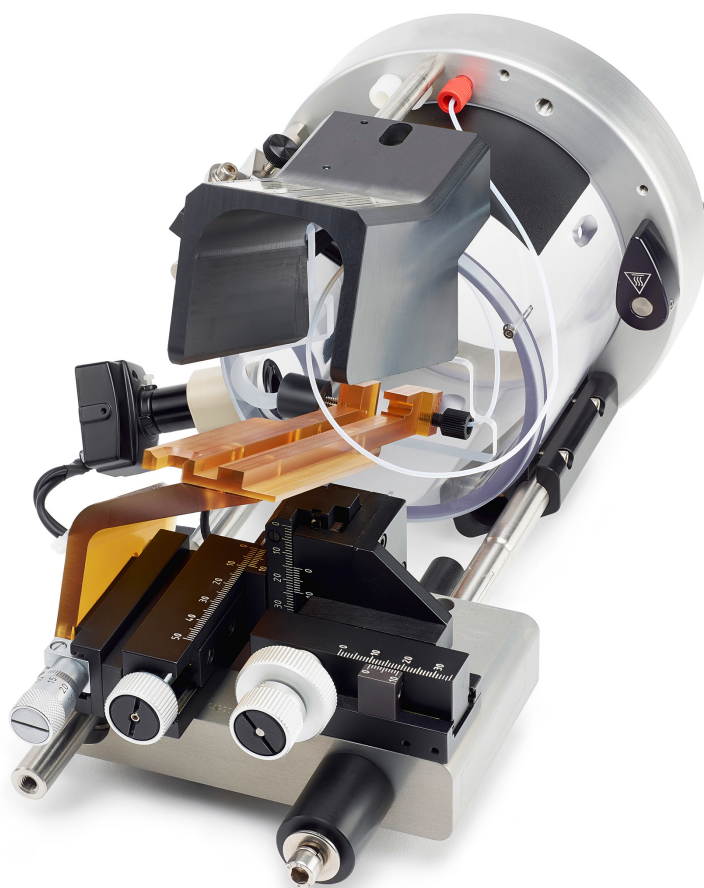




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# NanoSpray<sup>®</sup> Ion Source

## Operator Guide



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# Operational Precautions and Limitations

1

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**Note:** Before operating the system, carefully read all of the sections of this guide.

---

This section contains general safety-related information. It also describes potential hazards and associated warnings for the system and the precautions that should be taken to minimize the hazards.

In addition to this section, refer to [Glossary of Symbols](#) for information about the symbols and conventions used in the laboratory environment, on the system, and in this documentation.

## Operational Precautions and Hazards

For regulatory and safety information for the mass spectrometer, refer to the safety guide or *System User Guide*.



---

**WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard.** Use the ion source only if you have knowledge of and training in the proper use, containment, and evacuation of toxic or injurious materials used with the ion source.

---



---

**WARNING! Hot Surface Hazard.** Let the NanoSpray<sup>®</sup> ion source cool for at least 60 minutes before starting any maintenance procedures. Surfaces of the ion source become hot during operation.

---



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**WARNING! Toxic Chemical Hazard.** Wear personal protective equipment, including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

---



---

**WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard.** In the event of a chemical spill, review product Safety Data Sheets for specific instructions. Use appropriate personal protective equipment and absorbent wipes to contain the spill and dispose of it following local regulations.

---



**WARNING! Environmental Hazard.** Do not dispose of system components in municipal waste. Follow local regulations when disposing of components.

---



**WARNING! Electrical Shock Hazard.** Avoid contact with the high voltages applied to the ion source during operation. Put the system in Standby mode before adjusting the sample tubing or other equipment near the ion source.

---



**WARNING! Eye Injury Hazard—Direct and Reflected Beam.** Do not deliberately stare into the beam. This can cause injury to the retina. Be aware that reflection beams off of shiny surfaces could be as strong and focused as a direct beam.

---

## Chemical Precautions



**WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard.** Determine whether decontamination is required prior to cleaning or maintenance. The customer must decontaminate the system prior to cleaning or maintenance if radioactive materials, biological agents, or toxic chemicals have been used with the system.

---



**WARNING! Environmental Hazard.** Do not dispose of system components in municipal waste. Follow local regulations when disposing of components.

---



**WARNING! Biohazard, Toxic Chemical Hazard.** Connect the drain tubing to the mass spectrometer and the source exhaust drain bottle properly, to prevent leaks.

---

- Determine which chemicals have been used in the system prior to service and regular maintenance. Refer to the *Safety Data Sheets* for the health and safety precautions that must be followed with chemicals. SCIEX *Safety Data Sheets* can be found at [sciex.com/tech-regulatory](https://sciex.com/tech-regulatory).
- Always wear assigned personal protective equipment, including powder-free neoprene or nitrile gloves, safety glasses, and a laboratory coat.
- Work in a well-ventilated area or fume hood.

## Operational Precautions and Limitations

---

- Avoid ignition sources when working with flammable materials, such as isopropanol, methanol, and other flammable solvents.
- Take care in the use and disposal of any chemicals. Potential risk of personal injury if proper procedures for handling and disposing of chemicals are not followed.
- Avoid skin contact with chemicals during cleaning and wash hands after use.
- Make sure that all exhaust hoses are connected properly and that all connections are functioning as designed.
- Collect all spent liquids and dispose of them as hazardous waste.
- Comply with all of the local regulations for the storage, handling, and disposal of biohazardous, toxic, or radioactive materials.
- (Recommended) Use secondary containment trays beneath the roughing pump, the solvent bottles, and the waste collection container to capture potential chemical spills.

## System Safe Fluids

The following fluids can safely be used with the system. Refer to [Required Materials](#) for information about safe cleaning solutions.

---

**CAUTION: Potential System Damage. Do not use any other fluid until confirmation is received from SCIEX that it does not present a hazard. This is not an exhaustive list.**

---

- **Organic Solvents**
  - MS-grade acetonitrile; up to 100%
  - MS-grade methanol; up to 100%
  - Isopropanol; up to 100%
  - HPLC-grade or higher water; up to 100%
  - Tetrahydrofuran; up to 100%
  - Toluene and other aromatic solvents; up to 100%
  - Hexanes; up to 100%
- **Buffers**
  - Ammonium acetate; less than 1%
  - Ammonium formate; less than 1%
  - Phosphate; less than 1%



- **Acids and Bases**

- Formic acid; less than 1%
- Acetic acid; less than 1%
- Trifluoroacetic acid (TFA); less than 1%
- Heptafluorobutyric acid (HFBA); less than 1%
- Ammonia/ammonium hydroxide; less than 1%
- Phosphoric acid; less than 1%
- Trimethylamine; less than 1%
- Triethylamine; less than 1%

## Laboratory Conditions

### Operating Conditions

The system is designed to operate safely under these conditions:

- Indoors
- Altitude: Up to 2 000 m (6 560 feet) above sea level
- Ambient temperature: 5 °C (41 °F) to 40 °C (104 °F)
- Maximum relative humidity: 80% for temperatures up to 31 °C (88 °F), decreasing linearly to 50% at 40 °C (104 °F)
- Mains supply voltage fluctuations:  $\pm 10\%$  of the nominal voltage
- Transient overvoltages: Up to the levels of Overvoltage Category II
- Temporary overvoltages on the mains supply
- Pollution degree: Pollution Degree 2

### Performance Specifications

The system is designed to meet specifications under these conditions:

- An ambient temperature of 15 °C to 30 °C (59 °F to 86 °F)  
Over time, the temperature must remain within a range of 4 °C (7.2 °F), with the rate of the change in temperature not exceeding 2 °C (3.6 °F) per hour. Ambient temperature fluctuations exceeding the limits might result in mass shifts in spectra.
- Relative humidity from 20% to 80%, non-condensing

## Equipment Use and Modification

---



**WARNING! Personal Injury Hazard.** Contact the SCIEX representative if product installation, adjustment, or relocation is required.

---



**WARNING! Electrical Shock Hazard.** Do not remove the covers. Removing the covers might cause injury or malfunctioning of the system. The covers need not be removed for routine maintenance, inspection, or adjustment. Contact a SCIEX Field Service Employee (FSE) for repairs that require the covers to be removed.

---



**WARNING! Personal Injury Hazard.** Use SCIEX-recommended parts only. Use of parts not recommended by SCIEX or use of parts for any purpose other than their intended purpose can put the user at risk of harm or negatively impact system performance.

---

Use the mass spectrometer and ion source indoors in a laboratory that complies with the environmental conditions recommended in the *Site Planning Guide* for the mass spectrometer.

If the mass spectrometer and ion source are used in an environment or in a manner not prescribed by the manufacturer, then the protection provided by the equipment might be impaired.

Unauthorized modification or operation of the mass spectrometer and ion source might cause personal injury and equipment damage, and might void the warranty. Erroneous data might be generated if the mass spectrometer and ion source is operated either above or below the recommended environmental conditions or operated with unauthorized modifications. Contact an FSE for information on servicing the system.

## Laser Safety Information

This section contains safety information for the laser used in the illuminator for the NanoSpray<sup>®</sup> III ion source.

### Laser Classification



**WARNING! Laser Hazard.** Do not view the laser output with an optical instrument. Class 3(R) lasers can cause acute injury to the eyes.

---



**WARNING! Laser Hazard.** Follow all local codes, regulations, standards and internal requirements applicable to laser safety.

---



**WARNING! Laser Hazard.** Using equipment and controls or performing procedures in a manner different from that documented in this manual might result in hazardous laser radiation exposure.

The illuminator used in the ion source is a class 3(R) laser.

## Scheduled Maintenance

The illuminator requires no maintenance. Its expected lifetime is 3000 hours (more than 3 years).

**Tip!** The laser is designed for continuous operation. However, we recommend that the laser be turned off when not in use, to extend its lifetime.


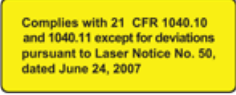


## Specifications

Specification	Range
<b>Laser Beam</b>	
Focused distance	Collimated 37 mm $\pm$ 3 mm
Spot size	0.7 mm $\pm$ 0.1 mm x 2.5 mm $\pm$ 0.2 mm
Divergence	< 0.7 mrad
<b>Output Parameters</b>	
Wavelength	655 nm, -10 nm, + 5 nm
Wavelength stability	0.25 nm/1 °C (nominal)
Output power	3.0 mW $\pm$ 0.15 mW
Output power stability (25°C)	< 1% fluctuation over 60 minutes

## Labels on the Ion Source

In accordance with regulatory requirements, all laser warning labels displayed on the ion source are documented in this guide. Warnings and labels on the ion source use international symbols.

## Operational Precautions and Limitations

External Labels	Definition	Location
	CAUTION: Visible and/or invisible laser radiation. Avoid eye or skin exposure to direct or scattered radiation.	External. On the top cover.
	Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007	External. On the top cover.
	Laser Aperture. Identifies the location of the aperture through which the laser beam emerges.	External. On the top cover.
	Laser Radiation: Avoid direct eye exposure. Class 3R laser product. Max power: 5 mW; Wavelength: 650 nm; IEC 60825-1	External. On the top cover.

# Ion Source Overview

---

# 2

Electrospray ionization (ESI) is a soft ionization technique for mass spectrometry. Nano-flow ESI is particularly useful when small amounts of valuable sample are available, or when high sensitivity is required.

The NanoSpray<sup>®</sup> ion source is ideally suited for the analysis of polar, thermally labile compounds by mass spectrometry. It is an atmospheric pressure ionization (API) source that provides high ionization efficiency for the transfer of analytes into gas phase ions.

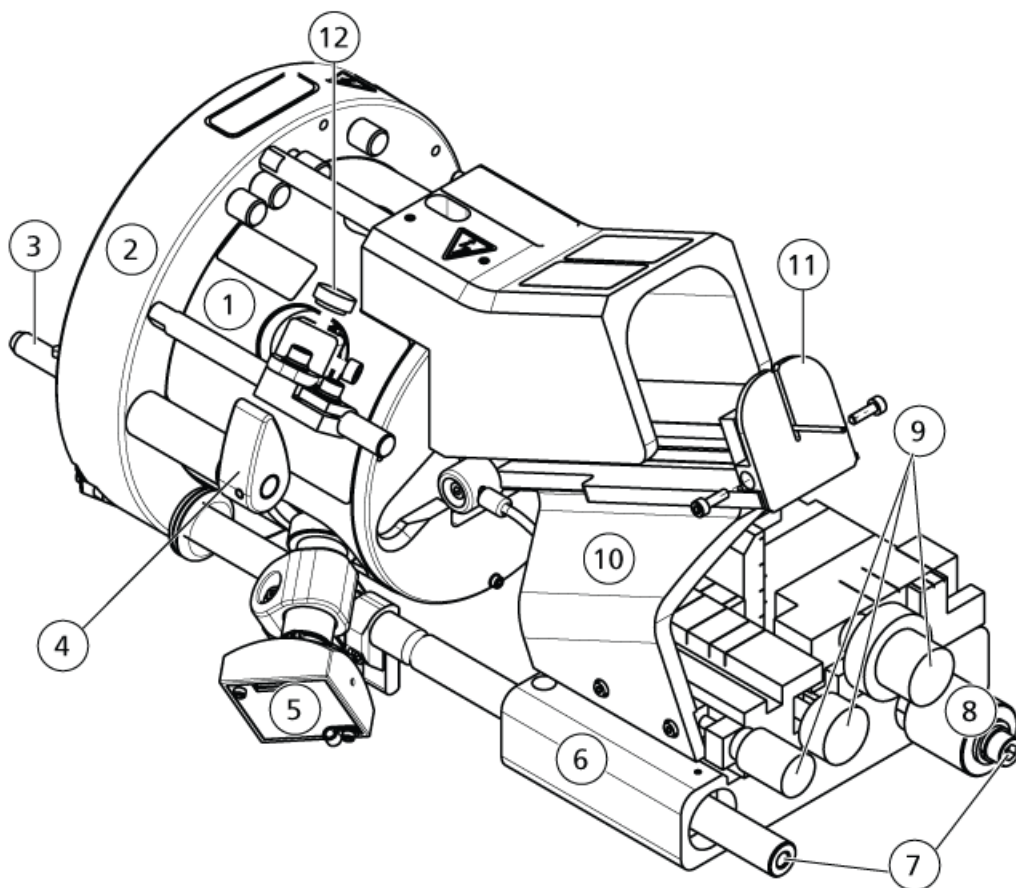
The ion source is intended for continuous sample throughput. It typically uses an external nano LC pump with a nano LC column for separation, although infusion can also be used. Samples travel along the nano LC column to the ion source head and then through an open-ended emitter tip. The ion source has an X-Y-Z positioning unit that can be used to position the emitter tip relative to the curtain plate. The ion source also has a camera that sends an image to the monitor. The image facilitates the positioning of the emitter tip and observation of the spray.

Refer to [Principles of Operation](#).

# Ion Source Components

# 3

Figure 3-1 Ion Source Components



Item	Description
1	Cover. Laser warning labels (not shown) are located on the top of this cover.
2	Ion source interface
3	Release pin
4	Release latch
5	Camera. Refer to <a href="#">Adjust and Focus the Camera</a> .

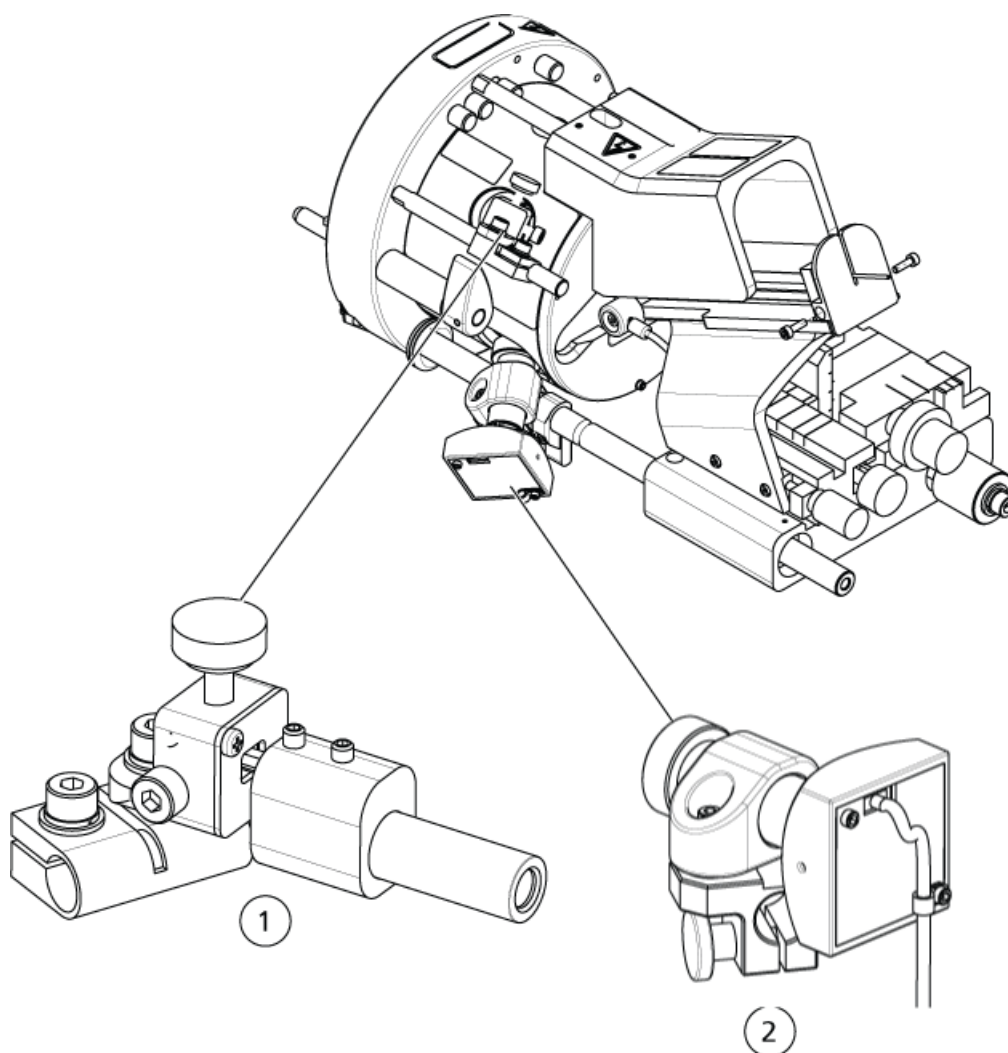
Item	Description
6	X-Y-Z positioning unit
7	Positioning rails
8	Sleeve
9	X-Y-Z adjustment knobs (micrometers)
10	Bracket. The ion source head is installed on the bracket. Refer to <a href="#">NanoSpray® III Head Assembly and Installation</a> .
11	Protective end cap
12	Illuminator. Refer to <a href="#">Adjust the Illuminator</a> .

## Camera and Illuminator

The camera is mounted on a rod connected to the ion source. Use it to focus the image on the monitor and to reposition the image of the emitter tip and curtain plate.

An illuminator provides light for observing the curtain plate aperture and the emitter tip.

