

Agilent 6500 Series Q-TOF LC/MS system

Maintenance Guide

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Procedures.**



Agilent Technologies

Notices

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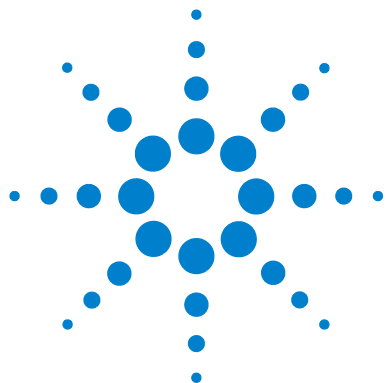
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This chapter describes procedures for the basic operation of your Q-TOF LC/MS instrument.

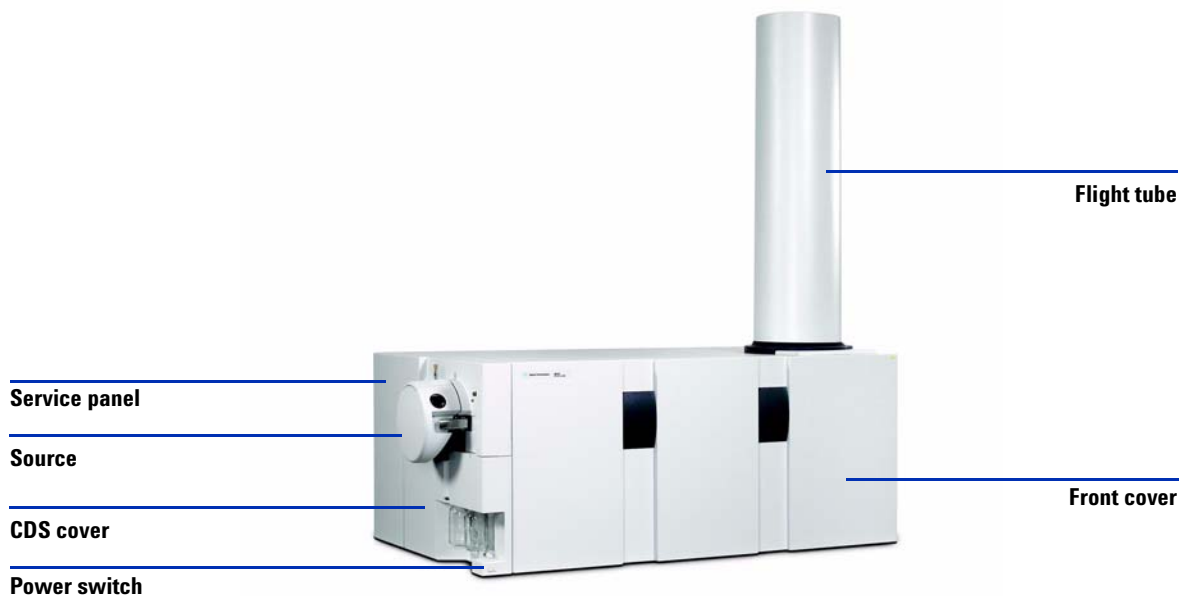


Figure 1 6520 Q-TOF LC/MS covers. The main power switch is behind the service panel.





Figure 2 6530 with Agilent Jet Stream Technology

For more details, see the site preparation guide that is sent to customers before installation. If you move the instrument, you must follow and repeat the steps detailed in the site preparation guide.



