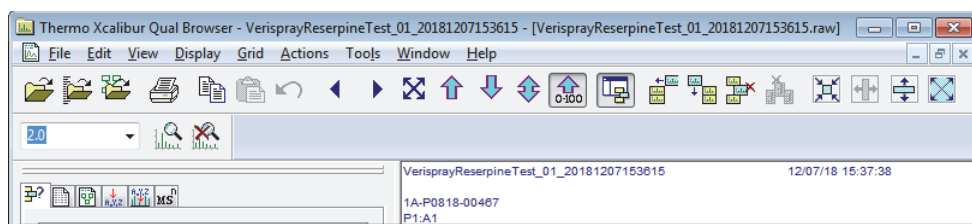


3. In the Heading Editor dialog box, do the following:
 - a. In the Value 1 column, select **Bar Code** from the dropdown list.
 - b. Click the next row. Then, in the Value 1 column, select **Position** from the dropdown list.

Figure 46. Heading Editor dialog box

4. Click **OK**.

The sample's barcode and strip position appear in the file heading.



Reading the Plate Barcode and Strip Location from FreeStyle

- ❖ To read the barcode and strip location in the raw data file for a paper spray analysis

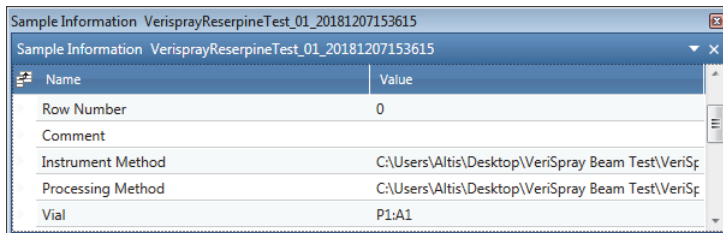
1. Open the raw data file in the FreeStyle application.
2. In the Report area of the Workspace Options toolbar, click **File Header**.
3. In the File Header report, scroll down to the **Bar Code** row.

Figure 47. File Header report in the FreeStyle application

FileHeader VerisprayReserpineTest_01_20181207153615	
Name	Value
Istd Amount	0
CD Factor	1
Bar Code	1A-P0818-00467
Bar Code Status	0

4. In the Report area of the Workspace Options toolbar, click **Sample Information**.
5. In the Sample Information report, scroll down to the **Vial** row.

Figure 48. Sample Information report with the strip position



The screenshot shows a window titled "Sample Information VerisprayReserpineTest_01_20181207153615". Inside the window is a table with two columns: "Name" and "Value". The table contains the following rows:

Name	Value
Row Number	0
Comment	
Instrument Method	C:\Users\Altis\Desktop\VeriSpray Beam Test\VeriSpray
Processing Method	C:\Users\Altis\Desktop\VeriSpray Beam Test\VeriSpray
Vial	P1:A1

6 Data Review

Reading the Plate Barcode and Strip Location from FreeStyle

Maintenance

This chapter provides instructions for the routine maintenance that you must perform to ensure optimum performance of the VeriSpray system. For a list of replaceable parts, see [Chapter 8, “Replaceable Parts.”](#)

Contents

- [Maintenance Schedule](#)
- [Tools and Supplies](#)
- [Preparation](#)
- [Opening the Ion Source Door](#)
- [Removing and Reinstalling the Ion Transfer Tube](#)
- [Replacing the High-Voltage Probe](#)
- [Maintaining the External Surfaces of the VeriSpray System](#)
- [Maintaining the Sample Plates Before Use](#)
- [Disposing of Used Sample Plates](#)
- [Cleaning the Ion Source Sensor Window](#)

Maintenance Schedule

Table 6 list the recommended frequency for maintenance procedures.