**Figure 3-2 Camera and Illuminator**



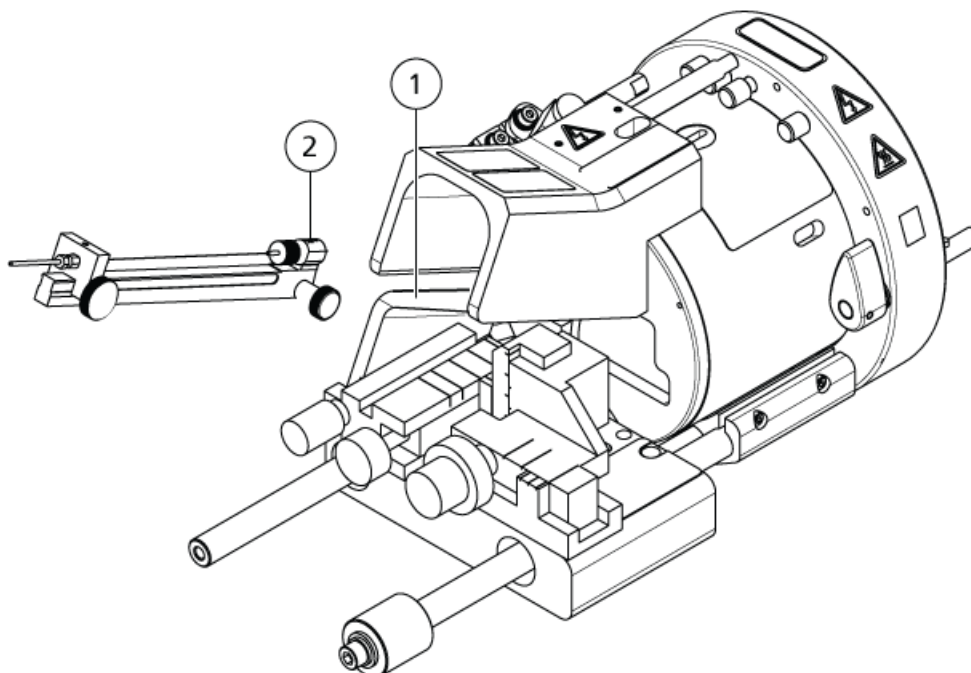
Item	Description
1	Illuminator
2	Camera



## Ion Source Head

The bracket holds the ion source head. [Figure 3-3](#) shows the NanoSpray<sup>®</sup> III bracket, used with the NanoSpray<sup>®</sup> III head. The ion source head holds the union that connects the fused silica or nano LC column to the emitter tip. The mass spectrometer supplies high-voltage power to the ion source head and the union holder.

**Figure 3-3 Ion Source and NanoSpray III Head**



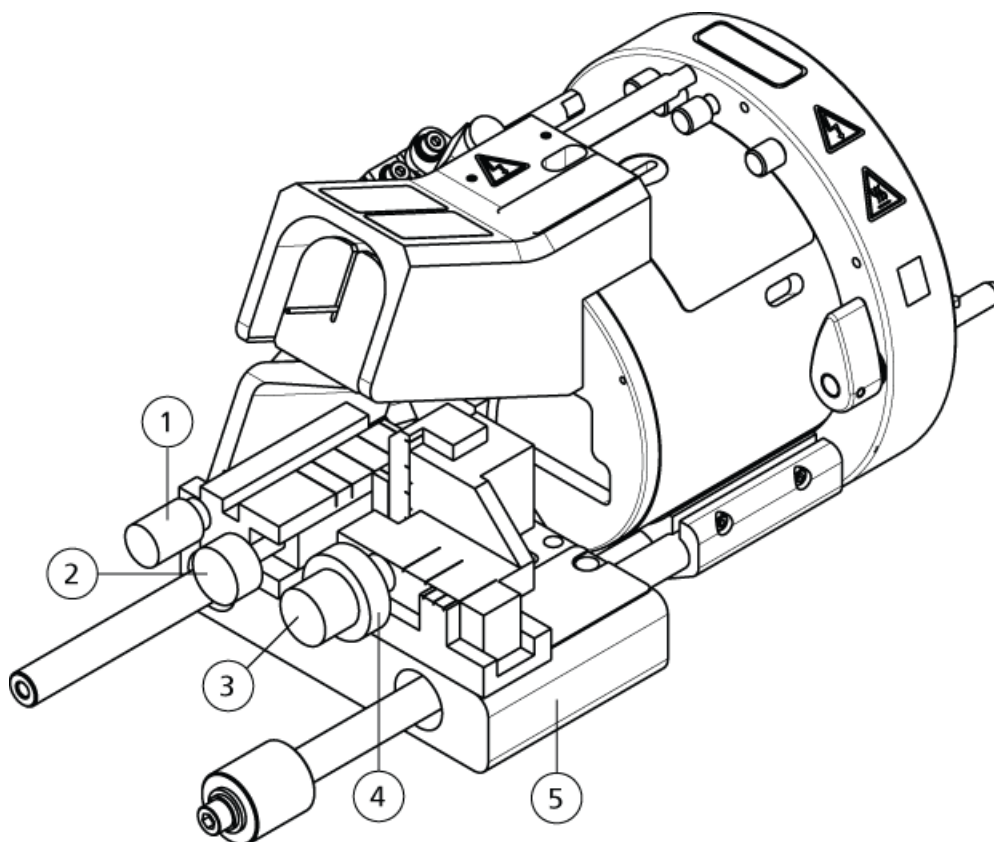
Item	Description
1	NanoSpray <sup>®</sup> III bracket
2	NanoSpray <sup>®</sup> III head

## X-Y-Z Positioning Unit

After the X-Y-Z positioning unit, shown in [Figure 3-4](#), is in place against the ion source interface, the position of the emitter tip can be adjusted with the X-Y-Z axis adjustment knobs. The image shown on the monitor facilitates the adjustment of the emitter tip position.

**Note:** The movement of the X-Y-Z positioning unit is limited by the cover. The unit cannot be moved to positions at the limits of the micrometer range.

**Figure 3-4 Controls on the X-Y-Z Positioning Unit**



Item	Description
1	Fine Z-axis adjustment knob (movement toward the curtain plate)
2	Coarse Z-axis adjustment knob (movement toward the curtain plate)
3	Y-axis adjustment knob (vertical movement)
4	X-axis adjustment knob (horizontal movement)
5	X-Y-Z positioning unit

## Positioning Rails

The ion source has two rails that support the X-Y-Z positioning unit. Move the X-Y-Z positioning unit along these rails into and out of the operating position. Moving the X-Y-Z positioning unit away from the ion source interface disconnects the high-voltage supply from the ion source head and allows the ion source head to be removed. The

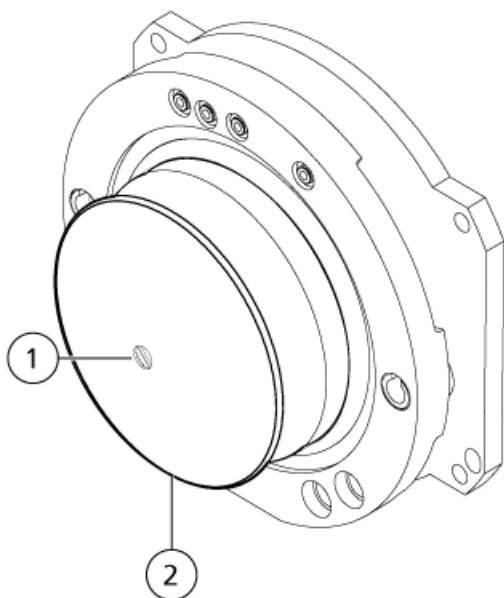
high-voltage power supply to the ion source head is disconnected until the X-Y-Z positioning unit is pushed completely into its operating position.

## NanoSpray<sup>®</sup> Interface Components

The ion source housing connects to the NanoSpray<sup>®</sup> interface components. Refer to [Figure 3-5](#). The interface components consist of the orifice plate and the curtain plate.

**Note:** The NanoSpray<sup>®</sup> interface components for the different mass spectrometers might be physically interchangeable, but they have different aperture sizes. Be sure to install the correct interface for the mass spectrometer. The NanoSpray<sup>®</sup> interface is not applicable to the TripleTOF<sup>®</sup> 6600+ system.

**Figure 3-5 NanoSpray<sup>®</sup> Interface Components**



Item	Description
1	Curtain plate aperture
2	Curtain plate

## OptiFlow<sup>™</sup> Interface Components

The ion source housing connects to the OptiFlow<sup>™</sup> interface components. Refer to [Figure 3-6](#). The OptiFlow<sup>™</sup> interface components consist of the nano cell heater assembly and nano cell curtain plate.

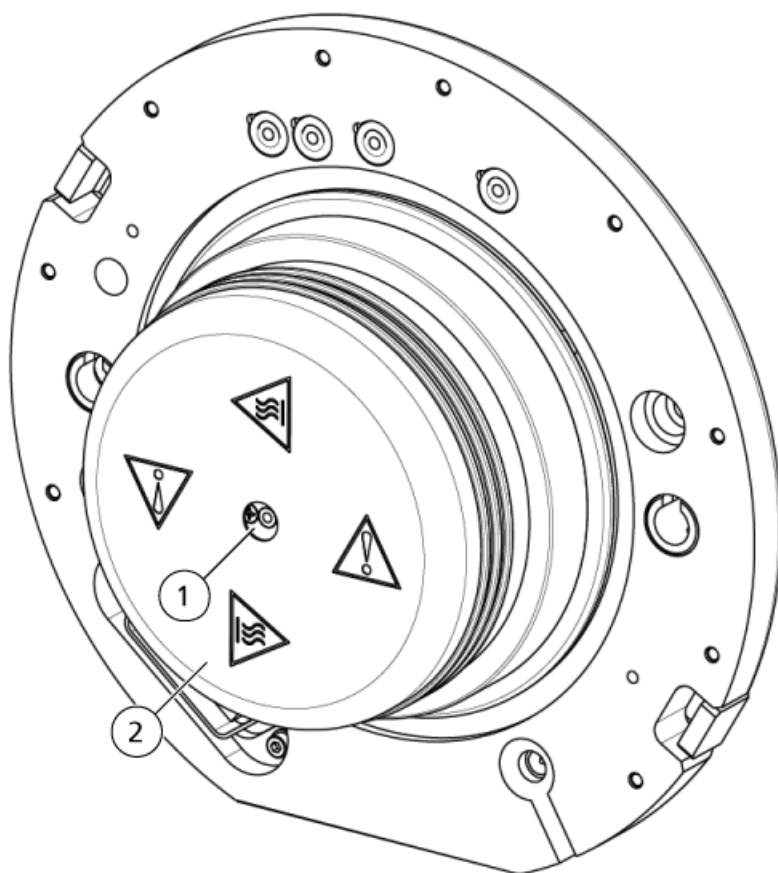
## Ion Source Components

---

**Note:** The OptiFlow™ interface components are applicable only to a TripleTOF® 6600 system upgraded with the OptiFlow™ interface or the TripleTOF® 6600+ system.

---

**Figure 3-6 OptiFlow™ Interface Components**



Item	Description
1	Nano cell heater assembly
2	Nano cell curtain plate

# Requirements

## Gases

---

**CAUTION: Potential System Damage. Do not supply nitrogen gas for Gas 1. Nitrogen gas increases the risk of corona damage, which can damage the emitter tip.**

---

---

**CAUTION: Potential System Damage. Do not supply house air for Gas 1.**

---

The ion source uses nebulizer gas, supplied through the Gas 1 connection to the instrument. Make sure that a supply of zero air is connected to the Gas 1 inlet on the mass spectrometer. For more information, refer to the *Site Planning Guide* for the mass spectrometer.

---

**Tip!** Typical zero air specifications are: hydrocarbon content of less than 0.1 PPM and particle size of less than 0.01 microns.

---

## Solvents

For best results, use high purity solvents for nano-flow experiments. Low quality solvents might result in high background, contaminant peaks, or blocked parts in the LC systems. Contaminants are difficult to remove from the HPLC system, and might result in downtime or require a service call.

We recommend pre-made high purity solvents such as those from Burdick-Jackson (that is, HPLC-grade water with 0.1% formic acid and acetonitrile with 0.1% formic acid). These solvents can be ordered from VWR (US PN BJLC452-2.5 - 0.1% Formic Acid#Water, US PN BJLC441-2.5 - 0.1% Formic Acid#Aceton).

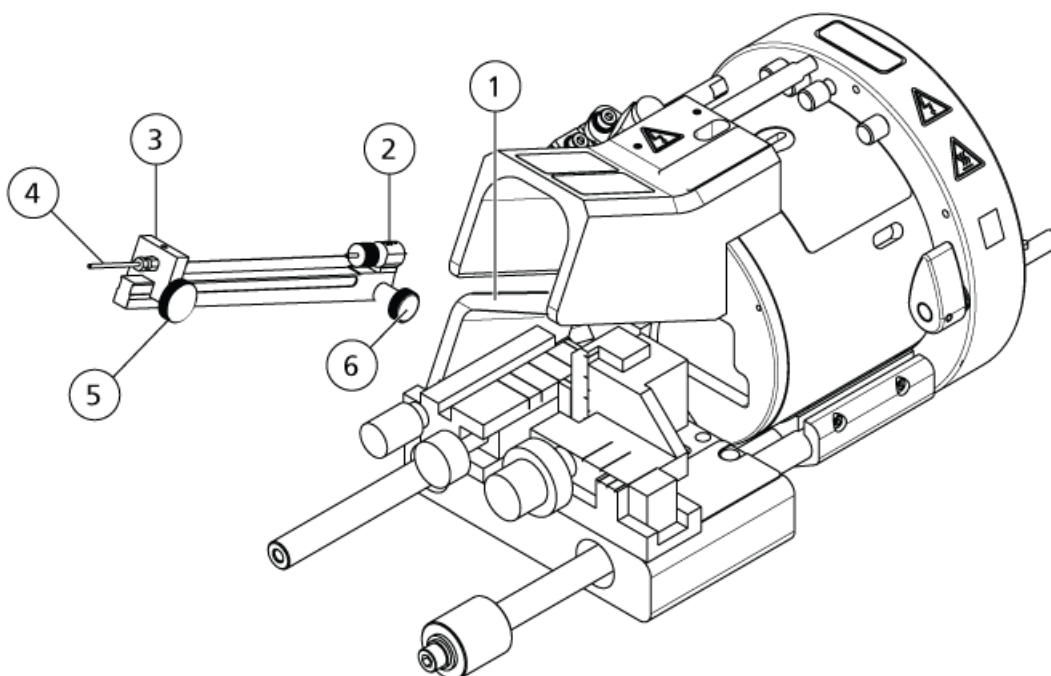
# NanoSpray<sup>®</sup> III Head Assembly and Installation

## 4

This section describes how to assemble and install the NanoSpray<sup>®</sup> III head. It includes procedures for preparing the head and emitter tips.

**Tip!** For additional training materials, go to [SCIEXUniversity](#).

**Figure 4-1 NanoSpray III Head Components**



Item	Description	For assembly instructions, refer to...
1	NanoSpray III bracket	—
2	High-voltage rail	Refer to <a href="#">Remove the NanoSpray<sup>®</sup> III Head and Install the NanoSpray III Head on the Bracket</a> .
3	Straight union and holder	—
4	Sample line connection	Refer to <a href="#">Connect the Sample Line</a> .

Item	Description	For assembly instructions, refer to...
5	Union thumbscrew	—
6	Rail thumbscrew	—

## Assemble the NanoSpray® III Head

The following types of emitter tips can be used with the NanoSpray® III head:

- Pre-cut New Objective tips
- Uncut New Objective tips
- Pre-packed column tips

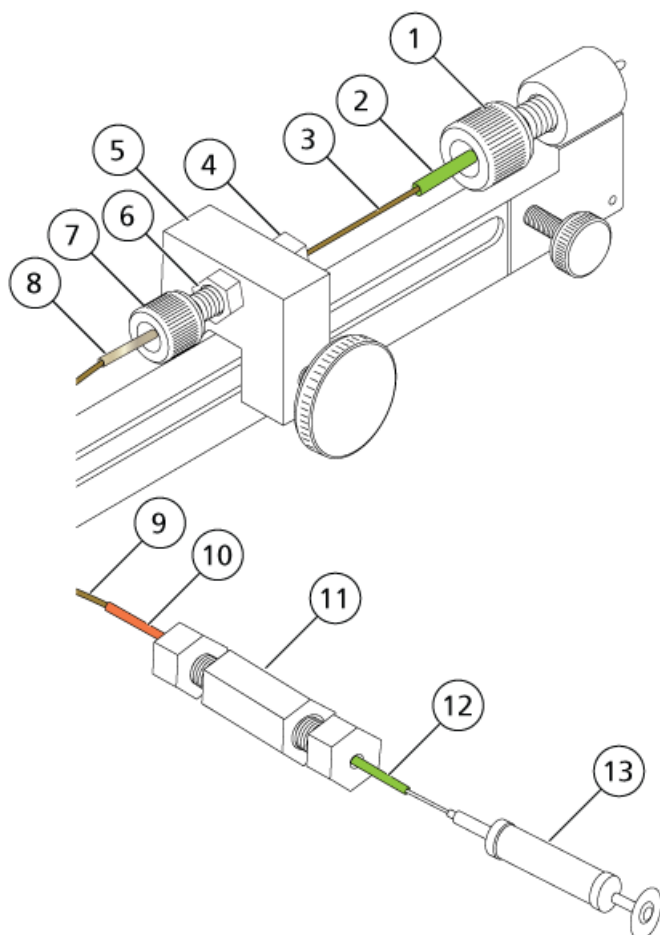
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**Note:** Emitter tips are also referred to as fused silica capillaries or needles.

---

[Figure 4-2](#) shows the parts needed to assemble and install the NanoSpray® III head. The key indicates whether the parts are available in the Consumables kit, Hardware Installation kit, or both.

Figure 4-2 Parts for the NanoSpray® III Head



Item	Description	Part Number	Kit
1	Sprayer fitting (PEEK nut and ferrule)	5031772	Both
2	Green FEP sleeve (1.58 mm outside diameter [o.d.], 0.38 mm inside diameter [i.d.])	1006547	Consumables
3	Emitter tip (precut, 7 cm)	1035752	Both
4	Finger-tight PEEK hex nut	5015860	Both
5	Union holder (includes union, PN 5015902)	5016361	See 5015902
6	Straight union	5015902	Consumables
7	Finger-tight PEEK nut	5017932	Both



Item	Description	Part Number	Kit
8	Tan PEEK sleeve (1/32 inch o.d., 0.015 inch i.d.)	5015909	Both
9	Fused silica (100 cm, 75 µm i.d., 360 µm o.d.)	1033299	Consumables
10	Orange PEEK sleeve (0.0625 inch o.d.)	1003994	Consumables
11	Syringe union	5015886	Consumables
12	Green PEEK sleeve (1/16 inch o.d., 0.030 inch i.d.)	1006549	Consumables
13	100 µL syringe	1003988	Both

**Required Materials**

- 2.5 mm hex screwdriver (PN 1034765)
- PEEK tube cutter (PN 011281)
- Fused silica cutter (PN 1006143)
- Two 1/4 inch wrenches (not supplied)
- HPLC-grade isopropanol or methanol (not supplied)

**Tip!** For methods requiring a more robust syringe, an alternate syringe, PN 81075, is available from Hamilton Company.

## Remove the NanoSpray<sup>®</sup> III Head



**WARNING! Electrical Shock Hazard.** Remove the ion source from the mass spectrometer before starting this procedure. Follow all electrical safe work practices.