Figure 3 6538/6540 Q-TOF LC/MS

1 Basic Operation

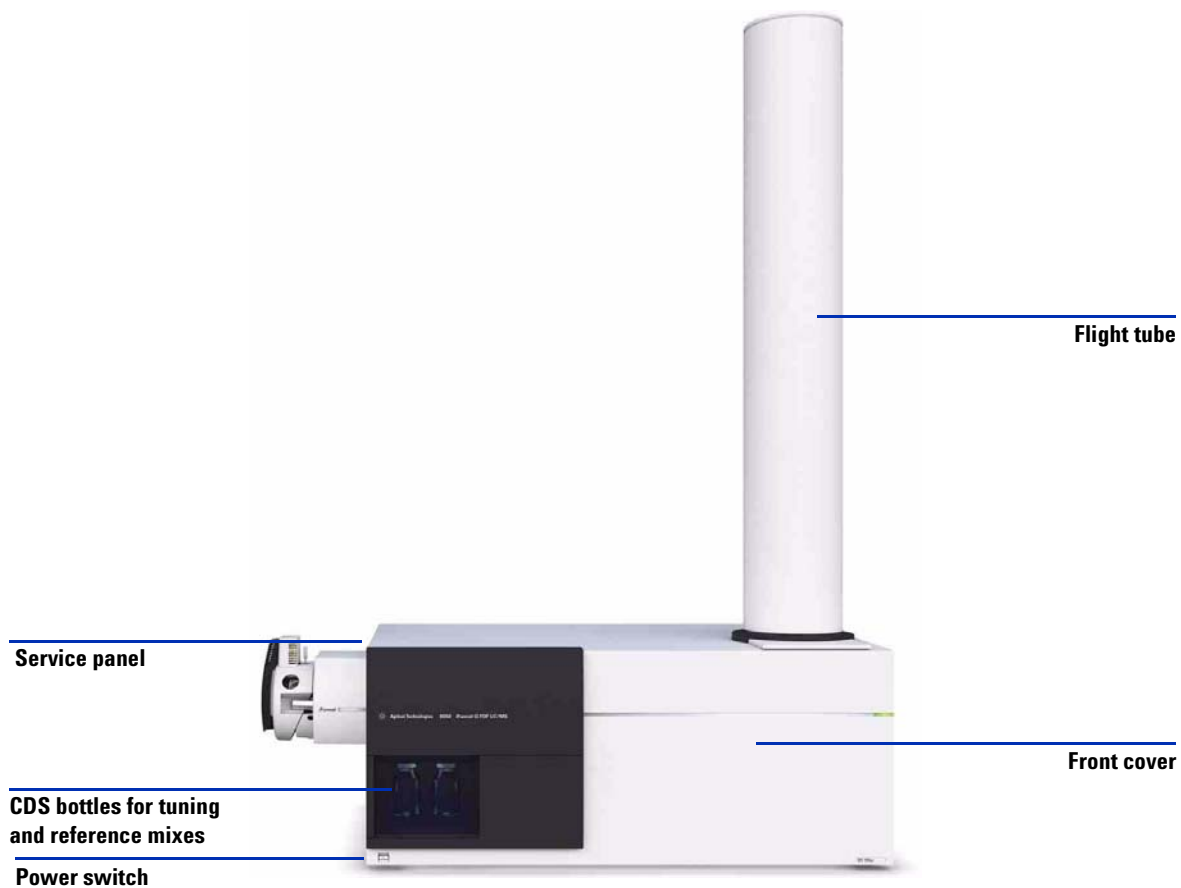


Figure 4 6550 Q-TOF LC/MS

LAN connection



Figure 5 6520/6530/6538/6540 gas, LAN, and power connections behind service panel



Pump expander box power switch

Figure 6 6550 power connections and pump expander box behind service panel

Starting and Shutting Down

This section describes how to start up your Q-TOF LC/MS and how to shut it down.

The Q-TOF LC/MS instruments have three standard modes of operation that you can select from the software.

On Mode *On* is the fully operational status of the system. The instrument and the source are on. The Q-TOF icon indicates the state of the instrument:

Table 1 Q-TOF icon color indication

Color	State
green	idle
blue	running, injecting
red	error
yellow	not ready
purple	pre-run, post-run
dark gray	offline
light gray	standby

To put an individual device in the On mode, right click the image of the device in the Instrument Status window and click **On**. To put all devices in the On mode, click the **On** button in the Instrument Status window.

Standby Mode In *Standby*, the source interface is on, the drying gas remains heated, and nebulizer flows are maintained. The source and ion optics voltages are turned off, and the mass spectrometer is not sending spectra to the computer. However, the Q-TOF high voltage electronics are on.

For APCI and MMI sources, the vaporizer gas heaters are turned down.

For an instrument with Agilent Jet Stream inlet assembly, the sheath gas temperature, drying gas flow, and drying gas temperatures are reduced.

1 Basic Operation

Starting and Shutting Down

This mode lets the instrument remain idle for periods lasting from minutes to days. You should place the instrument in Standby mode when it is not in use or when you want to change the ion source.

To put an individual device in the Standby mode, right click the image of the device in the Instrument Status window and click **Standby**.

Powered Off State

When the system is in the powered off state, the system is vented and the instrument is turned off to allow maintenance or to prepare for long periods when the instrument is not used.