Table 6. VeriSpray system maintenance procedures and frequency

Frequency	Procedure
As needed	“Cleaning the Ion Source Sensor Window” on page 80
	“Maintaining the External Surfaces of the VeriSpray System” on page 79
	“Maintaining the Sample Plates Before Use” on page 79
	“Disposing of Used Sample Plates” on page 79
	“Replacing the High-Voltage Probe” on page 78

Tools and Supplies

Performing routine maintenance on the VeriSpray system requires only a few tools. Table 7 lists the tools and supplies for maintaining the system.



CAUTION Avoid exposure to potentially harmful materials.

By law, producers and suppliers of chemical compounds are required to provide their customers with the most current health and safety information in the form of Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDSs). The MSDSs and SDSs must be freely available to lab personnel to examine at any time. These data sheets describe the chemicals and summarize information on the hazard and toxicity of specific chemical compounds. They also provide information on the proper handling of compounds, first aid for accidental exposure, and procedures to remedy spills or leaks.

Read the MSDS or SDS for each chemical you use. Store and handle all chemicals in accordance with standard safety procedures. Always wear protective gloves and safety glasses when you use solvents or corrosives. Also, contain waste streams, use proper ventilation, and dispose of all laboratory reagents according to the directions in the MSDS or SDS.

Table 7. Chemicals, equipment, and tools (Sheet 1 of 2)

Item	Part number
Chemicals	
Detergent (for example, Liquinox™)	(Liquinox) Fisher Scientific: <ul style="list-style-type: none"> • 16-000-125 (1 quart) • 16-000-128 (1 gallon)
Isopropyl alcohol	Fisher Scientific A459-1
Methanol, LC/MS-grade	Fisher Scientific A456-1

Table 7. Chemicals, equipment, and tools (Sheet 2 of 2)

Item	Part number
Nitrogen gas, clean and dry	—
Water, LC/MS-grade	Fisher Scientific W6-1
Equipment and tools	
Cotton-tipped swabs, lint-free	Fisher Scientific NC9954124
Kimwipes™ wipers	Fisher Scientific S47299
Gloves, lint-free and powder-free	—
Magnification device	—
5 mm hex key	—
4 mm hex key	—
5 mm wrench	—
Needle-nose pliers	—

Preparation

Before you perform the procedures in this chapter, do the following:

- Place the necessary tools, supplies, and replacement parts (when applicable) nearby.
- Place the components on a clean, lint-free work surface.
- Wear a new pair of lint- and powder-free gloves when handling internal components. Never reuse gloves after you remove them because the surface contaminants on them can contaminate clean parts.

Opening the Ion Source Door

To maintain the mass spectrometer's API source interface or clean the optical sensor, you must open the ion source door.

Opening this door turns off the following items:

- The ion source voltages
- The ion transfer tube offset voltage
- The voltages on the MS ion guides
- The ion transfer tube temperature heater
- The sweep gas

❖ To open the ion source door

Pull the handle on the top right of the door and open the door no more than 90 degrees.



CAUTION Attempting to force the door to open beyond a 90 degree angle might damage the ion source.

Removing and Reinstalling the Ion Transfer Tube

To remove and reinstall the ion transfer tube in a TSQ Series II MS with a VeriSpray ion source installed (but without the sweep cone installed), follow these topics in order:

1. [Cooling the API Source Interface for Maintenance](#)
2. [Removing the Ion Transfer Tube](#)
3. [Reinstalling the Ion Transfer Tube](#)

Cooling the API Source Interface for Maintenance

Before you perform maintenance on the API source interface, you must make sure that it is cooled down to 50 °C or less to avoid burning your fingers.




CAUTION Hot surface. Accidental contact with the API source interface can severely burn you, as this area of the mass spectrometer can reach 350 °C (662 °F). In addition, although the temperature of the metal surfaces behind the ion source door never reach the limit of 70 °C (158 °F) for accessible metal surfaces, they also can pose a burn hazard. Therefore, handle ALL heated components with extreme caution.



CAUTION Before you begin, place the MS in Standby to ensure that the system voltages are off. Keeping the MS in Standby also helps to prevent dust and moisture from entering the API source interface.