**WARNING! Electrical Shock Hazard.** Never operate the NanoSpray<sup>®</sup> ion source without the illuminator, camera, stop, and covers properly installed. Never touch the curtain plate or allow the emitter tip to contact the curtain plate. If the mass spectrometer is operational and the ion source is installed, then high voltage is present on the curtain plate, even if the X-Y-Z positioning unit is moved away from the interface.



---

**WARNING! Hot Surface Hazard.** Wait 30 minutes for the high-voltage rail to cool before removing it.

---



---

**WARNING! Laser Hazard.** Using equipment and controls or performing procedures in a manner different from that documented in this manual might result in hazardous laser radiation exposure.

---

1. Make sure that the illuminator is turned off.



---

**WARNING! Electrical Shock Hazard.** Move the X-Y-Z positioning unit away from the ion source interface to disconnect the supply of high-voltage power from the sprayer head and high-voltage rail.

---

2. Pull the X-Y-Z positioning unit as far from the ion source interface as possible, until it is stopped by the sleeve, to disable the supply of high-voltage power to the ion source head.
3. Loosen the rail thumbscrew, and then pull the high-voltage rail back and up to remove it from the bracket.

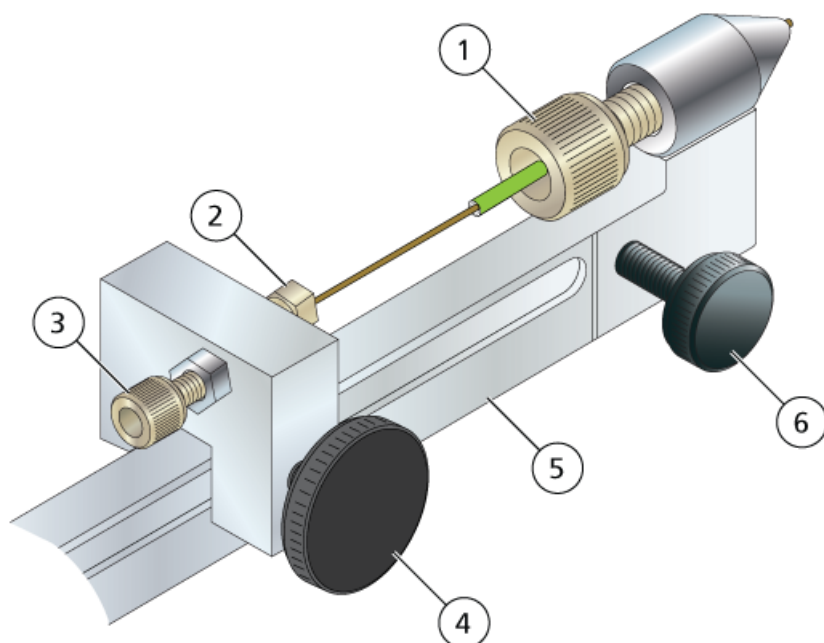
---

**Note:** Before the rail can be removed from the bracket, it might be necessary to adjust the X-Y-Z controls.

---

4. Put the NanoSpray<sup>®</sup> III head on a clean, flat surface.

Figure 4-3 NanoSpray III Head



Item	Description
1	Sprayer fitting
2	Finger-tight hex nut
3	Small sample line fitting
4	Union thumbscrew
5	High-voltage rail
6	Rail thumbscrew

## Prepare the Sprayer Fitting

Prepare the sprayer fitting before using the NanoSpray® III head for the first time.

Refer also to the *NanoSpray® III Head and Emitter Tip Assembly Quick Start Guide*.

**CAUTION: Potential System Damage. Be careful when dismantling the NanoSpray® III head because it contains small parts.**

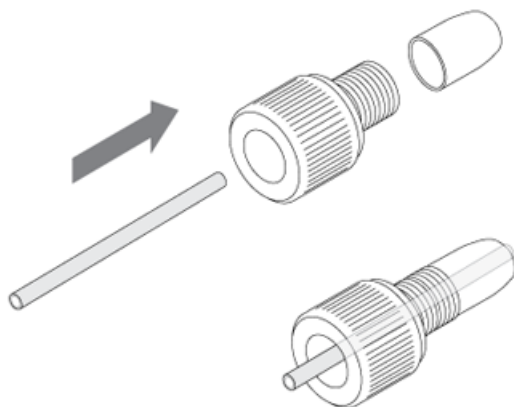
1. Remove the sprayer fitting from the NanoSpray head assembly.

## NanoSpray<sup>®</sup> III Head Assembly and Installation

---

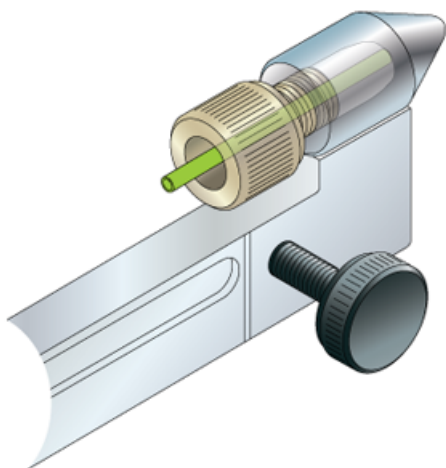
2. Use a PEEK tube cutter to cut a 2.5 cm piece of the 1/16 inch o.d. green FEP sleeve.
3. Insert the sleeve through the PEEK nut and the wide end of the ferrule, as shown in [Figure 4-4](#), with the end of the sleeve protruding 2 mm from the end of the ferrule.

**Figure 4-4 Preparing the Sprayer Fitting**



4. Insert the assembled fitting and the prepared sleeve into the rear of the sprayer head, and then tighten slightly.

**Figure 4-5 The Sprayer Fitting Installed**



## Insert the Emitter Tip



**WARNING! Puncture Hazard.** Handle the emitter tip with care. The tip is extremely sharp.

---

**Note:** To make sure that there is sufficient clearance between the X-Y-Z positioning unit and the covers, do not use emitter tips that are more than 15 cm long.

---

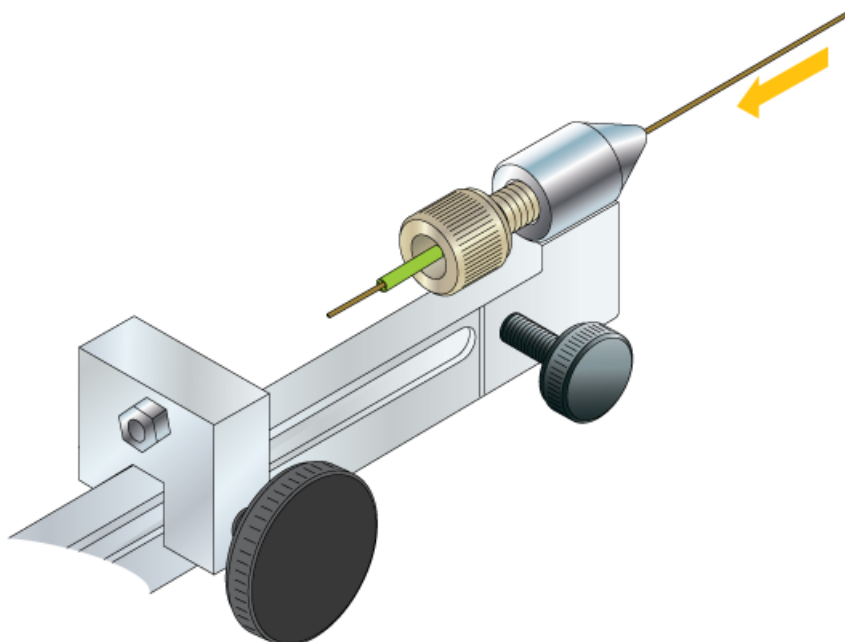
1. Remove a new emitter tip from the case.

**Note:** The emitter tips are delicate. If the emitter tip is touched or bumped an emitter tip during installation, throw it away and prepare a new one.

---

2. Loosen the sprayer fitting.
3. Insert the blunt (untapered) end of the emitter tip into the sprayer end of the NanoSpray® III head, and then through the sprayer fitting and green FEP sleeve, as shown in [Figure 4-6](#).

**Figure 4-6 Inserting the Emitter Tip**



4. Loosen the union thumbscrew.

## NanoSpray<sup>®</sup> III Head Assembly and Installation

---

5. Feed the blunt end of the emitter tip through the PEEK hex nut and then use the fused silica cutter to trim 1 cm from the blunt end of the emitter tip.

---

**Note:** Score the emitter tip and then pull the waste part laterally, along the axis of the tubing. When using uncut emitter tips, cut them to approximately 7 cm.

---

6. Insert the blunt end of the emitter tip into the union.
7. Tighten the PEEK hex nut in the union until it is finger-tight.

---

**Tip!** To eliminate any dead volume inside the union, make sure that the emitter tip is pushed all the way into the union before tightening the nut.

---

8. Adjust the position of the union until the emitter tip protrudes 0.5 mm to 1 mm from the sprayer head.
9. Tighten the sprayer fitting.
10. Tighten the union thumbscrew.

## Install the NanoSpray III Head on the Bracket



---

**WARNING! Electrical Shock Hazard.** Remove the ion source from the mass spectrometer before starting this procedure. Follow all electrical safe work practices.

---



---

**WARNING! Electrical Shock Hazard.** Never operate the NanoSpray<sup>®</sup> ion source without the illuminator, camera, stop, and covers properly installed. Never touch the curtain plate or allow the emitter tip to contact the curtain plate. If the mass spectrometer is operational and the ion source is installed, then high voltage is present on the curtain plate, even if the X-Y-Z positioning unit is moved away from the interface.

---



---

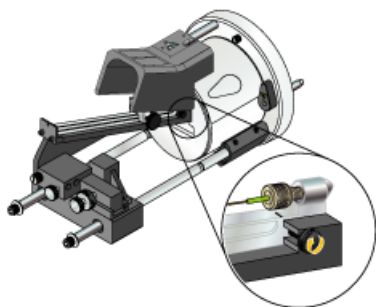
**WARNING! Electrical Shock Hazard.** Move the X-Y-Z positioning unit away from the ion source interface to disconnect the supply of high-voltage power from the sprayer head and high-voltage rail.

---

1. Make sure that the X-Y-Z positioning unit is as far from the ion source interface as possible, until it is stopped by the sleeve, to disable the supply of high-voltage power to the ion source head.
2. Make sure that the illuminator is off. The switch should be in the position furthest from the LED.
3. Turn the Z-axis adjustment knob counter-clockwise as far as it will go. The Z axis should be in the 0 position.

4. Insert the high-voltage rail into the bracket and then push the rail forward until it stops.

**Figure 4-7 Alignment Points on the Bracket**



---

**Note:** Resistance will be felt during installation of the rail. The resistance is caused by the O-ring, which seals the Gas 1 connection.

---

5. Tighten the rail thumbscrew until it is snug. Do not overtighten it.

## Connect the Sample Line

This procedure provides instructions for using fused silica tubing for the sample line. To use the PEEK-lined fused silica tubing, which does not require cutting or sleeves, refer to [Connecting the Syringe Using PEEK-lined Fused Silica Tubing](#).

1. Cut a 3 cm length of the green PEEK sleeve.
2. Insert the syringe needle in the green PEEK sleeve.
3. Remove the stainless steel nut and ferrule from one end of the syringe union.
4. Insert the needle and sleeve into the stainless steel nut and ferrule, pushing the sleeve in as far as it will go, and then insert the syringe needle.
5. Use two 1/4 inch wrenches to tighten the nut.
6. Insert one end of the fused silica tubing into the orange PEEK sleeve.
7. Cut the end of the fused silica tubing and then clean it with a wipe dampened with methanol or isopropanol.
8. Remove the stainless steel nut and ferrule from the other end of the syringe union.
9. Insert the sleeve and tubing into the stainless steel nut and ferrule until they protrude about 2 mm from the tip of the fitting.
10. Insert the fused silica tubing, sleeve, nut, and ferrule, into the syringe union, pushing the sleeve in as far as it will go.

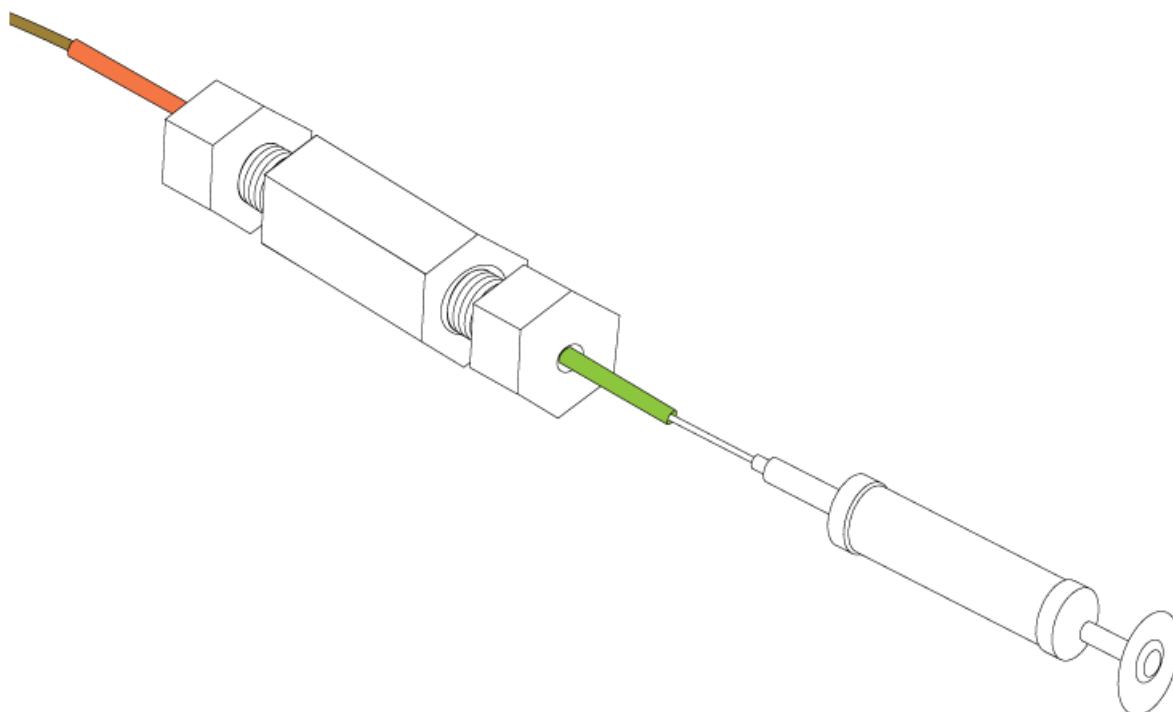
11. Use two 1/4 inch wrenches to tighten the nut.

---

**Tip!** Inject solution and make sure droplets come out of the tubing, to verify the connections.

---

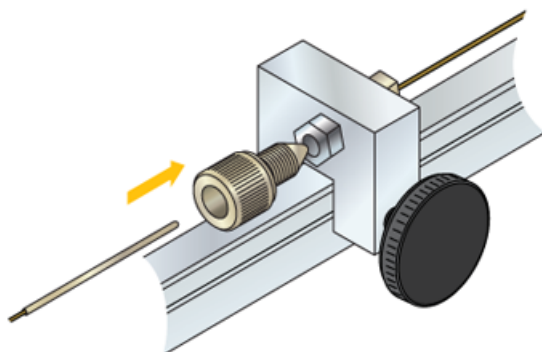
**Figure 4-8 Syringe Union**



12. Remove the fitting from the upstream side of the straight union.
13. Insert the fused silica tubing through the tan PEEK sleeve.
14. Cut the end of the fused silica tubing and then clean it with a wipe dampened with methanol or isopropanol.
15. Insert the sleeve and tubing into the PEEK fitting removed in step 12, until they protrude about 2 mm from the tip of the fitting.



**Figure 4-9 Connecting the Sample Line to the Union**



16. Insert the fused silica, PEEK sleeve, and fitting into the upstream side of the union, making sure that they are completely seated in the union.
17. While holding the tubing in place, tighten the fitting.
18. Move the X-Y-Z positioning unit toward the ion source interface slowly, until it stops, making sure that the emitter tip does not strike the curtain plate.

## Adjust the Illuminator and Camera



**WARNING! Electrical Shock Hazard.** Never operate the NanoSpray® ion source without the illuminator, camera, stop, and covers properly installed. Never touch the curtain plate or allow the emitter tip to contact the curtain plate. If the mass spectrometer is operational and the ion source is installed, then high voltage is present on the curtain plate, even if the X-Y-Z positioning unit is moved away from the interface.



**WARNING! Eye Injury Hazard—Direct and Reflected Beam.** Do not deliberately stare into the beam. This can cause injury to the retina. Be aware that reflection beams off of shiny surfaces could be as strong and focused as a direct beam.

Adjust the illuminator and camera to obtain the best possible images on the monitor.

## Adjust and Focus the Camera

1. Move the X-Y-Z positioning unit along the positioning rails, away from the ion source interface, until it is stopped by the sleeve. This automatically disconnects the supply of high-voltage power to the ion source head.

## NanoSpray<sup>®</sup> III Head Assembly and Installation

---

2. Turn on the monitor and adjust the camera until the curtain plate aperture is visible on the monitor.

---

**Tip!** If no image appears on the monitor, then make sure that the monitor and camera cables are connected, and that the illuminator is on. Refer to [Required Materials](#).

---

**Note:** Some monitor types are sensitive to electrostatic discharge, and might turn off unexpectedly. If the monitor turns off, then turn it back on. There is no impact on system performance or the accuracy or repeatability of the measurements.

---

3. Loosen the camera thumbscrew and then adjust the camera until the view on the monitor is similar to the recommended view shown in [Figure 4-10](#) or [Figure 4-11](#). The camera will be at approximately 40 degrees to the horizontal plane.