NOTE

Before you move the instrument to another location, maintain it, or expect it to be idle for long periods of time, turn off both the front switch and the main power breaker switch behind the service panel.

CAUTION

If the Q-TOF LC/MS is planned to be shut down for longer than one day, unplug the instrument from the wall outlet to prevent overheating of the turbo pump power supplies.

To start the system in Standby mode

This procedure brings the system from the powered off state to Standby mode.

- 1 Check that nitrogen gas for the drying gas and for the collision cell are turned on.

When you use an instrument with Agilent Dual Jet Stream Technology or Agilent Jet Stream Technology, the drying gas requirements are greater than when operating with ESI, APCI, APPI, or multimode sources. The supply line must have two hydrocarbon traps (part number BHT-4 or RMSN-4) plumbed in parallel to achieve these flows without triggering errors at the instrument. Refer to the *Installation Guide* for more details.

- 2 Check that the rough pump is connected to the Q-TOF LC/MS.
 - Check that the rough pump power cable is connected to the **Foreline Pump** power receptacle behind the service panel of the Q-TOF LC/MS.
 - **For 6550:** Check that the rough pump power cable is connected to the **Foreline Pump** power receptacle and that the Ion Funnel pump is connected to the **Auxiliary Pump** power receptacle in the pump expander box of the Q-TOF LC/MS.
 - Check that the rough pump has the correct voltage rating for your AC power (230 V or 208 V).
 - **For 6520/6530/6538/6540:** Check that the rough vacuum tubing is connected to the inlet part of the rough pump.
 - **For 6550:** Check that the rough vacuum hose for the foreline pump is connected to the foreline vacuum port and that the ion funnel rough vacuum hose is connected to the ion funnel rough pump inlet.
 - Check that the switch on the rough pump is in the On position.

1 Basic Operation

To start the system in Standby mode

NOTE

A silicone rubber septum is placed between the spray shield and the capillary for shipment. Make sure that this rubber septum is removed if you are starting the system for the first time.

CAUTION

Do not connect the spray chamber exhaust bottle to the rough pump exhaust tubing or the rough pump exhaust tubing to the spray chamber exhaust tubing. Doing so can contaminate the instrument with rough pump fluid.

- 3 Check that all pump and spray chamber exhausts are vented outside the laboratory.

CAUTION

Vent all exhausts external to the building where they cannot be recirculated by environmental control systems. Do not vent exhaust into your laboratory. The exhaust fumes from the vacuum pumps and spray chamber contains trace amounts of the chemicals you analyze. Health hazards include chemical toxicity from solvents, buffers, samples and pump fluid vapor, as well as potentially biohazardous aerosols of biological samples.

For oil-based rough pumps only: The oil mist filter must be installed on the rough pump, and the ballast valve must be closed. Open the ballast valve periodically (must be done on a weekly basis) to return any oil that has condensed in the oil mist filter to the pump as needed.

For dry pumps (Agilent TS800 or Edwards XDS351i), the ballast does not need to be emptied regularly.

- 4 Turn on the power for the computer and monitor.
- 5 Check that the instrument is plugged into a power outlet.
- 6 **For 6550 only:** Check that the power switch on the pump expander box is connected to the wall outlet and is turned on. The switch is illuminated green when the power is on.
- 7 Turn on the front switch of the Q-TOF LC/MS.

This starts the pumping system and the electronics.

- 8 After Windows starts, click **Start > Programs > Agilent > MassHunter Workstation > Acq Tools > Q-TOF Diagnostics** to start the Q-TOF diagnostics program.
- 9 From the **Connection** menu, select **Connect** and click **OK**.

10 Under System Turn-On, mark the check boxes for **Pump Down** and **HV Condition**.

11 Click the **Start** button under System Turn-On.

The system monitors the vacuum pressure. Once the vacuum pressure reaches 3×10^{-6} torr, the system will begin conditioning the high voltage electronics.

12 Once high voltage conditioning has completed, go to **Start > Programs > Agilent > MassHunter Workstation > Data Acquisition** to start the Data Acquisition program.

The system will come up in Standby mode.

By default, the source values are set to:

- Drying gas flow (non iFunnel systems): 3.5 L/minute
- Drying gas flow (6550): 12 L/minute
- Drying gas temperature: 300 °C
- Nebulizing gas pressure: 20 psi
- Sheath gas flow: 3 L/minute
- Sheath gas temperature: 125 °C

NOTE

You will not be able to set the flows while the Q-TOF system is in a “Not Ready” state. The system will remain in the Not Ready state while the high vacuum pressure is above 3.5×10^{-6} torr.