❖ To cool the API source interface

1. In the Tune application, place the MS in **Standby**, .
2. In the Ion Source pane, set the Ion Transfer Tube Temperature to 50 °C or less and observe the readback temperature.
3. After the system cools to the set temperature of 50 °C or less, remove the plate transport cover.

Note Removing the plate transport module cover provides room for using the ion transfer tube removal tool to remove the ion transfer tube from the spray cone.

4. Open the ion source door.

Note Opening the ion source door turns off the ion transfer tube heater and the sweep gas.

If the API source interface includes the optional ion sweep cone, uninstall the VeriSpray ion source and follow the instructions for removing the ion transfer tube in the TSQ Series II Hardware Manual.

Related Topics

- [Opening the Ion Source Door](#)
- [Removing the Cover from an Installed Ion Source](#)

Removing the Ion Transfer Tube

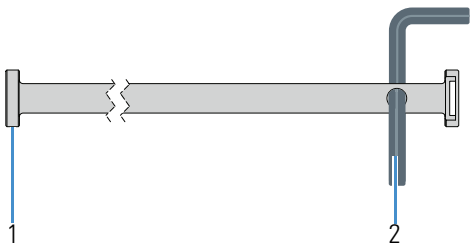
Required tools and materials:

- TSQ Altis MS and TSQ Quantiva MS: 1/4 turn ion transfer tube removal tool (P/N 98200-20154)
- TSQ Fortis MS, TSQ Quantis MS, and TSQ Endura MS: Ion transfer tube removal tool (P/N 98200-20165) and 1/4 turn ion transfer tube removal tool (P/N 98200-20154)
- Allen wrench small enough to fit through the side hole in the ion transfer tube removal tool
- Gloves, lint-free and powder-free

❖ To remove the ion transfer tube from the spray cone

1. Use one hand to hold down the plate target and use your other hand to align the flat end of the 1/4 turn ion transfer tube removal tool with the flat edges of the tube’s nose cone.
2. Insert an Allen wrench through the hole in the other end of the ion transfer tube removal tool.

Figure 49. Allen wrench inserted through the side hole in the removal tool



No.	Description	No.	Description
1	Flat end of the 1/4 turn ion transfer tube removal tool	2	Allen wrench inserted through the side hole

3. To release the tube from the spray cone, do one of the following:

- For a TSQ Altis MS or a TSQ Quantiva™ MS, use the Allen wrench for leverage to turn the tool counterclockwise by a quarter turn, releasing the pin that secures the tube to the spray cone.

Figure 50. Releasing the ion transfer tube from the spray cone



- For a TSQ Fortis™ MS, TSQ Quantis™ MS, or TSQ Endura™ MS, use the Allen wrench for leverage to turn the tool counterclockwise until you completely unscrew the ion transfer tube from the spray cone.

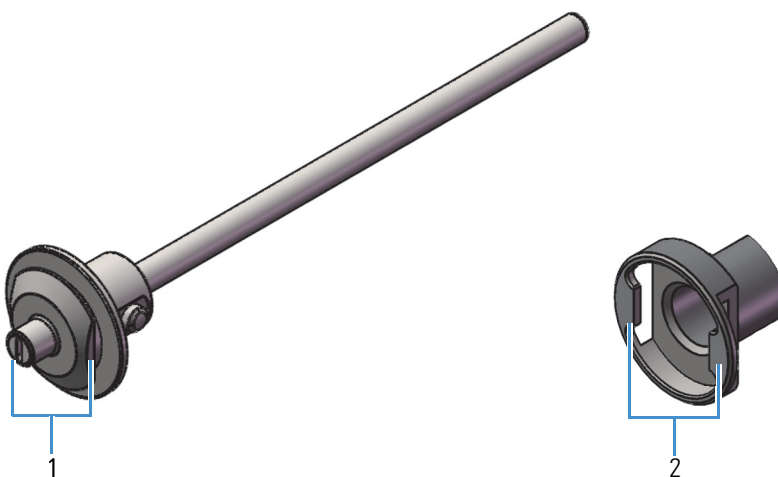
Tip For a TSQ Fortis MS, TSQ Quantis MS, or TSQ Endura MS, you can also use the ion transfer tube removal tool that has a heavy hook in combination with an Allen wrench to unscrew the ion transfer tube. To determine which tool works better for you, try both tools.