---

**WARNING! Electrical Shock Hazard. Never operate the NanoSpray<sup>®</sup> ion source without the camera properly installed. Do not remove the camera.**

---

**Figure 4-10 View of Aperture—Focus on the Orifice Region (OptiFlow<sup>™</sup> Interface)**

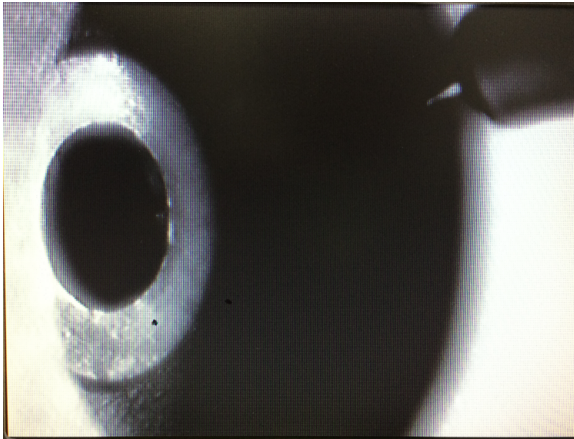


Figure 4-11 View of Aperture—Focus on the Orifice Region (NanoSpray® Interface)

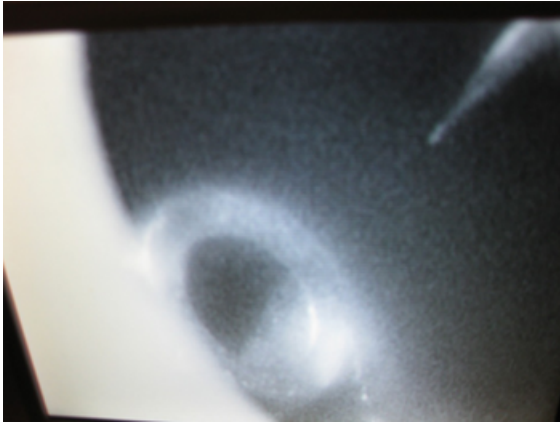
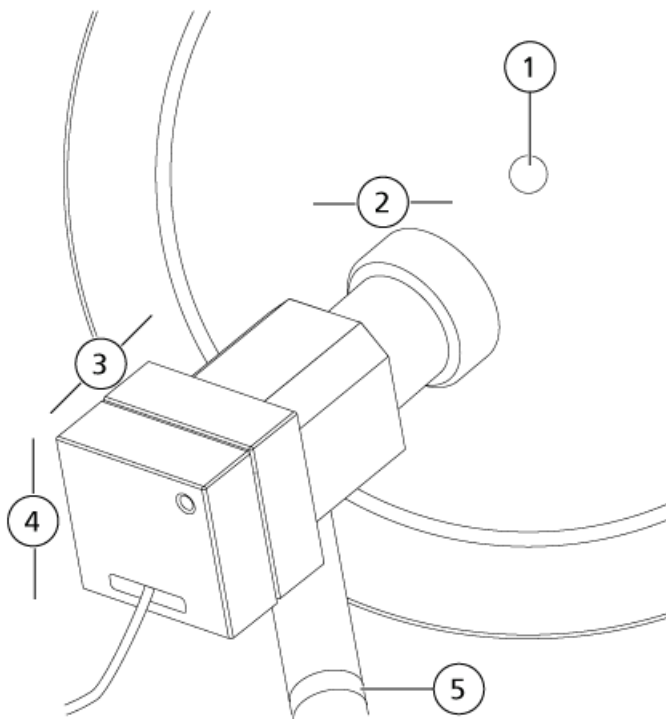


Figure 4-12 Camera Movement and Orientation (Covers Not Shown)



Item	Description
1	Curtain plate aperture
2	Horizontal movement (pan)

Item	Description
3	Movement to and from the aperture (focus)
4	Vertical movement (tilt)
5	Groove on positioning rail

4. Focus on the emitter tip by pushing the camera lens back in its holder, or focus on the orifice plate by pushing the camera lens forward.

## Adjust the Illuminator



**WARNING! Laser Hazard.** Follow all local codes, regulations, standards and internal requirements applicable to laser safety.

---



**WARNING! Laser Hazard.** Follow this procedure exactly to avoid exposure to hazardous laser radiation.

---



**WARNING! Eye Injury Hazard—Direct and Reflected Beam.** Do not deliberately stare into the beam. This can cause injury to the retina. Be aware that reflection beams off of shiny surfaces could be as strong and focused as a direct beam.

---

1. Start the Analyst® or Analyst® TF software.
2. Turn on the illuminator.

The green LED on the switch box becomes lit and a red dot appears on the surface at which the illuminator is directed.



**WARNING! Electrical Shock Hazard.** Do not loosen or remove the movement control hex screws.

---

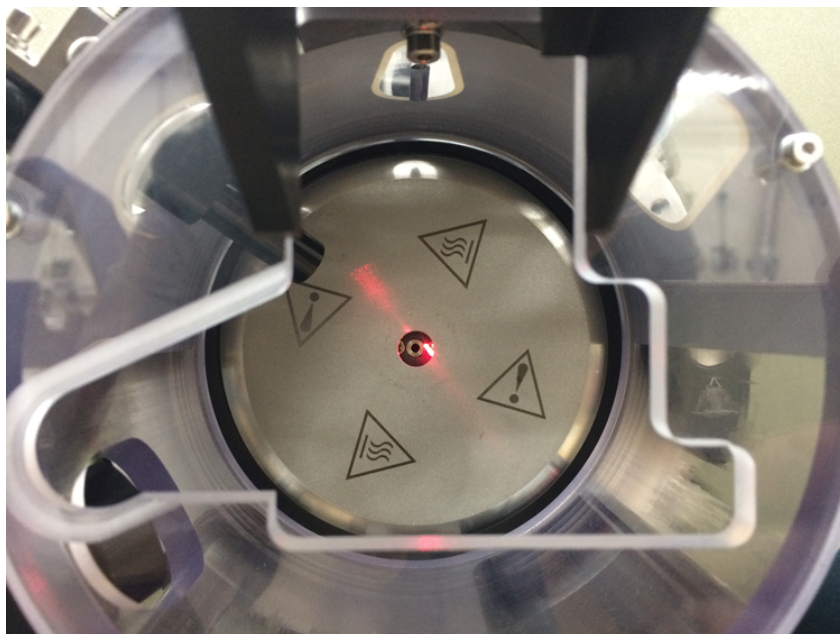
3. Using fingers only, adjust the position of the illuminator until the laser beam is aimed into the center of the aperture.

The illuminator should be aimed at the 4:00 position.

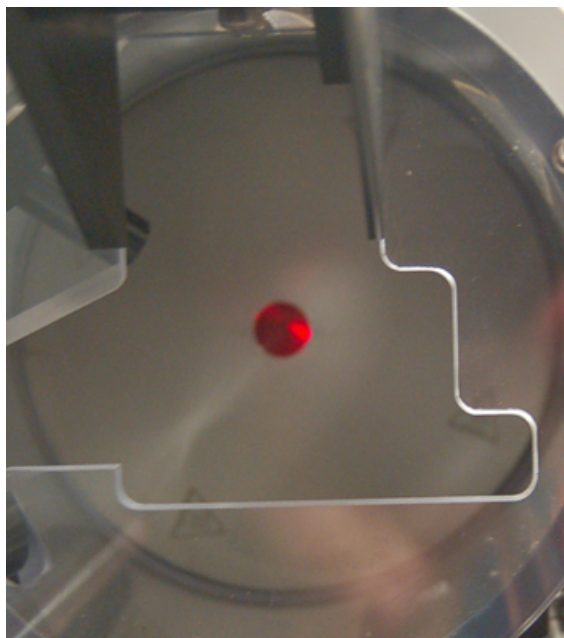
**Note:** To see the illuminator, look through the viewing ports in the cover.

---

**Figure 4-13 Beam Aimed into Aperture (OptiFlow™ Interface)**



**Figure 4-14 Beam Aimed into Aperture (NanoSpray® Interface)**



## NanoSpray® III Head Assembly and Installation

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**Tip!** When the illuminator is aimed correctly, there is little or no reflection or scattering of the beam on the curtain plate when the rail is in the operating position.

---

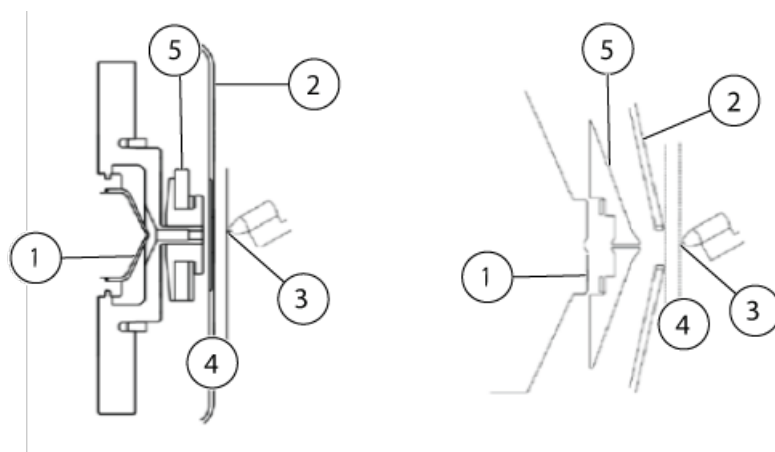
4. Begin infusing the sample to be analyzed at between 0.5 µL/min and 1.0 µL/min.

**CAUTION: Potential System Contamination.** Do not insert the end of the emitter tip into the curtain plate aperture. Make sure that the emitter tip is at least 2 mm to 5 mm outside the aperture. Spraying too close to the aperture can cause contamination of the mass spectrometer.

---

5. Adjust the X-Y-Z positioning unit until the emitter tip is visible on the monitor.

**Figure 4-15 Emitter Tip Position: OptiFlow™ Interface (left) and NanoSpray® Interface (right)**



Item	Description
1	Orifice plate
2	Curtain plate
3	Emitter tip
4	2 mm to 5 mm
5	Heater

6. Set the **Ion Source Gas 1 (GS1)** and **Ion Source Gas 2 (GS2)** parameters to 0, and the **IonSpray Voltage (IS)** or **IonSpray Voltage Floating (ISVF)** parameter to 100.

Within a few minutes, a droplet becomes visible at the tip.

7. Increase the IS or ISVF parameter until droplets spray towards the aperture in short bursts.
8. Increase the GS1 parameter until the plume is visible.

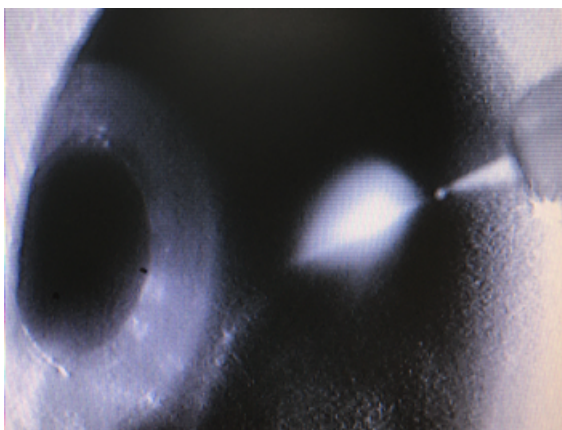
Figure 4-16 and Figure 4-17 show the monitor image when the illuminator is adjusted correctly and the sample is flowing freely. The position of the emitter tip might vary depending on the application.

---

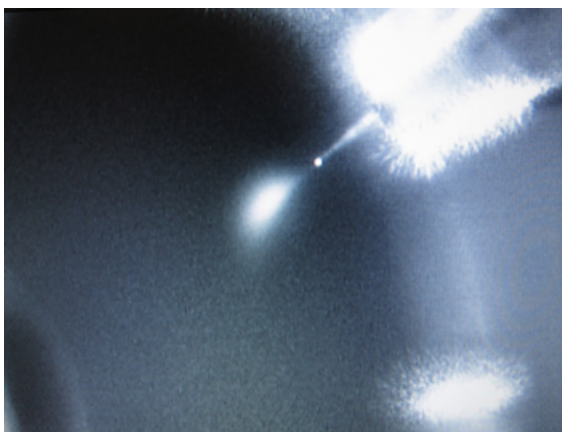
**Tip!** If the plume seems detached from the emitter tip, then adjust illuminator slightly.

---

**Figure 4-16 Monitor Image with Correctly Adjusted Illuminator (OptiFlow™ Interface)**



**Figure 4-17 Monitor Image with Correctly Adjusted Illuminator (NanoSpray® Interface)**



---

**Note:** The picture is monochrome.

---

9. Adjust the brightness and color on the monitor for best picture quality.



## Inspect for Leaks



**WARNING! Laser Hazard.** Follow this procedure exactly to avoid exposure to hazardous laser radiation.

---

**Note:** The 3R laser is not a skin or material burn hazard. It does not normally harm the eyes because it is low powered and is within the aversion response of the eye. It is a distraction, a glare hazard, or an eye hazard if the laser is stared at directly.

---

**CAUTION: Potential System Damage.** Make sure that the fused silica capillary contains no blockages. Blockages can cause a buildup of back pressure, which can break the glass syringe.

---

**CAUTION: Potential System Damage.** Adjust the stop on the syringe pump to prevent the syringe plunger from being forced into the needle assembly and breaking the needle.

---

Test the connections for leaks before starting analysis. Nano-flow ionization techniques use small sample volumes, so leaks might not be noticed for a long time.

When **Ion Source Gas 1 (GS1)** and **IonSpray Voltage** (IS or ISVF) are set to zero, a droplet should form at the emitter tip. If there is no droplet, there might be a leak or blockage. Perform a leak test.

1. Use the 100 µL syringe to infuse a high flow (0.5 µL/min to 1.0 µL/min) of solvent through the NanoSpray® III head for a few minutes, and then inspect the sleeves at all connections for visible leaks.

---

**Note:** Smaller syringes can withstand greater back pressures.

---

2. Remove the sample line fitting from the upstream side of the union.
3. Examine the sample line to make sure that the sample is flowing. If the sample is flowing, then connect the sample line again and tighten the nut.
4. If droplets are not visible at the emitter tip, then remove the emitter tip and wait for a few minutes.
  - If liquid does not come out of the union, then the union is blocked. Replace it.
  - If liquid flows freely out of the union, then connect the emitter to the union. If no droplets are observed at the emitter tip, then the tip might be blocked. Replace it.

For more troubleshooting tips, refer to [Troubleshooting](#).



# Optimize the NanoSpray III Head

# 5

This section describes how to optimize the performance of the NanoSpray<sup>®</sup> III head for a specific compound.



**WARNING! Laser Hazard.** Follow this procedure exactly to avoid exposure to hazardous laser radiation.



**WARNING! Hot Surface Hazard.** Do not touch the high voltage rail or emitter tip.



**WARNING! Electrical Shock Hazard.** Never operate the NanoSpray<sup>®</sup> ion source without the illuminator, camera, stop, and covers properly installed. Never touch the curtain plate or allow the emitter tip to contact the curtain plate. If the mass spectrometer is operational and the ion source is installed, then high voltage is present on the curtain plate, even if the X-Y-Z positioning unit is moved away from the interface.

This procedure assumes that the XYZ coordinates are set to the optimized values recorded during testing. If the XYZ values have been changed (for example, during replacement of the emitter tip), set them to the optimized values, being careful not to strike the emitter tip against the curtain plate.

This section describes how to optimize the performance of the NanoSpray<sup>®</sup> III head for a specific compound.

**Note:** For installation tests for the OptiFlow<sup>™</sup> and NanoSpray<sup>®</sup> ion source, refer to the *Ion Source Tests, Specifications and Data Log*, available at [sciex.com/customer-documents](https://sciex.com/customer-documents).

1. Start the Analyst<sup>®</sup>/Analyst<sup>®</sup> TF software.
2. In **Tune and Calibrate** mode, double-click **Manual Tune** and then open the method optimized in the ion source tests.
3. Set the **Interface Heater Temperature (IHT)** to **75 °C**.

**Note:** For the NanoSpray<sup>®</sup> ion source application, the IHT optimizes between 50 °C and 100 °C. While higher temperatures produce slightly better spray, they decrease the lifetime of the emitter tip.

4. Wait until the interface reaches the correct temperature. This can take up to 10 minutes.
5. Infuse or inject the compound.

## Optimize the NanoSpray III Head

---

6. If a makeup flow is being used, then set it to the same flow rate as the sample flow and then optimize as necessary.

---

**CAUTION: Potential System Damage. Do not allow the emitter tip to contact the curtain plate. Use the fine Z-axis adjustment knob to adjust the sprayer position, to avoid damage to the emitter tip.**

---

7. If necessary, adjust the position of the emitter tip to improve the transmission of ions into the mass spectrometer, and then record the optimized XYZ settings for future use.
8. In the **IonSpray Voltage (IS)** or **IonSpray Voltage Floating (ISVF)** field, type **2100** for positive ion mode, or **-1400** for negative ion mode.
9. Adjust the IS or ISVF in **100 V** increments, and use the fine Z-axis adjustment knob to adjust the emitter tip position, until the optimal signal and signal-to-noise ratio is achieved.

---

**Note:** Do not set the IS voltage or ISVF too high. Start with a low value and then adjust it upward. If the voltage is too high, then a corona discharge occurs, detectable as a blue glow on the sprayer. This can decrease the sensitivity and stability of the signal and damage the emitter tip.

---

10. Set **Ion Source Gas 1 (GS1)** to **2**.
11. Increase the GS1 flow rate until the signal starts to decrease and then reduce GS1 until the signal reaches its maximum value.

---

**Note:** GS1 might optimize at zero.

---

12. Increase the Curtain Gas<sup>TM</sup> flow rate (CUR) until the signal starts to decrease.

---

**Note:** To prevent contamination, use the highest CUR value possible without sacrificing sensitivity. Do not use a value lower than 15.

---

13. Save the optimized acquisition method.

# Ion Source Maintenance

# 6

The following warnings apply to all of the maintenance procedures in this section.



**WARNING! Hot Surface Hazard.** Let the NanoSpray<sup>®</sup> ion source cool for at least 60 minutes before starting any maintenance procedures. Surfaces of the ion source become hot during operation.



**WARNING! Fire and Toxic Chemical Hazard.** Keep flammable liquids away from flame and sparks and use them only in vented chemical fume hoods or safety cabinets.



**WARNING! Toxic Chemical Hazard.** Wear personal protective equipment, including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.



**WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard.** In the event of a chemical spill, review product Safety Data Sheets for specific instructions. Use appropriate personal protective equipment and absorbent wipes to contain the spill and dispose of it following local regulations.



**WARNING! Electrical Shock Hazard.** Avoid contact with the high voltages applied to the ion source during operation. Put the system in Standby mode before adjusting the sample tubing or other equipment near the ion source.

**CAUTION: Potential System Damage.** Do not lift or carry the ion source with one hand. The ion source is designed to be lifted or carried using the molded grips on each side of the ion source.

This section contains general maintenance procedures for the ion source. To determine how often to clean the ion source or perform preventive maintenance, consider the following:

- Compounds tested
- Cleanliness of the samples and sample preparation techniques
- Amount of time an idle probe contains a sample
- Overall system run time

## Ion Source Maintenance

---

These factors can cause changes in ion source performance, indicating that maintenance is required.

Make sure that the installed ion source is fully sealed to the mass spectrometer with no evidence of gas leaks. Regularly inspect the ion source and its fittings for leaks. Clean the ion source components regularly to keep the ion source in good working condition.

---

**CAUTION: Potential System Damage. Use only the recommended cleaning methods and materials to avoid damaging the equipment.**

---

Required Materials
<ul style="list-style-type: none"><li>• 1/4 inch open-ended wrench</li><li>• Flat-bladed screwdriver</li><li>• MS-grade methanol</li><li>• HPLC-grade deionized water</li><li>• Safety glasses</li><li>• Breathing mask and filter</li><li>• Powder-free gloves (nitrile or neoprene is recommended)</li><li>• Lab coat</li></ul>



## Remove the Ion Source

---

**Tip!** Before removing the source, note how the cables are routed, so that they can be routed the same way when the source is installed.

---

The ion source can be removed quickly and easily, without tools. Always remove the ion source from the mass spectrometer before you perform any maintenance on the ion source.

1. Stop any ongoing scans.
2. Shut down the sample stream.
3. Pull the X-Y-Z positioning unit as far back from the ion source interface as possible, until it is stopped by the sleeve, to make sure that the supply of high-voltage power to the ion source head is disabled.
4. Deactivate the hardware profile.
5. Close the Analyst<sup>®</sup>/Analyst<sup>®</sup> TF software.
6. Let the ion source cool for 60 minutes.

---

**Note:** For the NanoSpray<sup>®</sup> interface and OptiFlow<sup>™</sup> interface wait for 60 minutes.

---

7. Turn off the illuminator by moving the switch to the position furthest from the LED.
8. Disconnect the 2-pin locking plug from the illuminator switch box.
9. Disconnect the camera video cable from the monitor video cable.
10. Disconnect the camera power cable from the 12 VDC power supply.
11. Disconnect the sample tubing from the ion source.
12. Turn the two source latches upward to release the ion source.
13. Pull the ion source gently away from the vacuum interface.
14. Put the ion source on a clean, secure surface.

## Install the Ion Source

1. (For the TripleTOF<sup>®</sup> 6600 system upgraded with the OptiFlow<sup>™</sup> interface or the TripleTOF<sup>®</sup> 6600+ mass spectrometer.) If the OptiFlow<sup>™</sup> interface is used, then turn on the power to the SelexION<sup>®</sup> controller module.

The power switch is located on the back of the SelexION<sup>®</sup> controller module.

2. Align the ion source with the mass spectrometer. Make sure that the ion source latches are in their unlocked positions (that is, the 12 o'clock position) and that they are aligned with the sockets on the mass spectrometer.
3. Push the ion source towards the vacuum interface and then turn the ion source latches towards the 6:00 o'clock position until they stop. Do not force the latches after they become tight. Make sure that no gap is visible between the ion source housing and the ion source interface.

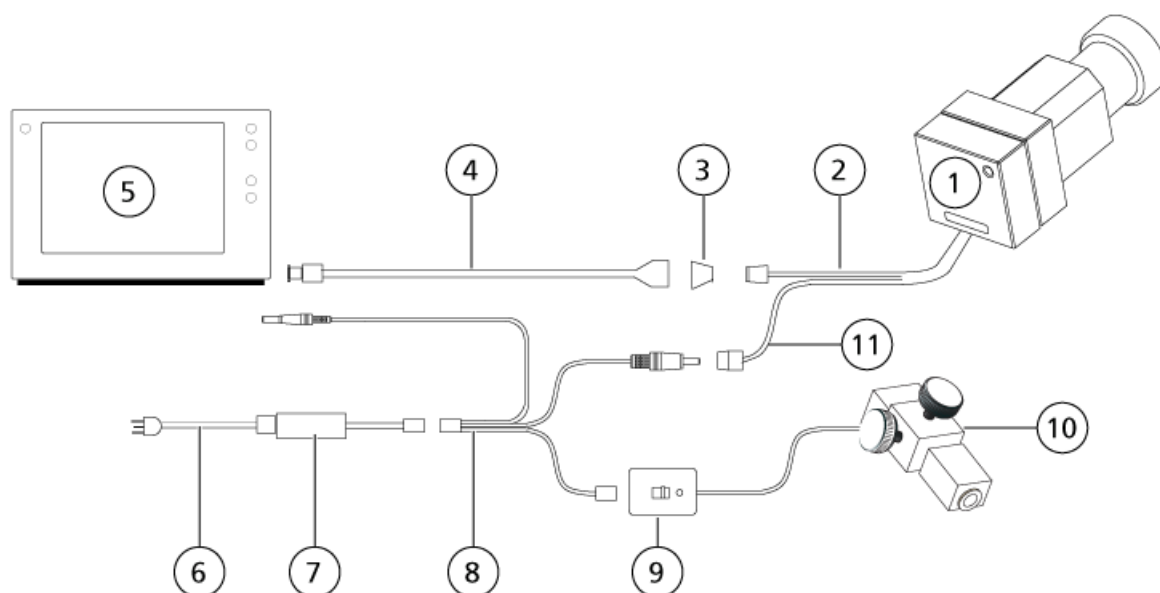
---

**CAUTION: Potential System Damage. Be careful when routing the camera and illuminator cables. Make sure that they do not interfere with the movement of the X-Y-Z positioning unit.**

---

4. Connect the camera video cable to the monitor video cable. Refer to [Figure 6-1](#).

**Figure 6-1 Camera and Illuminator Cables**



Item	Description
1	Camera
2	Video cable to camera
3	RCA to BNC adapter
4	Yellow video cable to LCD monitor
5	Monitor
6	Mains cable
7	12 VDC power supply for the monitor, illuminator, and camera
8	Power and video harness
9	Illuminator switch box
10	Illuminator
11	12 VDC power supply cable

5. Connect the camera to the power and video harness.
6. Plug the 2-pin locking plug on the power and video harness into the illuminator switch box.
7. Connect the power and video harness to the 12 VDC power supply.

8. Connect the mains cable on the 12 VDC power supply to the power bar.
9. Connect the power bar to the mains power supply.



**WARNING! Electrical Shock Hazard.** Use only power cables supplied with the product. For markets where power cables are not supplied, use only power cables that are properly rated and certified for the local market. Do not use cables that are not properly rated and certified.

---

**Tip!** Use cable ties to bundle up unused lengths of cables, as required.

---

10. Turn on the illuminator.

## Change Ion Sources



**WARNING! Hot Surface Hazard.** Let the NanoSpray<sup>®</sup> ion source cool for at least 60 minutes before starting any maintenance procedures. Surfaces of the ion source become hot during operation.

---

The procedure for changing from a NanoSpray<sup>®</sup> ion source to a Turbo V<sup>™</sup>, IonDrive<sup>™</sup> Turbo V, DuoSpray<sup>™</sup>, or PhotoSpray<sup>®</sup> ion source varies depending on whether the OptiFlow<sup>™</sup> interface components are installed on the mass spectrometer.

- If they are installed, then the nano cell heater assembly and curtain plate must be removed, and the standard curtain plate installed. Refer to [Change to a Different Ion Source \(OptiFlow<sup>™</sup> Interface Components\)](#).

**Note:** Because the orifice plate does not need to be changed, the system need not be shut down and vented.

---

- If they are not installed, then the NanoSpray<sup>®</sup> interface components must be removed, and the standard interface components installed. Refer to [Change to a Different Ion Source \(NanoSpray<sup>®</sup> Interface Components\)](#).

The procedure for changing from a different ion source to the NanoSpray<sup>®</sup> ion source also varies depending on whether the OptiFlow<sup>™</sup> components are installed.

- If they are installed, then the standard curtain plate must be removed and the nano cell heater assembly and curtain plate must be installed. Refer to [Change to the NanoSpray<sup>®</sup> Ion Source \(OptiFlow<sup>™</sup> Interface Components\)](#).

**Note:** Because the orifice plate does not need to be changed, the system need not be shut down and vented.

---

- If they are not installed, then the standard interface components must be removed, and the NanoSpray<sup>®</sup> interface components installed. Refer to [Change to the NanoSpray<sup>®</sup> Ion Source \(NanoSpray<sup>®</sup> Interface Components\)](#).

### Change to a Different Ion Source (OptiFlow<sup>™</sup> Interface Components)

Follow these steps to change from a NanoSpray<sup>®</sup> ion source to a Turbo V<sup>™</sup>, IonDrive<sup>™</sup> Turbo V, DuoSpray<sup>™</sup>, or PhotoSpray<sup>®</sup> ion source when the OptiFlow<sup>™</sup> interface components are being used.

1. Remove the NanoSpray<sup>®</sup> ion source. Refer to [Remove the Ion Source](#).
2. Remove the OptiFlow<sup>™</sup> interface components. Refer to [Install the OptiFlow<sup>™</sup> Interface Components](#).
3. Clean the standard curtain plate. Refer to the documentation that comes with the mass spectrometer.

---

**Tip!** To easily clean the components before installing them on the mass spectrometer, remove the nano cell curtain plate and nano cell heater assembly separately and then store them in the nano cell holder.

---

4. Install the standard curtain plate.
5. Install the ion source. Refer to the appropriate ion source *Operator Guide*.

### Change to the NanoSpray<sup>®</sup> Ion Source (OptiFlow<sup>™</sup> Interface Components)

1. Remove the installed ion source. Refer to the *Operator Guide* for the ion source.
2. Install the OptiFlow<sup>™</sup> interface components, by following these steps:
  - a. Clean the nano cell heater assembly. Refer to [Clean the Nano Cell Heater Assembly](#).
  - b. Install the OptiFlow<sup>™</sup> interface components. Refer to [Install the OptiFlow<sup>™</sup> Interface Components](#).
3. Install the ion source. Refer to [Install the Ion Source](#).

### Change to a Different Ion Source (NanoSpray<sup>®</sup> Interface Components)

Follow these steps to change from a NanoSpray<sup>®</sup> ion source to a Turbo V<sup>™</sup>, IonDrive<sup>™</sup> Turbo V, DuoSpray<sup>™</sup>, or PhotoSpray<sup>®</sup> ion source when the NanoSpray<sup>®</sup> interface components are being used.

1. Remove the NanoSpray<sup>®</sup> ion source. Refer to [Remove the Ion Source](#).



---

**Tip!** You can remove the components (the curtain plate and orifice plate) separately, and store them disassembled, so that you can clean them more easily before installing them on the mass spectrometer.

---

2. Remove the NanoSpray<sup>®</sup> interface components. Refer to [Remove the Interface Components](#).
3. Clean the standard interface components. Refer to the mass spectrometer documentation.
4. Install the standard interface components. Refer to [Install the Interface Components](#).
5. Install the ion source. Refer to the *Operator Guide* for ion source.

## Change to the NanoSpray<sup>®</sup> Ion Source (NanoSpray<sup>®</sup> Interface Components)

1. Remove the installed ion source. Refer to the *Operator Guide* for the ion source.
2. Install the NanoSpray<sup>®</sup> interface components by following these steps:
  - a. Remove the standard interface components. [Remove the Interface Components](#).
  - b. Clean the NanoSpray<sup>®</sup> curtain plate and orifice plate. Refer to the documentation that comes with the mass spectrometer.

---

**Note:** The curtain plate is easier to remove from the interface when it is installed on the instrument.

---

- c. Install the NanoSpray<sup>®</sup> interface components. Refer to [Install the Interface Components](#).
3. Install the NanoSpray<sup>®</sup> ion source. Refer to [Install the Ion Source](#).

## Change the Interface Components

Before using an ion source, make sure that the correct interface is installed. The NanoSpray<sup>®</sup> ion source requires either the NanoSpray<sup>®</sup> interface components or the OptiFlow<sup>™</sup> interface components.

## Install the OptiFlow<sup>™</sup> Interface Components

The NanoSpray<sup>®</sup> ion source is the only ion source that fits on the OptiFlow<sup>™</sup> interface components. Other ion sources will not fit on the mass spectrometer if the OptiFlow<sup>™</sup> interface components are installed.

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**Note:** The following procedure is applicable only for TripleTOF<sup>®</sup> 6600 mass spectrometers, the TripleTOF<sup>®</sup> 6600 mass spectrometers upgraded with OptiFlow<sup>™</sup> interface components, and TripleTOF<sup>®</sup> 6600+ mass spectrometers with the prefix EY.

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## Ion Source Maintenance

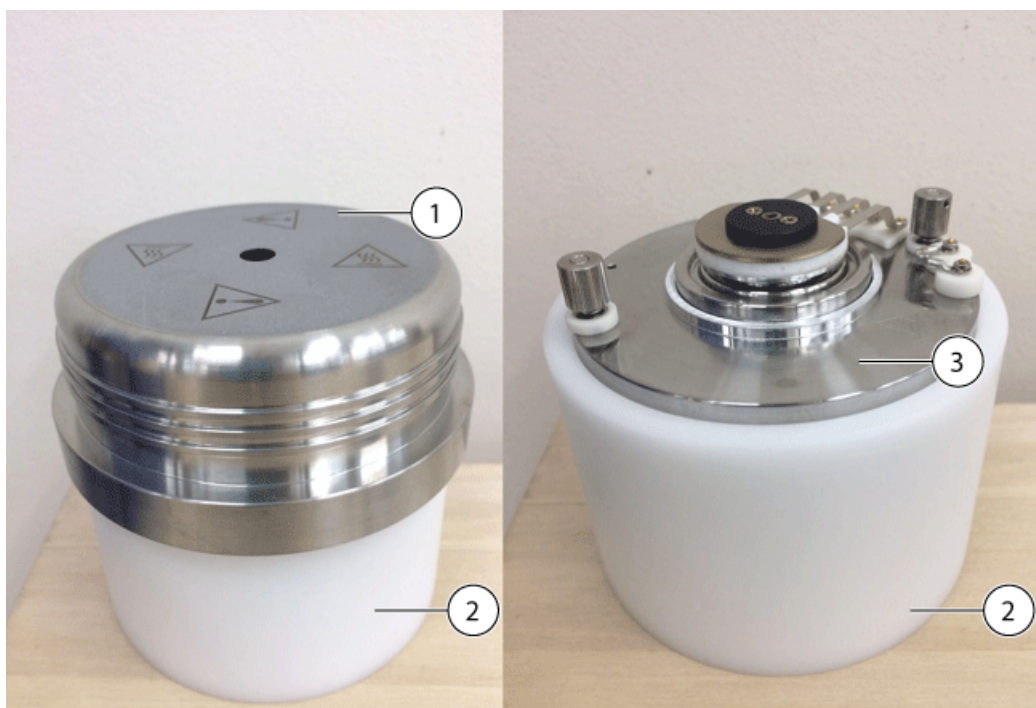
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**CAUTION: Potential System Damage. Wear gloves and be careful when handling the interface components. The electrical connecting pins are delicate.**

---

1. Turn off the power for the SelexION<sup>®</sup> controller module, if the SelexION<sup>®</sup> technology is installed.
2. Remove the nano cell heater assembly and the nano cell holder from the foam packaging.
3. Remove the standard curtain plate on the mass spectrometer.
4. Remove the nano cell curtain plate from the foam packing.
5. Remove the nano cell heater assembly from the nano cell holder.

**Figure 6-2 OptiFlow<sup>™</sup> Interface Components**



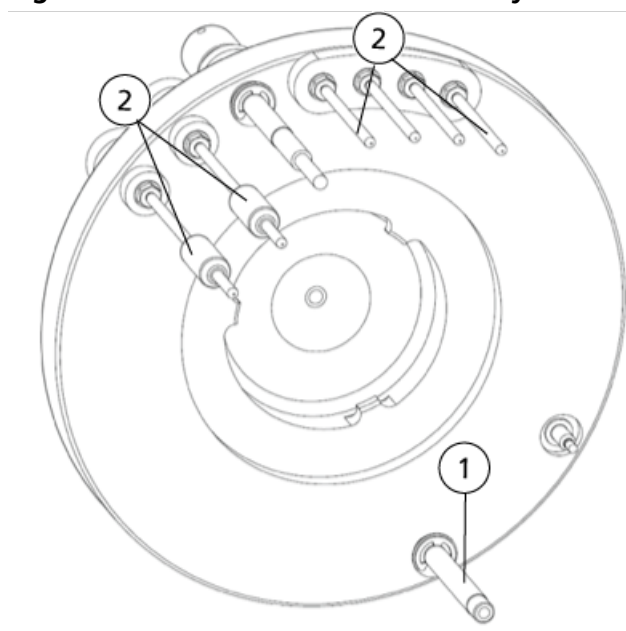
Item	Description
1	Nano cell curtain plate
2	Nano cell holder
3	Nano cell heater assembly

6. Find the six contact pins on the nano cell heater assembly and the corresponding sockets of the orifice plate on the mass spectrometer.

These pins and sockets act as keys to prevent the orifice plate from being installed in the wrong orientation.

7. Orient the nano cell heater assembly so that the six contact pins align with the sockets, when the two retaining pins are inserted into the tightening sockets, and then push the assembly firmly into position. Refer to [Figure 6-3](#).

**Figure 6-3 Nano Cell Heater Assembly Contacts and Retaining Pins**



Item	Description
1	Retaining pins
2	Contact pins

8. Tighten the two retaining pins to secure the nano cell heater assembly.
9. Install the nano cell curtain plate.
10. Turn on the power for the SelexION<sup>®</sup> controller module, if SelexION<sup>®</sup> technology is installed.

## Remove the Interface Components

Use this procedure to remove the standard or NanoSpray<sup>®</sup> interface components (curtain plate and orifice plate) from the mass spectrometer.

## Ion Source Maintenance

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---

**Note:** The assembly is system-specific. Use the correct interface components for the mass spectrometer.

---

**CAUTION: Potential System Damage. Wear gloves and be careful when handling the interface components. The electrical connecting pins and ceramic base are delicate.**

---

1. Complete or stop any ongoing scans.

---

**CAUTION: Potential System Damage. Turn off the sample flow before shutting down the system.**

---

2. Turn off the sample flow to the mass spectrometer.
3. Deactivate the hardware profile in the Analyst<sup>®</sup> or Analyst<sup>®</sup> TF software, if it is active.
4. Shut down the system. Refer to the documentation that comes with the mass spectrometer.



---

**WARNING! Hot Surface Hazard. Let the ion source cool for at least 60 minutes for the NanoSpray<sup>®</sup> interface before starting any maintenance procedures. Surfaces of the ion source and the vacuum interface components become hot during operation.**

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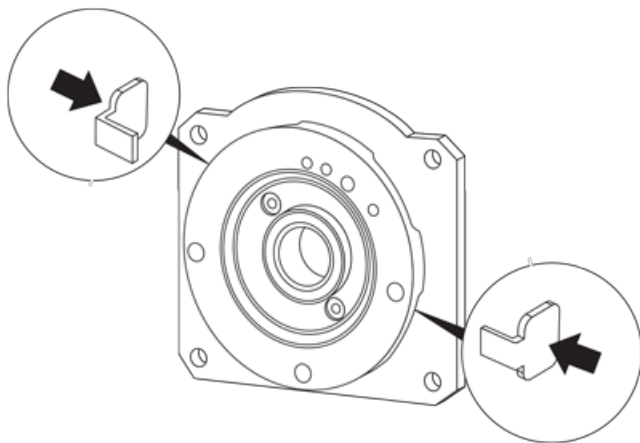
5. After the mass spectrometer reaches atmospheric pressure, remove the installed ion source from the mass spectrometer and then put the ion source carefully to one side.

---

**CAUTION: Potential System Damage. If the interface does not release, do not attempt to pry it from the bulkhead. Continue to vent the mass spectrometer until the interface releases easily.**

---

6. While holding the curtain plate with one hand, use the other hand to release the interface latches.

**Figure 6-4 Interface Latch Release Buttons**

7. Remove the interface components and then put them on a clean, stable surface.

---

**Tip!** Use the shaped foam insert from the package to store the standard interface components.

---

## Install the Interface Components

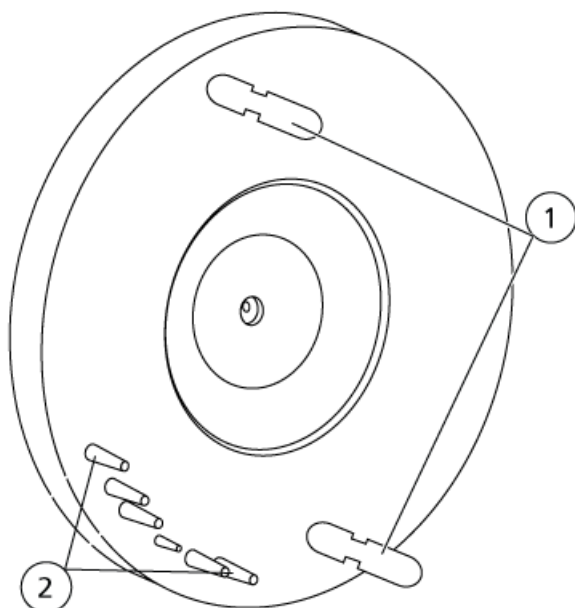
Use this procedure to install the standard or NanoSpray<sup>®</sup> interface components on the mass spectrometer.

1. Find the six contact pins on the interface components and the corresponding sockets on the mass spectrometer.

These pins and sockets act as keys to prevent the interface components from being installed in the wrong orientation.