4. To pull the tube out of the spray cone, do one of the following:

- a. For a TSQ Altis MS or a TSQ Quantiva MS, use the other end of the 1/4 turn ion transfer tube removal tool to latch onto the nose cone and pull the tube out of the spray cone.

To latch onto the nose cone, align the tabs inside the slotted end of the tool to the flat edges of the nose cone, and then turn the tool by a quarter turn.

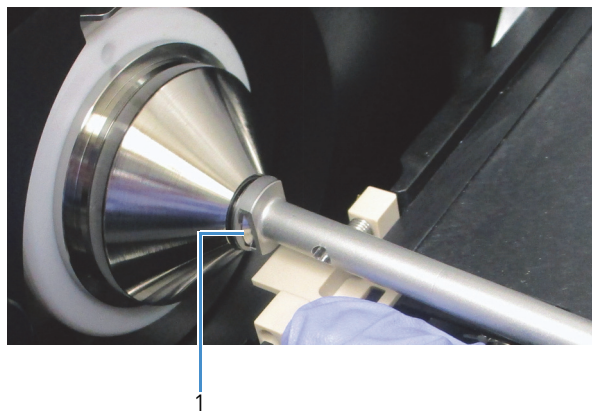
Figure 51. View of the tube's nose cone and the removal tool's slotted end



No.	Description
-----	-------------

- | | |
|---|--|
| 1 | Flat edges of the nose cone |
| 2 | Tabs in the slotted end of the 1/4 turn ion transfer tube removal tool |

Figure 52. Pulling the ion transfer tube out of a TSQ Altis MS

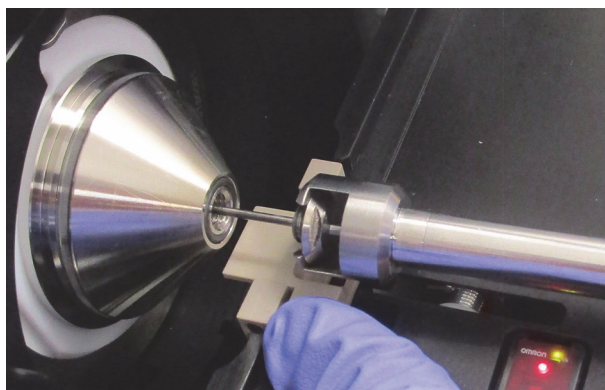


No.	Description
-----	-------------

- | | |
|---|---|
| 1 | Slotted end of the 1/4 turn ion transfer tube removal tool latched onto the nose cone |
|---|---|

- For a TSQ Fortis MS, TSQ Quantis MS, or TSQ Endura MS, use the ion transfer tube removal tool that has a hooked end to grab the tube from the back of the nose cone and pull it out of the spray cone (Figure 53).

Figure 53. Pulling the ion transfer tube out of a TSQ Fortis MS



5. Clean the ion transfer tube as described in the MS hardware manual.

Reinstalling the Ion Transfer Tube

❖ To reinstall the ion transfer tube

1. Make sure that the ion transfer tube temperature is below 50 °C.
2. Insert the tube's nose cone into the flat end of the 1/4 turn ion transfer tube removal tool.
3. Hold down the plate window with one hand, and use your other hand to push the tube past the ball in the spray cone.



CAUTION Make sure that you insert the tube straight into the spray cone. Inserting the tube at an angle can irreparably damage the tube.