2. Orient the interface components so that the six contact pins align with the sockets when the two retaining pins are inserted in their clamps. Refer to [Figure 6-5](#).

**Figure 6-5 Interface Contacts and Retaining Pins**



Item	Description
1	Retaining pins
2	Contact pins

3. Holding the interface components with both hands, insert the retaining pins in the clamps, and then push the assembly firmly into place. If the interface components are properly aligned then a click is heard as the retaining pins are pushed into position.

## Remove the Monitor

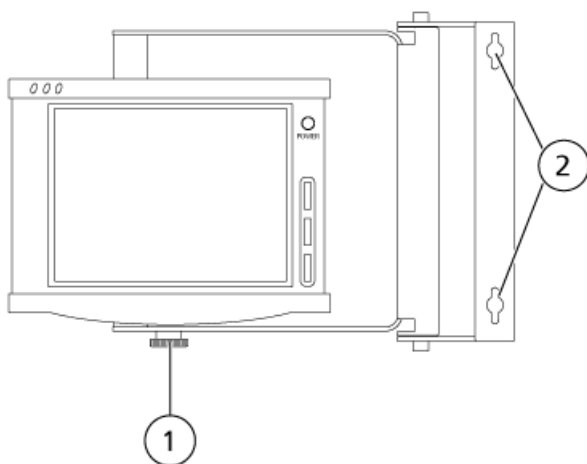
### Remove the Monitor from the 4500, 5500, 6500, 6500<sup>+</sup>, and TripleTOF<sup>®</sup> Systems



**WARNING!** Electrical Shock Hazard. Use only power supply model HES10-12010-0-7 with the NanoSpray<sup>®</sup> III ion source.

1. Turn off the monitor.
2. Disconnect the monitor power supply cable from the power bar.
3. Disconnect the video and power cables from the monitor.
4. (Optional) To remove the bracket from the mass spectrometer, loosen the two 5 mm hex screws that hold the bracket on the mass spectrometer, and then push the bracket up and pull it out to remove it.
5. Loosen the thumbscrew that holds the monitor on the bracket, and then remove the monitor from the bracket.

**Figure 6-6 Bracket Assembly**



Item	Description
1	Thumbscrew
2	Installation holes

## Remove the Monitor from the 3200 and 4000 Series Systems



---

**WARNING! Electrical Shock Hazard.** Use only power supply model HES10-12010-0-7 with the NanoSpray<sup>®</sup> III ion source.

---

1. Turn off the monitor.
2. Disconnect the monitor power supply cable from the power bar.
3. Disconnect the video and power cables from the monitor.
4. Remove the monitor from the shelf.

## Install the Monitor

### Install the Monitor 4500, 5500, 6500, 6500<sup>+</sup>, and TripleTOF<sup>®</sup> Systems



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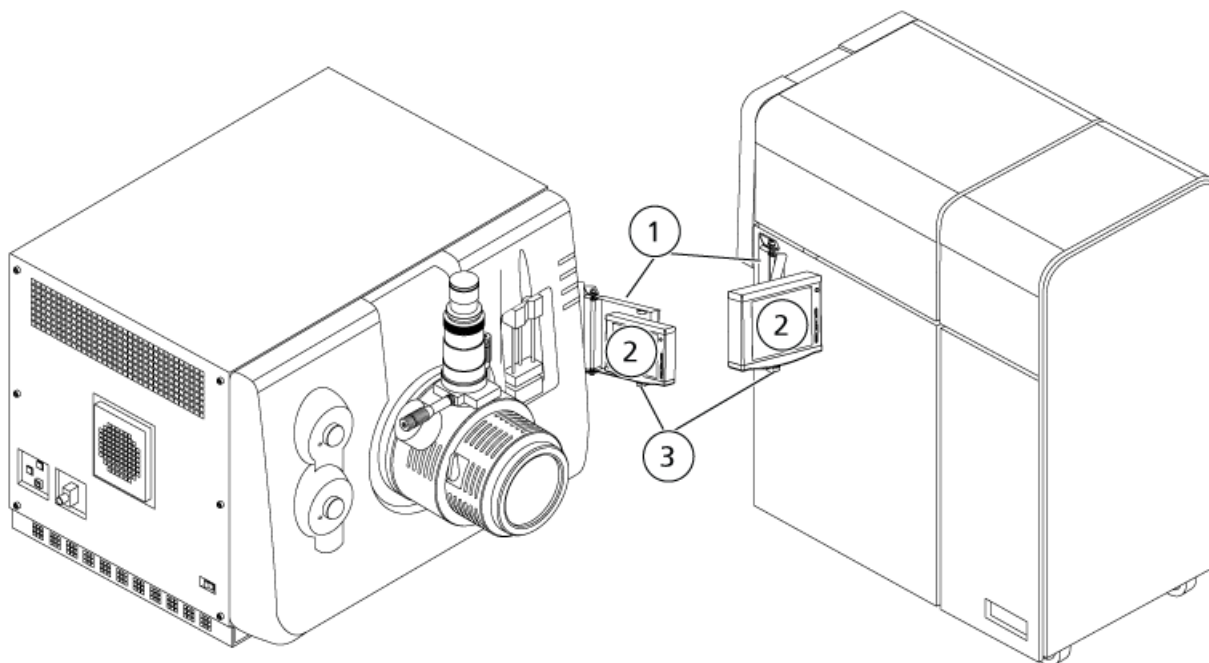
**WARNING! Electrical Shock Hazard.** Use only power supply model HES10-12010-0-7 with the NanoSpray<sup>®</sup> III ion source.

---

On 4500, 5500, 6500, and 6500<sup>+</sup> series systems, the monitor is supported on a bracket that can be installed on the left or right side cover. On TripleTOF<sup>®</sup> systems, the monitor is supported on a bracket that is connected to the right side cover.



**Figure 6-7 Mass Spectrometer and Monitor: 4500/5500/6500/6500<sup>+</sup> Systems (left) and TripleTOF<sup>®</sup> Systems (right)**



Item	Description
1	Bracket
2	Monitor
3	Monitor attachment knob

1. To install the monitor bracket on the mass spectrometer:

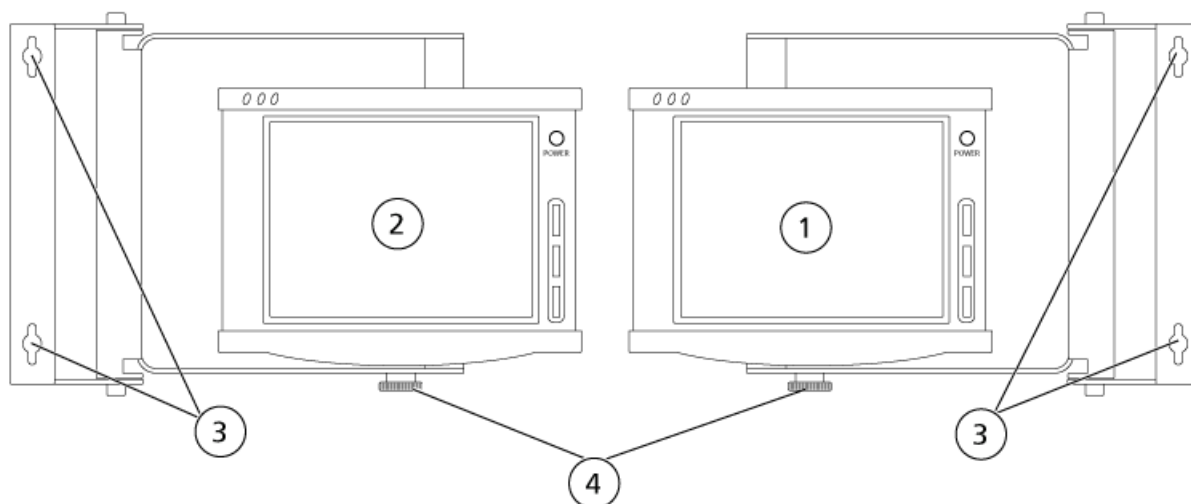
- For 4500, 5500, 6500, and 6500<sup>+</sup> systems, choose whether to install the monitor on the left or right side of the mass spectrometer.

**Note:** For 4500, 5500, 6500, and 6500<sup>+</sup> systems, the configuration of the HPLC system determines where the monitor is installed. Refer to the documentation provided with the HPLC system.

- If necessary, insert the two 5 mm hex screws into the installation holes on the instrument cover, and then tighten them slightly. Make sure that the thread is still visible.
- Align the installation holes in the bracket with the holes in the instrument cover, install the bracket, and then tighten the screws.

2. Attach the monitor to the bracket with the thumbscrew. Refer to [Figure 6-8](#).

**Figure 6-8 Bracket Assembly for Right- and Left-Side Installation**



Item	Description
1	Bracket orientation for left-side installation (not applicable for TripleTOF <sup>®</sup> systems)
2	Bracket orientation for right-side installation
3	Installation holes
4	Thumbscrews

3. Connect the monitor cables. Refer to [Connect the Monitor Cables](#).

## Install the Monitor on 3200 and 4000 Series Systems

The monitor stands on an adjustable shelf.

1. Install the monitor on the shelf. The monitor is not fastened to the shelf, so that the user can determine the best viewing position.

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**Note:** Make sure that the monitor is secured on the stand.

---

2. Connect the monitor cables. Refer to [Connect the Monitor Cables](#).

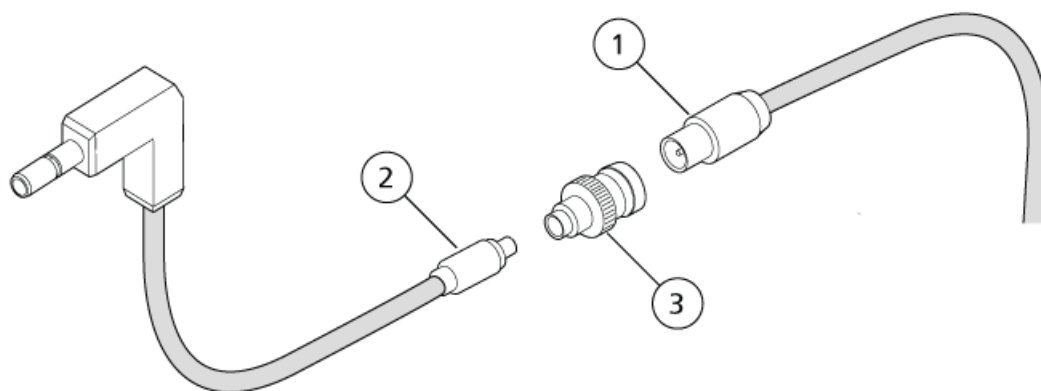
## Connect the Monitor Cables

**CAUTION: Potential System Damage.** Be careful when routing the camera and illuminator cables. Make sure that they do not interfere with the movement of the X-Y-Z positioning unit.

1. Connect the video cable to the monitor:
  - a. Plug the yellow 90 degree end of the monitor cable into the VIDEO IN jack on the rear of the monitor. Refer to [Figure 6-9](#).
  - b. Connect the RCA to BNC adapter to the yellow connector at the other end of the video cable.

**Note:** The cables supplied with the monitor include white and red connectors that are not used for this application. These two wires can be removed to simplify the assembly.

**Figure 6-9 Monitor Video Cable Connection**



Item	Description
1	Video cable to camera
2	Video cable to LCD monitor
3	RCA to BNC adapter



**WARNING! Electrical Shock Hazard.** Do not intentionally interrupt the protective earth conductor. Any interruption of the protective earth conductor creates an electrical shock hazard.

## Ion Source Maintenance

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2. Connect the appropriate power supply to the monitor:

- a. Plug the power supply cable into the **DC 12V** jack on the rear of the monitor.



---

**WARNING! Electrical Shock Hazard. Use only power supply model HES10-12010-0-7 with the NanoSpray<sup>®</sup> III ion source.**

---

- b. Connect the mains supply cable to the monitor power supply. Use the appropriate mains supply cable.
- c. Plug the mains supply cable into the power bar included with the kit.

3. Plug the power bar into the mains supply outlet.

## Bake the Interface

The following procedure is applicable for both the NanoSpray<sup>®</sup> interface and the OptiFlow<sup>™</sup> interface components.

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**Note:** Sample need not be infused for this procedure.

---

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**Note:** Make sure that the curtain plate, orifice plate, and nano cell heater assembly are clean and dry before baking the interface.

---

1. Move the X-Y-Z positioning unit along the positioning rails, away from the interface.
2. Start the Analyst<sup>®</sup> /Analyst<sup>®</sup> TF software.
3. On the Navigation bar, click **Configure**.
4. Click **Tools > Settings > Queue Options**.
5. In the **Max. Tune Idle Time** field, type **720**.
6. On the Navigation bar, under **Tune and Calibrate**, double-click **Manual Tuning**.

---

**Note:** Do not have the tip rail in place when performing this step as it might damage the tip. This procedure can be performed using any scan type.

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7. In the Tune Method Editor, click the **Source/Gas** tab.
8. In the upper left corner of the screen, make sure that the **Ion Source ID** is **NanoSpray**.
9. Set the interface heater temperature by typing a value in the Interface Heater Temperature field and then pressing enter:
  - For the OptiFlow<sup>™</sup> interface, type 300.

- For the NanoSpray<sup>®</sup> interface, type 225.
10. Wait 5 minutes for the interface heater to reach the correct temperature.

To determine whether the temperature has been reached, monitor the mass spectrometer detailed status by double-clicking the mass spectrometer icon on the status bar. When the correct temperature is reached, the **Interface Heater Status** is **Ready**.

11. Let the interface bake at least 12 hours to eliminate any chemical contaminants.

## Clean the Ion Source



**WARNING! Electrical Shock Hazard.** Remove the ion source from the mass spectrometer before starting this procedure. Follow all electrical safe work practices.

**CAUTION: Potential System Damage.** Be careful not to damage the emitter tip. It is fragile.

Clean the surfaces of the ion source after a spill or when they become dirty.

**Tip!** When removing the high-voltage rail to reassemble the ion source head, inspect for residue under the rail. Use a slightly damp, lint-free wipe to remove any residue from under the rail and from the outside of the O-ring. Inspect the O-ring for damage. If it is damaged, replace it with a spare 1.5 mm by 1 mm O-ring (supplied).

### Prerequisite Procedures

- [Remove the Ion Source](#)

1. Remove the ion source from the instrument.
2. Wipe the surfaces of the ion source with a soft, damp, cloth.

## Clean the Nano Cell Heater Assembly

### Required Materials

**Note:** U.S. customers can call 877-740-2129 for ordering information and inquiries. International customers can visit [sciex.com/contact-us](https://sciex.com/contact-us).

- Powder-free gloves (nitrile or neoprene recommended)

## Ion Source Maintenance

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- Safety glasses
- Laboratory coat
- Fresh, high-quality (pure) water (at least 18 MΩ de-ionized [DI] water or ultra-pure HPLC-grade water). Old water can contain contaminants that can further contaminate the mass spectrometer.
- MS-grade methanol, isopropanol (2-propanol), or acetonitrile
- Cleaning solution. Use one of:
  - 100% methanol
  - 100% isopropanol
  - 1:1 acetonitrile:water solution (freshly prepared)
  - 1:1 acetonitrile:water with 0.1% acetic acid solution (freshly prepared)
- Clean 1 L or 500 mL glass beaker to prepare cleaning solutions
- 1 L beaker to catch used solvent
- Organic waste container
- Lint-free wipes. Refer to [Tools and Supplies Available from the Manufacturer](#).
- (Optional) Polyester (poly) swabs

## Tools and Supplies Available from the Manufacturer

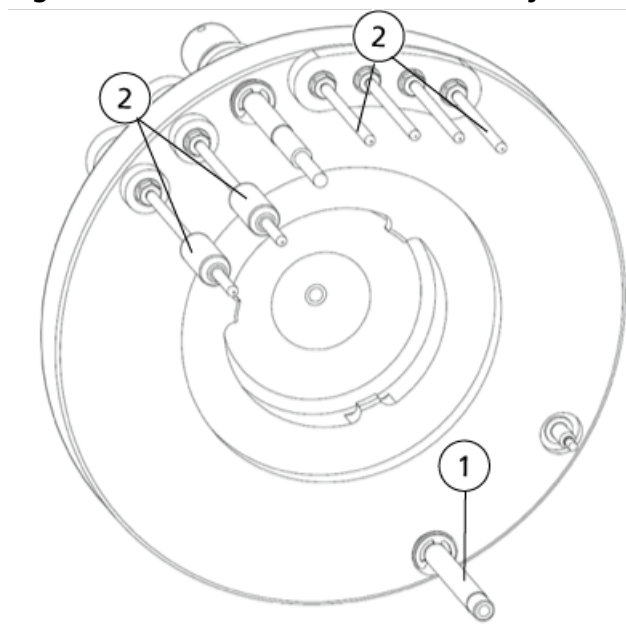
Description	Part Number
Small poly swab (thermally bonded). Also available in the Cleaning kit.	1017396
Lint-free wipe (11 cm x 21 cm, 4.3 inches x 8.3 inches). Also available in the Cleaning kit.	018027
Cleaning kit. Contains the small poly swab, lint-free wipes, Q0 cleaning tool, cleaning brush, and Alconox packets.	5020761
Cleaning kit. Contains the small poly swab, lint-free wipes, Q0 cleaning tool, straight QJet <sup>®</sup> ion guide cleaning brush, and Alconox packets.	5020761
Cleaning kit. Contains the small poly swab, lint-free wipes, Q0 cleaning tool, tapered QJet <sup>®</sup> ion guide cleaning brush, and Alconox packets.	5020763
Cleaning kit. Contains the small poly swab, lint-free wipes, Q0 cleaning tool, tapered IonDrive <sup>™</sup> QJet ion guide cleaning brush, Q0 cleaning brush, and Alconox packets.	5021294

## Clean the Assembly

**CAUTION: Potential System Damage.** Do not insert a wire or metal brush into the aperture on the OptiFlow™ heater to avoid damaging the aperture.

1. Turn off the SelexION® technology, if it is installed.
2. Remove the nano cell curtain plate.
3. Loosen the two retaining pins that secure the nano cell heater assembly. Refer to [Figure 6-10](#).

**Figure 6-10 Nano Cell Heater Assembly Contacts and Retaining Pins**



Item	Description
1	Retaining pins
2	Contact pins

4. Remove the nano cell heater assembly.

**Note:** After the nano cell heater assembly and nano cell curtain plate are removed, make sure that they are stored in the nano cell holder provided.

5. Clean the aperture in the nano cell heater assembly with a syringe using the cleaning solution. Refer to the list of [Required Materials](#) for information about the cleaning solution.

## Ion Source Maintenance

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- Put the nano cell heater assembly on a 100 mL beaker as shown in [Figure 6-11](#).

**Figure 6-11 Nano Cell Heater Assembly on Beaker and Syringe**



- Fill the 5 mL syringe with 5 mL cleaning solution.
- Inject the cleaning solution through the aperture of the nano cell heater assembly.
- Repeat step [7](#) and step [8](#) three times.
- Wipe the nano cell heater assembly with a lint-free wipe dampened with water.
- Wipe the nano cell heater assembly with a lint-free wipe dampened with the cleaning solution.

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**Note:** If more rigorous cleaning is required, then use the brush supplied in the cleaning kit.

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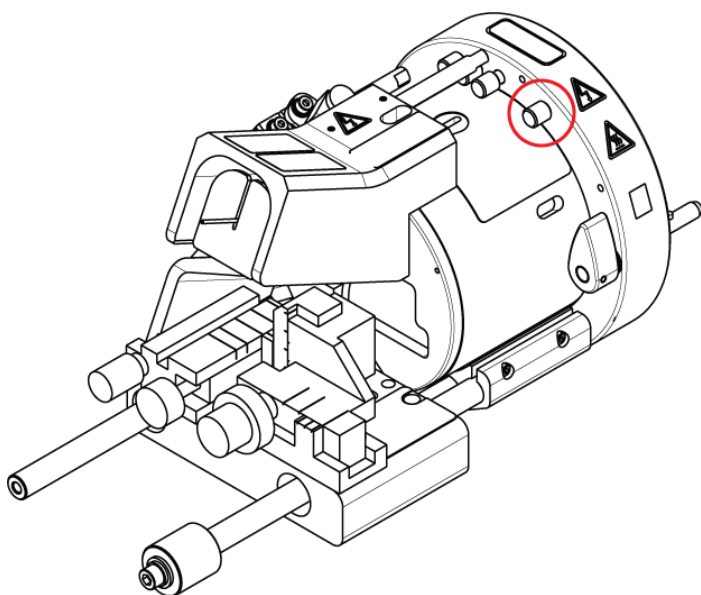
- Wait until the nano cell heater assembly is dry.
- Inspect the nano cell heater assembly for solvent stains or lint, removing any residue with a clean, slightly damp, lint-free wipe.



## Mass Spectrometer Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
Gas 2 Over Pressure error occurs and the electronics turn off	The Gas 2 inlet port on the ion source is blocked and Ion Source Gas 2 (GS2) is set to a value other than 0 in the acquisition method.	a. Loosen the plug in the port so that the inlet is not sealed. (Do not remove the plug.) Refer to <a href="#">Figure 7-1</a> . b. Set GS2 to 0 in the acquisition method.

Figure 7-1 Gas 2 Port



## Syringe Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
No spray	<ol style="list-style-type: none"> <li>The syringe drive pressure has not stabilized.</li> <li>Back pressure is excessive. This can result from blockages in the emitter tip, sample line, or union connections.</li> <li>The syringe is leaking (inspect for droplets along the body of the syringe).</li> <li>The syringe volume is incorrect.</li> </ol>	<ol style="list-style-type: none"> <li>Wait at least 5 minutes for the syringe drive pressure to stabilize. Larger-o.d. lines might require more time.</li> <li>Stop the syringe flow <ul style="list-style-type: none"> <li>Replace the emitter tip</li> <li>Remove any constrictions or blockages in the flow path</li> </ul> </li> <li>Replace the syringe.</li> <li>Use a syringe with the specified volume.</li> </ol>
Inconsistent flow	<ol style="list-style-type: none"> <li>The infusion pump is faulty.</li> </ol>	<ol style="list-style-type: none"> <li>Lubricate the syringe pump shaft with pump grease.</li> </ol>
Sudden variations in pressure, resulting in low or erratic TIC	<ol style="list-style-type: none"> <li>The syringe drive is unstable. (This occurs at low flow rates.)</li> </ol>	<ol style="list-style-type: none"> <li>Increase the flow rate, or use an LC pump.</li> </ol>

## External Pump Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
Sudden variations in pressure, resulting in low or erratic TIC	<ol style="list-style-type: none"> <li>Air bubbles are present in the HPLC system or sample.</li> <li>The HPLC system or emitter tip contains a blockage.</li> <li>The HPLC system or union has a leak.</li> <li>A fitting is loose.</li> </ol>	<ol style="list-style-type: none"> <li>Refer to the guide for the external pump to determine how to handle air bubbles or blockages.</li> <li>Locate the blockage and then remove it, or replace the blocked component.</li> <li>Refer to <a href="#">Inspect for Leaks</a>.</li> <li>Tighten all fittings. (Do not over-tighten.)</li> </ol>

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## NanoSpray<sup>®</sup> III Head Troubleshooting Tips

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**Tip!** To troubleshoot problems with the NanoSpray<sup>®</sup> III head, remove the ion source from the mass spectrometer, and then run sample through it.

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Symptom	Possible Cause	Corrective Action
Air bubbles at emitter tip	<ul style="list-style-type: none"><li>a. A loose connection.</li><li>b. In rare cases bubbles can result from normal outgassing as the gradient moves through a 1:1 solvent mix. They can also be a sign of dead volume resulting from an improperly installed emitter tip.</li></ul>	<ul style="list-style-type: none"><li>a. Refer to <a href="#">Assemble the NanoSpray<sup>®</sup> III Head</a>.</li></ul>

## Troubleshooting

Symptom	Possible Cause	Corrective Action
No spray	<ul style="list-style-type: none"> <li>a. Liquid is not arriving at the sprayer head.</li> <li>b. The emitter tip is blocked or damaged.</li> <li>c. The diameter of the syringe sample line is too small.</li> <li>d. A connection is leaking. This can result from: <ul style="list-style-type: none"> <li>• A poor or over-tight connection</li> <li>• An incorrect sleeve size</li> <li>• An incorrect ferrule in the union</li> </ul> </li> <li>e. The union is blocked.</li> <li>f. The sample line contains a blockage.</li> </ul>	<ul style="list-style-type: none"> <li>a. Set GS1 and IS or ISVF to 0. If droplets are not visible at the tip, then there is a leak or blockage. (Refer to the following tips in this table.)</li> <li>b. Disconnect the connection between the spray tip and union. If droplets appear, then the emitter tip was blocked. Replace the emitter tip. Refer to <a href="#">Assemble the NanoSpray® III Head</a>.</li> <li>c. For the syringe sample line, use tubing with a larger i.d. (75 µm or larger) to reduce back pressure. A smaller diameter, 25 µm, is appropriate for the LC sample line.</li> <li>d. Troubleshoot the connection leak <ul style="list-style-type: none"> <li>• Tighten all connections until a droplet forms at the emitter tip. Do not overtighten. Overtightening crushes the silica. If the silica is damaged, then cut it and then clean it with isopropanol.</li> </ul> <hr/> <p><b>Note:</b> Do not cut damaged fused silica-lined PEEK tubing. It must be replaced.</p> <hr/> <ul style="list-style-type: none"> <li>• Make sure that the sleeve size matches the o.d. of the fused silica.</li> <li>• Make sure that the ferrule used in the union is a high-pressure ferrule.</li> </ul> </li> <li>e. Confirm that the correct union is being used. Sonicate or replace the union.</li> <li>f. Recut the blunt end of the emitter tip, or recut the end of the sample line at the point where it connects to the union. Do not cut the PEEK-lined fused silica tubing.</li> </ul>

Symptom	Possible Cause	Corrective Action
No spray (continued)	<ul style="list-style-type: none"> <li>a. IonSpray™ voltage (IS or ISVF) is too low. (Droplets appear at the emitter tip when GS1 is set to 0.)</li> <li>b. The nebulizer gas (GS1) setting is incorrect. If it is too low, the spray bends away from the curtain plate aperture. If it is too high, droplets appear. In both cases, sensitivity decreases.</li> <li>c. The Curtain Gas™ flow (CUR) is too high. The spray bends away from the curtain plate aperture.</li> <li>d. The rail is not fully seated on the bracket.</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjust IS or ISVF in increments of 100 volts. IonSpray™ voltage optimizes over a wide range—from 2200 V to 2400 V for the TripleTOF® systems, and from 1800 V to 2200 V for other systems.</li> <li>b. Increase or decrease GS1 in steps of 5. In general, for negative mode or high aqueous solvent composition, set GS1 to 25.</li> <li>c. Decrease the CUR setting.</li> </ul> <hr/> <p><b>Note:</b> Do not set CUR to less than 15.</p> <hr/> <ul style="list-style-type: none"> <li>d. Make sure that the rail is pushed forward as far as it will go.</li> </ul>

## Troubleshooting

Symptom	Possible Cause	Corrective Action
Unstable spray	<ul style="list-style-type: none"> <li>a. The emitter tip is not protruding the correct length.</li> <li>b. The IonSpray voltage (IS or ISVF) value is incorrect.</li> <li>c. The Ion Source Gas 1 (GS1) value is too low or too high.</li> <li>d. The emitter tip is faulty, dirty, or poorly cut.</li> <li>e. The Interface Heater Temperature (IHT) parameter is incorrect.</li> <li>f. There is a leak in the tubing or connections.</li> <li>g. The Gas 1 connection is loose.</li> <li>h. The high-voltage rail is not in position, or it is loose.</li> <li>i. The liquid junction union is partially clogged, oxidized, or otherwise suboptimal.</li> </ul>	<ul style="list-style-type: none"> <li>a. Loosen the union thumbscrew and then move the union until the silica protrudes 1.0 mm to 2.0 mm beyond the nut.</li> <li>b. Adjust in increments of 100 V. IonSpray voltage optimizes over a wide range—from 2200 V to 2400 V.</li> <li>c. Adjust the value in steps of 5 while monitoring sensitivity. In general, for negative mode or high aqueous solvent composition, set GS1 to 25.</li> <li>d. Replace the emitter tip. Refer to <a href="#">Assemble the NanoSpray® III Head</a>. If the spray is still unstable, set GS1 to 0. If the spray is present, but punctuated by air bubbles, the problem is probably a poor cut at the spray tip.</li> <li>e. In general, for peptide work, use a temperature of 50 °C to 100 °C.</li> <li>f. Inspect for leaks. Refer to <a href="#">Inspect for Leaks</a>.</li> <li>g. Inspect the gas connections on the ion source interface.</li> <li>h. Make sure that the rail is in position and that the thumbscrew is finger-tight. Check for tiny O-ring inside the rail, replace if it is damaged.</li> <li>i. Replace the liquid junction union.</li> </ul>

Symptom	Possible Cause	Corrective Action
Arcing (can melt the emitter tip and damage the temperature controller board)	<ul style="list-style-type: none"> <li>a. The tip is too close to the curtain plate.</li> <li>b. Too much of the tip is exposed.</li> <li>c. The incorrect gas is supplied for Gas 1.</li> <li>d. IS or ISVF is too high.</li> </ul>	<ul style="list-style-type: none"> <li>a. Use the X-Y-Z adjustment knobs to adjust the emitter tip position.</li> <li>b. Reassemble the emitter tip. Refer to <a href="#">Assemble the NanoSpray<sup>®</sup> III Head</a>.</li> <li>c. Supply zero air for Gas 1.</li> <li>d. Reduce IS or ISVF. The emitter tip might need to be replaced if it was exposed to too high a voltage.</li> </ul>

# Spray Plume Troubleshooting Tips

Before troubleshooting the spray plume, verify that liquid is arriving at the sprayer head.

Symptom	Possible Cause	Corrective Action
Inability to view the spray plume on the monitor	a. The X-Y-Z settings are incorrect. b. The illuminator is off or faulty. c. The emitter tip is clogged or damaged.	a. Use the X-Y-Z adjustment knobs to move the sprayer to the correct position. b. Turn on the illuminator and then verify that it is operational. c. Inspect the LC pump pressure. If it is too high, then replace the emitter tip.
Misshapen or incorrectly angled spray plume	a. There is dirt on the emitter tip.	a. Replace the emitter tip.
No spray plume	a. Source/Gas parameter (GS1, IS, or ISVF) settings are incorrect.	a. Adjust the Source/Gas parameters.

# Monitor and Camera Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
Poor picture quality on monitor	Incorrectly adjusted camera or illuminator	Refer to <a href="#">Adjust and Focus the Camera</a> or <a href="#">Adjust the Illuminator</a> .
Inverted image on monitor	Incorrectly adjusted camera	Rotate the camera in the mount.



## Emitter Tip Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
Frequent clogging or degrading of spray with new tips	<ul style="list-style-type: none"> <li>a. The incorrect gas is supplied for Gas 1.</li> <li>b. Solvent quality is poor.</li> <li>c. The emitter tip and infusion line were not flushed before and after a [Glu1]-Fibrinopeptide B infusion.</li> <li>d. The emitter tip is poorly cut.</li> <li>e. Sample flow has stopped for several minutes while the interface heater is on, resulting in melting or deforming of the emitter tip.</li> <li>f. IHT is too high.</li> </ul>	<ul style="list-style-type: none"> <li>a. Supply zero air for Gas 1.  <b>Note:</b> Make sure to spin the samples before placing them in the autosampler vial, so that no particulate in the sample vial can clog the system.</li> <li>b. Use MS-grade solvent. Refer to <a href="#">Solvents</a>.</li> <li>c. Flush thoroughly before and after using [Glu1]-Fibrinopeptide B.</li> <li>d. Examine the blunt end of the emitter tip under a microscope. Recut the emitter tip. Refer to <a href="#">Cleaving an Emitter Tip</a>.</li> <li>e. Make sure that sample flow does not stop for more than three minutes while the tip is in the spraying position, and the interface heater is on (50 °C to 100 °C). When the sample flow stops, move the X-Y-Z positioning unit away from the ion source interface, or set IHT to 0 °C.</li> <li>f. Reduce IHT to 50 °C to 100 °C.</li> </ul>

## Acquisition Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
No signal	<ul style="list-style-type: none"> <li>a. No spray is being generated.</li> <li>b. The ion source head position is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>a. Refer to <a href="#">Spray Plume Troubleshooting Tips</a> and <a href="#">NanoSpray® III Head Troubleshooting Tips</a> to troubleshoot spray problems.</li> <li>b. Use the X-Y-Z adjustment knobs to adjust the emitter tip position.</li> </ul>
Unexpectedly wide LC peaks or tailing	<ul style="list-style-type: none"> <li>a. The union has a dead volume.</li> </ul>	<ul style="list-style-type: none"> <li>a. Make sure that all of the post-column tubing has an i.d. less than or equal to 25 microns.</li> <li>b. Inspect all of the connections to make sure that they are properly seated.</li> <li>c. Flush all cuts.</li> <li>d. Replace the emitter tip.</li> </ul> <p>Refer to <a href="#">Assemble the NanoSpray® III Head</a>.</p>
Low peak intensity	<ul style="list-style-type: none"> <li>a. The source position, tip protrusion, or source parameter values are incorrect.</li> <li>b. The syringe or sample line is leaking.</li> <li>c. The mass spectrometer is not optimized.</li> <li>d. The sample has degraded or has a low concentration.</li> <li>e. There is a problem with the autosampler or LC pumps.</li> </ul>	<ul style="list-style-type: none"> <li>a. Optimize the source. Refer to <a href="#">Assemble the NanoSpray® III Head</a>.</li> <li>b. Inspect for leaks. Refer to <a href="#">Inspect for Leaks</a>.</li> <li>c. Use the <b>Instrument Optimization</b> wizard to optimize the mass spectrometer.</li> <li>d. Inspect the sample concentration. Use either fresh sample or sample that has been frozen. Use an alternate sample, such as 5600 Tuning Solution, Renin, or Reserpine, to determine whether the sample is causing an issue.</li> <li>e. Troubleshoot the autosampler or LC pumps.</li> </ul>
Poor MS resolution	<ul style="list-style-type: none"> <li>a. The instrument is not optimized.</li> </ul>	<ul style="list-style-type: none"> <li>a. Optimize the instrument.</li> </ul>

Symptom	Possible Cause	Corrective Action
Low signal-to-noise ratio	<ul style="list-style-type: none"> <li>a. The heater temperature is too high.</li> <li>b. The source position, tip protrusion, or source parameter values are incorrect.</li> <li>c. The syringe or sample line is leaking.</li> </ul>	<ul style="list-style-type: none"> <li>a. Reduce the IHT parameter.</li> <li>b. Optimize the source. Refer to <a href="#">Assemble the NanoSpray® III Head</a>.</li> <li>c. Inspect for leaks. Refer to <a href="#">Inspect for Leaks</a>.</li> </ul>
High background	<ul style="list-style-type: none"> <li>a. The diluent is contaminated.</li> <li>b. The syringe or sample line is dirty.</li> <li>c. There is residue on the interface. The emitter tip is too close to the curtain plate aperture, resulting in frequent contamination.</li> </ul>	<ul style="list-style-type: none"> <li>a. Use freshly prepared diluent made with MS-grade reagents (0.1% formic acid, 10% acetonitrile).</li> <li>b. Clean or replace the syringe or sample line.</li> <li>c. Clean the curtain plate and orifice plate. Contact the QMP. If necessary, bake the interface. Refer to <a href="#">Bake the Interface</a>. If the problem is not resolved, clean Q0 or the QJet® ion guide, following the procedures in the hardware documentation for the mass spectrometer.</li> </ul>

## Troubleshooting

Symptom	Possible Cause	Corrective Action
Temperature not reached	a. The interface heater is faulty.	<p>a. Open the Mass Spectrometer Detailed Status dialog.</p> <ul style="list-style-type: none"><li>For the NanoSpray<sup>®</sup> interface, the <b>Source Temperature</b> field does not contain the set temperature value and it is shown as n/a and the <b>Interface Heater Status</b> should be Ready.</li><li>For the OptiFlow<sup>™</sup> interface, the <b>Source Temperature</b> field should contain the set temperature and the <b>Interface Heater Temperature</b> should show the temperature.</li></ul> <p>If not, contact FSE. For more information, visit the SCIEX website at <a href="https://www.sciex.com">sciex.com</a>.</p>
Temperature too high or unstable	a. The interface heater is faulty.	<p>a. Open the Mass Spectrometer Detailed Status dialog.</p> <ul style="list-style-type: none"><li>For the NanoSpray<sup>®</sup> interface, the <b>Source Temperature</b> field does not contain the set temperature value and it is shown as n/a and the <b>Interface Heater Status</b> should be Ready.</li><li>For the OptiFlow<sup>™</sup> interface, the <b>Source Temperature</b> field should contain the set temperature and the <b>Interface Heater Temperature</b> should show the temperature.</li></ul> <p>If not, contact FSE. For more information, visit the SCIEX website at <a href="https://www.sciex.com">sciex.com</a>.</p>

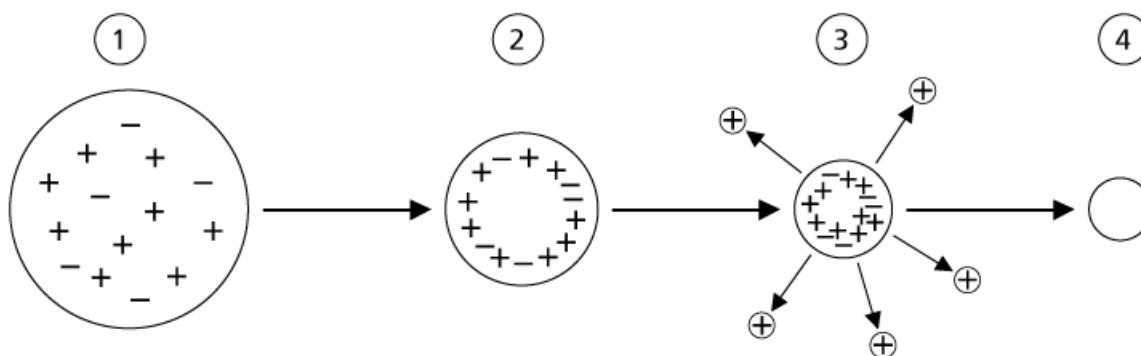
# Principles of Operation

# A

Nano-flow ionization is a soft ionization technique that is particularly useful for analyzing biological samples such as proteins and peptides. It uses very small volumes of sample and takes full advantage of the benefits of capillary chromatography. It also preserves the sample integrity and reduces fragmentation.