4. For the TSQ Altis MS or the TSQ Quantiva MS, make sure that the tube's pin aligns with the slot in the spray cone (Figure 54).

Figure 54. Installing the ion transfer tube in a TSQ Altis MS

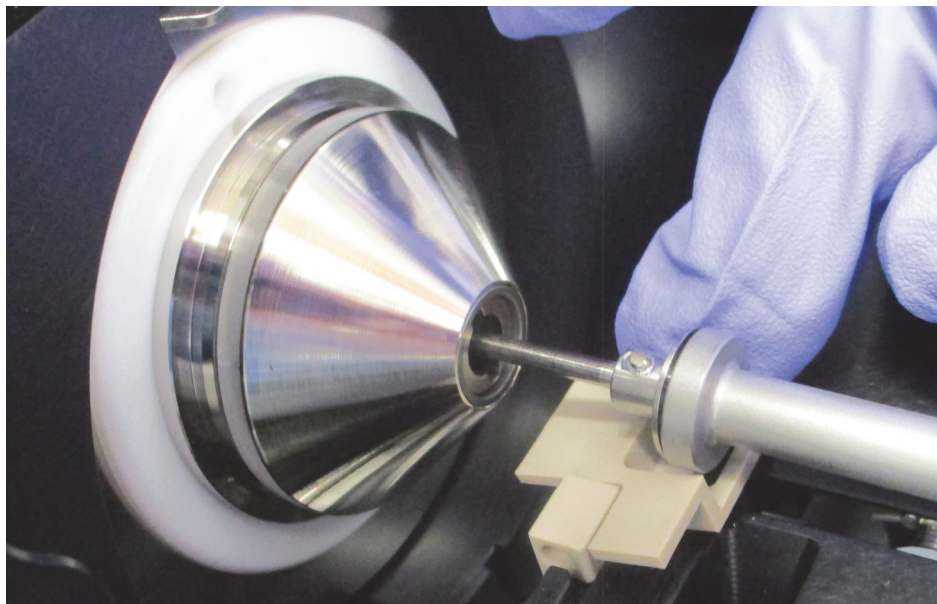
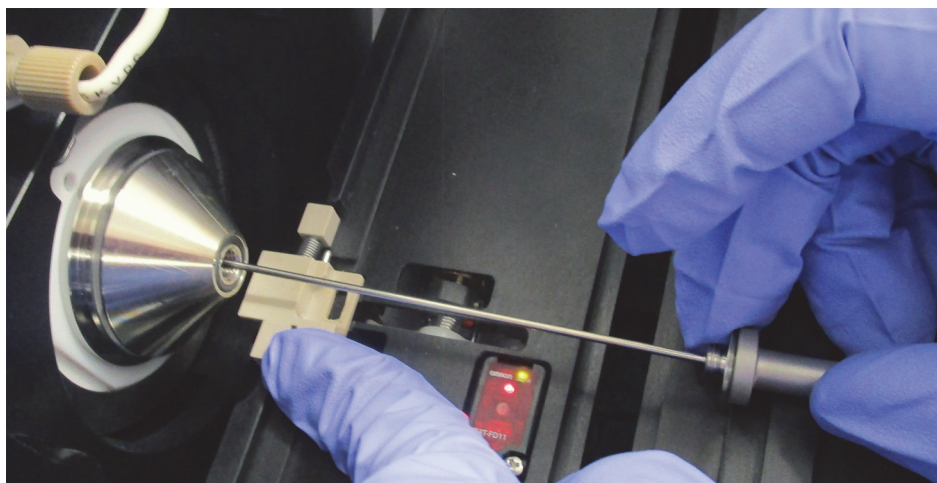


Figure 55. Installing the ion transfer tube in a TSQ Fortis MS



Once you push the tube past the vent ball, the vacuum draws the tube into the spray cone.