The Curtain Gas™ flow improves the laminar flow of ions toward the orifice plate aperture, creating smaller droplets that ionize more efficiently and produce a higher yield of useful ions. The interface removes larger particles from the ion current before they enter the aperture.

**Figure A-1 Ion Evaporation**



Item	Description
1	Droplet contains ions of both polarities with one polarity being predominant.
2	As the solvent evaporates, the electrical field increases and the ions move to the surface.
3	At some critical field value, ions are emitted from the droplets.
4	Nonvolatile residue remains as a dry particle.

Each charged droplet contains solvent, positive ions, and negative ions, but with one polarity predominant. The surface of each droplet contains an excess of charges. As the droplets evaporate, the radius of the droplet shrinks, and the electrical field at the surface increases.

If the droplet contains excess ions, and enough solvent evaporates from its surface, a critical point is reached at which ions are ejected into the gas phase by a very low energy process that does not induce fragmentation. After the solvent evaporates, it leaves a dry particle consisting of the non-volatile components from the sample.

## Principles of Operation

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Analyzing samples with the NanoSpray<sup>®</sup> ion source interface accelerates this process by using two separate stages of desolvation. Charged droplets first pass through a counter-current gas flow that provides the primary desolvation and discriminates against neutrals and very large charged particles. The finely dispersed charged droplets then enter a heated laminar flow chamber where they undergo a rapid evaporation with minimal thermal decomposition. This gentle evaporation preserves the sample's molecular identity.

The laminar gas flow and the electric field between the heated chamber and the orifice plate aperture transports the ions into the vacuum system of the mass spectrometer. The heated interface removes the larger residual charged particles.

# Tips for Working with the Ion Source

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B

## Cleaving an Emitter Tip

Successful open capillary chromatography relies on properly made capillary connections. Junctions between fused silica capillaries need clean, perpendicular cuts, or they will not seal properly. The capillaries have a protective plastic coating and ordinary scoring devices, including diamond-tip pencils, can tear it. This leaves a jagged edge that prevents the connections from sealing properly, and that can absorb sample components.

For detailed instructions for cleaving emitter tips, refer to the documentation for the fused silica cutter, located in the Hardware Installation Kit.

## NanoSpray<sup>®</sup> III Head

The NanoSpray<sup>®</sup> III head consists of a stainless steel microvolume union that is maintained at voltages from –2800 V to +3000 V, as well as a high-voltage rail and a nebulizer gas connection.

The high voltage charges the solution being sprayed, which lets the process occur without coated metal tips. The charged solution is sprayed through a short piece of fused silica capillary or emitter tip.

## Sample Solvent Composition

Solvents that are mixtures of water and organic modifiers offer higher sensitivity than pure water or pure organic solvents alone. The ideal solvent is a 20:1 mixture of water and an organic solvent, together with a small amount of acid or base to act as a modifier. Commonly used organic solvents include acetonitrile, methanol, propanol, and commonly used modifiers include acetic acid, formic acid, ammonium formate, ammonium acetate, and ammonium hydroxide.

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**Note:** Modifiers such as TEA (triethylamine), sodium phosphate, TFA (trifluoroacetic acid), and SDS (sodium dodecyl sulfate) are not commonly used because their ion mixtures and cluster combinations complicate the spectrum. They can also suppress the strength of the signal from the target ion.

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## Factors Affecting Optimization

The following factors affect NanoSpray<sup>®</sup> III head performance:

- Head position

## Tips for Working with the Ion Source

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- NanoSpray<sup>®</sup> III voltage
- Nebulizer gas flow
- Curtain Gas<sup>™</sup> flow
- Sample solvent composition
- Source exhaust
- Heater temperature

## NanoSpray<sup>®</sup> III Head Position

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**CAUTION: Potential System Damage. Do not allow the emitter tip to contact the curtain plate. Use the fine Z-axis adjustment knob to adjust the sprayer position, to avoid damage to the emitter tip.**

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The head optimizes off-axis with the curtain plate aperture. For analyses in positive ion mode at typical flow rates of 200 nL/min to 300 nL/min, the head can operate anywhere between 0 mm and 4.5 mm away from the curtain plate. This distance varies depending on the solution being analyzed and the flow rate. Operating nearer to the plate is possible if the IonSpray<sup>™</sup> voltage is decreased as the head is moved nearer to the plate.

In general, for samples in a highly aqueous solution, move the head away from the aperture. For samples in low aqueous solution, move the head toward the aperture.

Obtain results with the head centered in the aperture and 4.5 mm from the curtain plate. After establishing a signal, adjust the distance from the curtain plate and the vertical position until the signal is optimized. Do not change the head position after the signal is optimized.

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**Note:** Always monitor the signal and background levels while adjusting the sprayer position.

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## NanoSpray<sup>®</sup> III Head Voltage

Positive mode analyses usually require a voltage between 1500 V and 3000 V. Negative mode analyses usually require a slightly lower voltage to prevent corona discharge. Typical values are between –1000 V and –2800 V. These values are suggestions. Voltages depend on the type of solution being analyzed and the flow rate.

If the NanoSpray<sup>®</sup> III voltage is too high, a blue glow appears on the sprayer, indicating a corona discharge. This decreases the sensitivity and stability of the ion signal.

## Nebulizer Gas Flow

The nebulizer gas (Gas 1) flow must be optimized for signal stability and sensitivity. The gas flow usually optimizes at a very low value, or even at zero. Higher values are often used to stabilize the spray in negative ion and polarity switching applications. For more information on nebulizing gas parameters, refer to [Source Parameters and Voltages](#).



### Curtain Gas<sup>TM</sup> Flow

The Curtain Gas<sup>TM</sup> flow must be optimized for signal stability and sensitivity. Start at a low value and increase the flow rate until the signal starts to decrease. Reduce the gas flow until the signal returns to the maximum value. Refer to [Source Parameters and Voltages](#).

### Heater Temperature

The choice of heater temperature depends on the type of sample being analyzed and the solvent used. If the heater temperature is too high, the signal degrades. The maximum heater temperature is 250 °C for the NanoSpray<sup>®</sup> interface or 300 °C for the OptiFlow<sup>TM</sup> interface, but this is too high for most applications. For proteomics samples, for example, we recommend a temperature of 50 °C to 150 °C.

The interface takes approximately 10 minutes to reach its working temperature after the system reaches a vacuum ready state. Refer to [Source Parameters and Voltages](#).

The following describes the heater temperature set-point relationship between the NanoSpray<sup>®</sup> interface and OptiFlow<sup>TM</sup> interface

For  $a < 100$  °C,  $b = 0.8a + 10$

For  $a > 100$  °C,  $b = 1.4a - 50$

Where  $a$  = heater temperature for NanoSpray<sup>®</sup> interface

Where  $b$  = heater temperature for OptiFlow<sup>TM</sup> interface

# Connecting the Syringe Using PEEK-lined Fused Silica Tubing

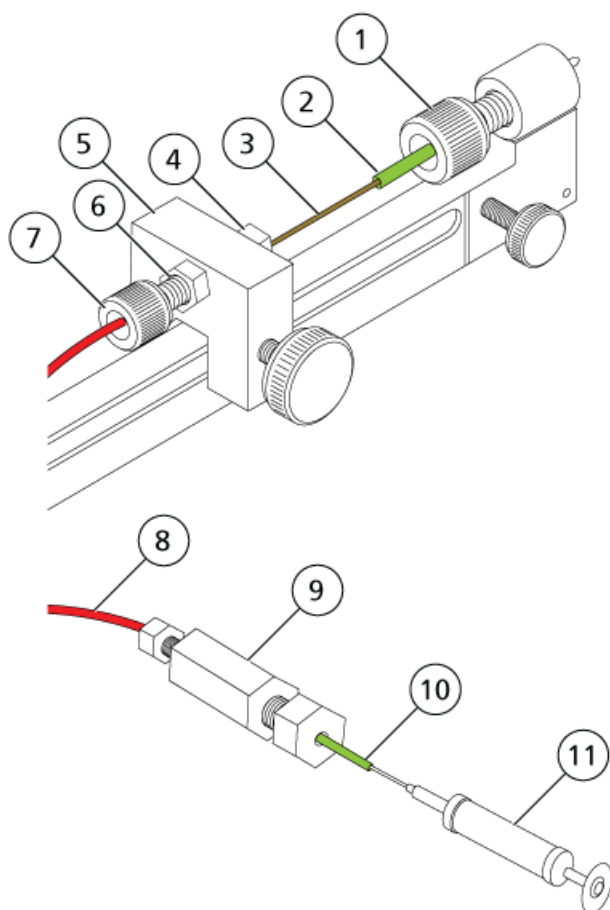
## C

Figure C-1 shows the parts required to assemble and install the NanoSpray<sup>®</sup> III head for use with PEEK-lined fused silica tubing. The key indicates whether the parts are available in the Consumables kit, Hardware Installation kit, or both.

When using PEEK-lined fused silica tubing, follow the procedures in Figure C-1 up to and including [Install the NanoSpray III Head on the Bracket](#). Then continue with the procedure in this section.

This procedure provides instructions for using infusion. If an HPLC system is being used, then refer to the documentation for the HPLC system.

**Figure C-1 Parts for the NanoSpray III Head**



## Connecting the Syringe Using PEEK-lined Fused Silica Tubing

Item	Description	Part Number	Kit
1	Sprayer fitting (PEEK nut and ferrule)	5031772	Both
2	Green FEP sleeve (1.58 mm o.d., 0.38 mm i.d.)	1006547	Both
3	Emitter tip (precut, 7 cm)	1035752	Both
4	Finger-tight PEEK hex nut	5015860	Both
5	Union holder (includes the union, PN 5015902)	5016361	See 5015902
6	Straight union	5015902	Consumables
7	Finger-tight PEEK nut	5017932	Both
8	Red PEEKsil tubing, 1/32 in. o.d., 100 µm i.d.	5017973	Both
9	Syringe union for use with red PEEKsil tubing	5017900	Consumables
10	Green PEEK sleeve (1/16 inch o.d., 0.030 inch i.d.)	1006549	Consumables
11	100 µL syringe	1003988	Both

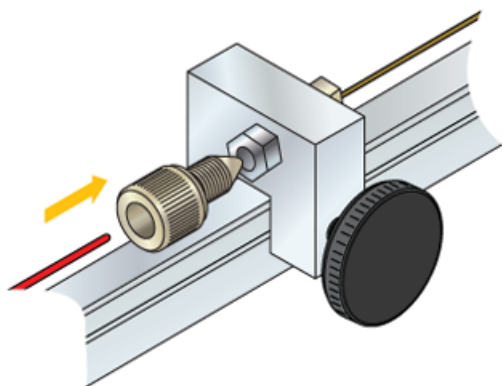
### Required Materials

- 2.5 mm hex screwdriver (PN 1034765)
- PEEK tube cutter (PN 011281)
- Fused silica cutter (PN 1006143)
- 1/4 inch and 3/16 inch wrench (not supplied)
- HPLC-grade IPA or methanol (not supplied)

**CAUTION: Potential System Damage. Do not cut the PEEK-lined fused silica tubing.**

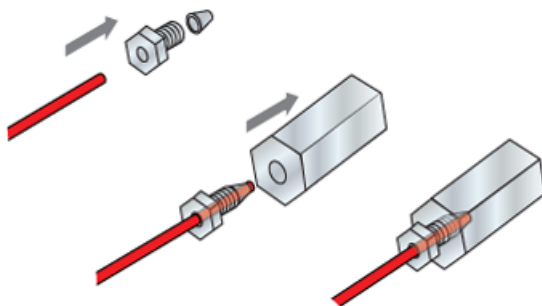
1. Remove the fitting from the upstream side of the union.
2. Insert the red PEEK-line fused silica tubing into the fitting until it protrudes about 2 mm from the tip of the fitting. Inspect the end to make sure that it is clean, and, if necessary, clean it with isopropanol or methanol.

**Figure C-2 Connecting the Sample Line to the Union**



3. Insert the fitting into the upstream side of the union, pushing the tubing into the fitting as far as it will go.
4. While holding the tubing in place, tighten the fitting slightly.
5. Insert the other end of the red PEEK-line fused silica tubing through the stainless steel nut and ferrule, making sure that it protrudes about 2 mm.
6. Insert the PEEK-line fused silica tubing, with the nut and ferrule, into the syringe union, pushing the tubing in as far as it will go, and then use a 1/4 inch and a 3/16 inch wrench to tighten the nut.

**Figure C-3 Syringe Union, Ion Source Side**



7. Cut a 3 cm length of the green PEEK sleeve.
8. Insert the syringe needle in the green PEEK sleeve.
9. Remove the stainless steel nut and ferrule from the other end of the syringe union.
10. Insert the needle and sleeve into the stainless steel nut and ferrule, pushing the sleeve in as far as it will go.
11. Insert the syringe needle, sleeve, nut, and ferrule, into the syringe union, pushing the sleeve in as far as it will go.
12. Use two 1/4 inch wrenches to tighten the nut.

## Connecting the Syringe Using PEEK-lined Fused Silica Tubing

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13. Move the X-Y-Z positioning unit toward the ion source interface slowly, until it stops, making sure that the emitter tip does not strike the curtain plate.
14. Continue with [Adjust the Illuminator](#).

# Source Parameters and Voltages

# D

Table D-1 and Table D-2 contain standard parameters for using the NanoSpray<sup>®</sup> III head with the NanoSpray<sup>®</sup> or OptiFlow<sup>™</sup> interface.

**Table D-1 NanoSpray III Head—Positive Mode**

Parameter	Typical Value	Range
Flow rate	500 nL/min	50 nL/min to 2000 nL/min
Sprayer distance from curtain plate	5 mm	2 mm to 5 mm
IonSpray <sup>™</sup> Voltage (IS) or IonSpray <sup>™</sup> Voltage Floating (ISVF)	2300 V	1000 V to 3000 V
Nebulizer gas (GS1)	6	1 to 20
Curtain Gas <sup>™</sup> flow (CUR)	20 (Triple quadrupole and QTRAP <sup>®</sup> systems)	15 to 30
	25 (TripleTOF <sup>®</sup> systems)	
Interface heater temperature (IHT)	75 °C	50 °C to 150 °C









**Table D-2 NanoSpray III Head—Negative Mode**

Parameter	Typical Value	Range
Flow rate	500 nL/min	50 nL/min to 2000 nL/min
Sprayer distance from curtain plate	5 mm	2 mm to 5 mm
IonSpray Voltage (IS) or IonSpray Voltage Floating (ISVF)	-1900 V	-1000 V to -2800 V
Nebulizer gas (GS1)	20	1 to 50
Curtain Gas flow (CUR)	20 (Triple quadrupole and QTRAP <sup>®</sup> systems)	15 to 30
	25 (TripleTOF <sup>®</sup> systems)	
Interface heater temperature (IHT)	75 °C	50 °C to 150 °C











# Glossary of Symbols

# E



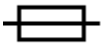








**Note:** Not all of the symbols in the following table are applicable to every instrument.

Symbol	Description
	Australian Regulatory Compliance Mark. Indicates the products complies with Australian Communications Media Authority (ACMA) EMC Requirements.
	Alternating current
A	Amperes (current)
	Authorized representative in the European community
	Biohazard
	CE Marking of Conformity
	cCSAus mark. Indicates electrical safety certification for Canada and USA.
	Catalogue number
	Caution <b>Note:</b> In SCIEX documentation, this symbol identifies a personal injury hazard.











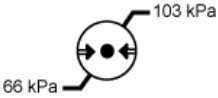
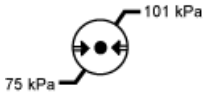
## Glossary of Symbols



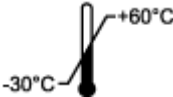





Symbol	Description
	China RoHS Caution Label. The electronic information product contains certain toxic or hazardous substances. The center number is the Environmentally Friendly Use Period (EFUP) date, and indicates the number of calendar years the product can be in operation. Upon the expiration of the EFUP, the product must be immediately recycled. The circling arrows indicate the product is recyclable. The date code on the label or product indicates the date of manufacture.
	China RoHS logo. The device does not contain toxic and hazardous substances or elements above the maximum concentration values, and it is an environmentally-friendly product that can be recycled and reused.
	Consult instructions for use.
	cTUVus mark for TUV Rheinland of North America.
	Data Matrix symbol that can be scanned by a barcode reader to obtain a unique device identifier (UDI).
	Environmental Hazard
	Ethernet connection
	Explosion Hazard
	Eye Injury Hazard
	Fire Hazard



Symbol	Description
	Flammable Chemical Hazard
	Fragile
	Fuse
Hz	Hertz
	High Voltage. Electrical Shock Hazard If the main cover must be removed, contact a SCIEX representative to prevent electric shock.
	Hot Surface Hazard
	In Vitro Diagnostic Device
	Ionizing Radiation Hazard
	Keep dry. Do not expose to rain. Relative humidity must not exceed 99%.
	Keep upright.
	Lacerate/Sever Hazard
	Laser Radiation Hazard

## Glossary of Symbols

Symbol	Description
	Lifting Hazard
	Manufacturer
	Moving Parts Hazard
	Pinch Hazard
	Pressurized Gas Hazard
	Protective Earth (ground)
	Puncture Hazard
	Reactive Chemical Hazard
	Serial number
	Toxic Chemical Hazard
	Transport and store the system within 66 kPa to 103 kPa.
	Transport and store the system within 75 kPa to 101 kPa.

Symbol	Description
	Transport and store the system within 10% to 90% relative humidity.
	Transport and store the system within –30 °C to +45 °C.
	Transport and store the system within –30 °C to +60 °C.
	USB 2.0 connection
	USB 3.0 connection
	Ultraviolet Radiation Hazard
VA	Volt Ampere (power)
V	Volts (voltage)
	WEEE. Do not dispose of equipment as unsorted municipal waste. Environmental Hazard
W	Watts
	yyyy-mm-dd Date of manufacture

# Contact Us

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## Customer Training

- In North America: [NA.CustomerTraining@sciex.com](mailto:NA.CustomerTraining@sciex.com)
- In Europe: [Europe.CustomerTraining@sciex.com](mailto:Europe.CustomerTraining@sciex.com)
- Outside the EU and North America, visit [sciex.com/education](http://sciex.com/education) for contact information.

## Online Learning Center

- [SCIEXUniversity](#)

## SCIEX Support

SCIEX and its representatives maintain a staff of fully-trained service and technical specialists located throughout the world. They can answer questions about the system or any technical issues that might arise. For more information, visit the SCIEX website at [sciex.com](http://sciex.com) or contact us in one of the following ways:

- [sciex.com/contact-us](http://sciex.com/contact-us)
- [sciex.com/request-support](http://sciex.com/request-support)

## CyberSecurity

For the latest guidance on cybersecurity for SCIEX products, visit [sciex.com/productsecurity](http://sciex.com/productsecurity).

## Documentation

This version of the document supercedes all previous versions of this document.

To view this document electronically, Adobe Acrobat Reader is required. To download the latest version, go to <https://get.adobe.com/reader>.

To find software product documentation, refer to the release notes or software installation guide that comes with the software. Documentation for the hardware products can be found on the *Customer Reference* DVD that comes with the system or component.

The latest versions of the documentation are available on the SCIEX website, at [sciex.com/customer-documents](https://sciex.com/customer-documents).

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