5. Use the flat end of the 1/4 turn ion transfer tube removal tool to secure the ion transfer tube to the spray cone as follows:
 - For a TSQ Altis MS or a TSQ Quantiva MS, turn the tube clockwise by a quarter turn.
 - For a TSQ Fortis MS, a TSQ Quantis MS, or a TSQ Endura MS, turn the tube clockwise until you completely screw the tube into the spray cone.

Replacing the High-Voltage Probe

The high-voltage (spring-loaded) probe that is visible from the bottom of the ion source door provides the ionizing voltage to the wetted paper strips. If you notice a loss in signal or you accidentally break the probe, replace the probe.

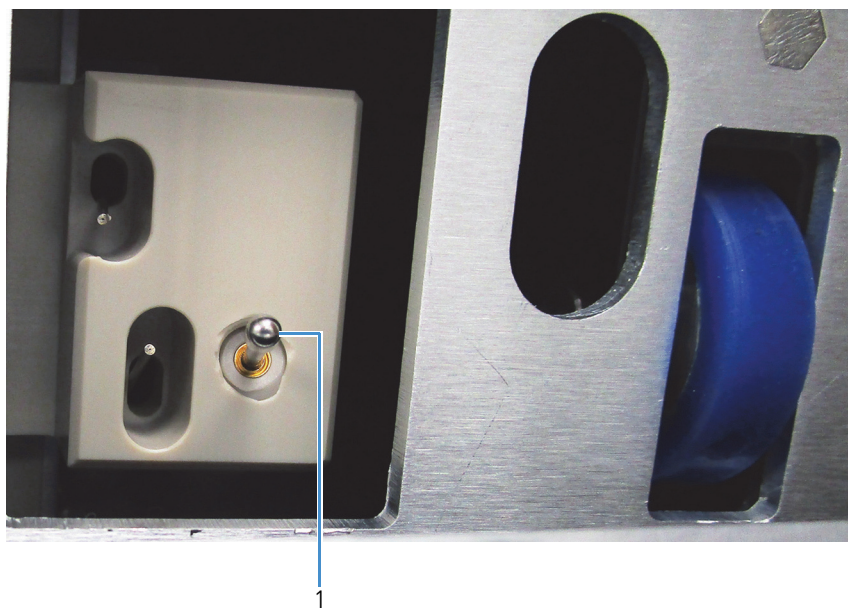
Required tools and materials:

- Replacement probe, P/N 00004-99-00142
- Needle-nose pliers
- Gloves, lint-free and powder-free

❖ To replace the high-voltage probe

1. Turn off the ion source by placing its power switch in the Off (0) position.
2. Open the ion source door.
3. From the opening in the bottom of the door, use a needle-nose pliers to pull the probe out of the cable assembly.

Figure 56. View of the high-voltage probe from the bottom of the ion source door



No.	Description
-----	-------------

1	High-voltage probe
---	--------------------

4. While wearing gloves, hold the replacement probe by its silver-colored end and insert the gold-colored end into the cable assembly until it meets resistance.
5. Turn on the ion source by placing its power switch in the On (1) position.

Maintaining the External Surfaces of the VeriSpray System

Only Thermo Fisher Scientific field service engineers may service the VeriSpray system. User maintenance is limited to cleaning the housing as necessary. For any additional service, contact your local Thermo Fisher Scientific service engineer.

❖ To clean the external surfaces of the VeriSpray system

Wipe the surfaces with a moistened, lint-free cloth.



CAUTION Do not spray or pour liquids onto the external or internal surfaces of the VeriSpray system, as liquids can damage internal system components.

Maintaining the Sample Plates Before Use

The sample plates are consumable parts that you cannot reuse once you have used all the strips.

❖ To properly store and maintain the sample plates before use

Store the sample plates in their original containers before use. If necessary, use a dry, lint-free cloth to wipe the external surfaces of the plate.



CAUTION Do not use solvents to clean the external surfaces of the plate, as doing so can remove the silk-screened text (labels) on the top cover of the plate and the bar code stickers (labels) on the ends of the plate. The plates are unusable without their bar code stickers.

Disposing of Used Sample Plates

Once you have used all the strips on a sample plate, dispose of the plate.

❖ To dispose of used sample plates

Follow the local regulations for disposing of the following:

- The sample plate components—metal, acetal plastic, and paper
- The chemicals that make up the wetting and spray solvents
- The chemicals or biological matrices that make up the samples

Cleaning the Ion Source Sensor Window

❖ **To clean the sensor window**

Wipe it with a moistened, lint-free cloth.

Replaceable Parts

This chapter provides the ordering information for the VeriSpray system's replaceable parts.

Contents

- [Top-Level VeriSpray Components](#)
- [Installation Kit](#)
- [Replaceable System Components and Custom Tools](#)
- [Consumables](#)

Top-Level VeriSpray Components

[Table 8](#) describes the top-level VeriSpray system components that you can order from Thermo Fisher Scientific.

Table 8. Top-level components

Part	Part number	Description
VeriSpray Ion Source	VSIS1-10000	VeriSpray ion source, installation kit (P/N 98200-62000), and the power cable for shipping destination
VeriSpray Plate Loader and magazine	VSPM1-10000	VeriSpray plate loader, magazine, and communication cable
Magazine	VSMZ1-10000	Magazine that holds 10 plates
Sample plates	VSSP1-10000	24-count sample plates (10 per box)

Installation Kit

Table 9 describes the content of the VeriSpray Installation Kit (P/N 98200-62000).

Table 9. VeriSpray Installation Kit (Sheet 1 of 2)


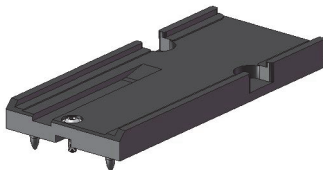
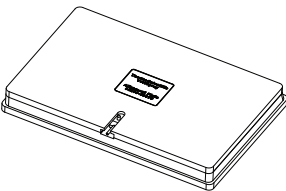






Part	Part number	Description
	VSSP1-10000	24-count sample plates (10 plates/box) (2 each/kit)
	Third-party part: Corning product no. 1396-100 You can order this part through the Fisher Scientific catalogue.	Solvent bottle, square, 100 mL (2 each) Manufactured by Corning
	N/A	Manual plate loader
	98200-60076	Alignment plate
	98200-20154	Tool (two-ended) for removing the ion transfer tube from a TSQ Altis MS or a TSQ Quantiva MS
	98200-20165	Tool for removing the ion transfer tube from a TSQ Quantis MS, TSQ Fortis MS, or TSQ Endura MS
	N/A	Ethernet cable, CAT5E, 7 ft length, RoHS
	N/A	Power supply: 24 VDC, minimum 2.7 A output, Limited Power Source (LPS). Must be Safety and EMC certified for location of use.

Table 9. VeriSpray Installation Kit (Sheet 2 of 2)

Part	Part number	Description
	N/A	Assembly, cable, COMM/Power (from the plate transport module to the VeriSpray Plate Loader)
	00004-99-00142	Probe, spring, loaded (spring-loaded probe for the electrode wire cable assembly of the solvent module) (5 each)

Replaceable System Components and Custom Tools

You can replace the following system components and custom tools.

Plate Loader and magazine	VSPM1-10000
Plate magazine.	VSMZ1-10000
Probe spring	00004-99-00142
1/4 turn ion transfer tube removal tool (TSQ Altis and TSQ Quantiva)	98200-20154
Ion transfer tube removal tool (for threaded nose cones) (TSQ Quantis, TSQ Fortis, and TSQ Endura)	98200-20165

Consumables

You can order the following consumables from Thermo Fisher Scientific.

24-count sample plates (10/box.	VSSP1-10000
---	-------------

8 Replaceable Parts

Consumables

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