13 Allow the instrument to continue pumping down.

The Rough Vac (rough pump) pressure should be about 1.75 to 2.5 torr. The TOF Vac (flight tube region) pressure should be approximately 3×10^{-6} torr within two to three hours. The TOF Vac reading should be in the 10^{-7} torr range after pumping overnight to several days.

Leave the instrument in Standby.

To change from Standby to On

Use this procedure when the Q-TOF LC/MS is in Standby mode and you need to bring it into the On mode.

Before you begin, check that:

- The Q-TOF LC/MS is in Standby mode
- In the Data Acquisition program, click **On**.

You can only activate the Standby mode or On mode if the ion source is mounted and closed. You can now select parameters for your measurement.

The instrument is now in the On mode.

To change from On to Standby

Put the Q-TOF LC/MS in Standby mode when you have completed your analysis of samples.

Before you begin, check that:

- You have completed tuning and data acquisition and you have saved all data as needed (described in later chapters).
- In the Data Acquisition program, click **Standby**.

The drying gas flow, drying gas temperature, nebulizer pressure, vaporizer temperature, and sheath gas temperature are reduced when the instrument is in Standby mode. The spray chamber high voltages are turned off in Standby mode. Voltages in the flight tube remain On in Standby mode to maintain stable operating voltages. The mass spectrometer stops generating spectra.

The system is now in Standby mode.

To shut down the instrument

You can turn off the Q-TOF LC/MS when the instrument will be idle for an extended time or when you must do maintenance.

Before you begin, check that you have completed tuning and acquiring data, and that you have saved all data as needed.

CAUTION

When you click **Vent** in the Q-TOF shortcut menu, the Q-TOF LC/MS does not turn off. You must follow the entire shutdown procedure.

WARNING

The spray shield and related spray chamber components are likely to be hot. Do not touch them!

- 1 Turn off the solvent flow.

If you have analyte in any of the components in the sample delivery system, flush the delivery system with pure solvent before you continue.

- 2 Check that the ballast valve on the rough pump is closed.
- 3 In the Data Acquisition program, right-click the Q-TOF device pane and click **Vent**.

When you vent the system, these parts are turned off: spray chamber high voltages, the drying gas heater, the nebulization flow, the detector, and other lens voltages. The drying gas flow is set to 3.5 L/minute. If the APCI source is installed, the vaporizer heater is also turned off. If you have an instrument with Agilent Jet Stream Technology, the sheath gas heater is also turned off. The Rough Pump turns off when the turbo speed is below 20 percent.

- 4 Wait until the instrument completely vents (reaching 760 torr) to ensure that the flight tube is filled with nitrogen. This protects the detector from moisture damage.
- 5 Turn off the front switch located in the lower left front corner of the instrument.

1 Basic Operation

To shut down the instrument

- 6** Unplug the main power cable behind the service panel. This action prevents the turbo pump components from overheating.
- 7** At this point, you can also shut down the Data Acquisition program and computer. The system is now shut down.

Changing Ion Sources

This section describes the steps to change from one ion source to another. First, you need to follow the set of steps to remove your current source. Then, you need to follow the steps to install the new source.

To remove an electrospray source

WARNING

The spray chamber operates at very high temperatures. Let the spray chamber cool before you continue.

- 1 Put the instrument in Standby mode.
- 2 Slide open the nebulizer cover.
- 3 Disconnect the LC nebulizer tubing and LC nebulizing gas tubing.
- 4 Disconnect the Reference nebulizer tubing and Reference nebulizing gas tubing.
- 5 Open the spray chamber.
- 6 Plug the reference nebulizer gas outlet on the side of the instrument, under the service panel.
- 7 Remove the spray chamber by lifting it along the axis of its hinges.

To remove the ESI with Agilent Jet Stream Technology

WARNING

The spray chamber operates at very high temperatures. Let the spray chamber cool before you continue.

- 1 Put the instrument in standby mode.

If the ESI with Agilent Jet Stream Technology is at operating temperature (for example 400°C, it may take 20 to 30 minutes to cool down to an acceptable temperature.

- 2 Disconnect the LC tubing and LC nebulizing gas tubing.
- 3 Disconnect the heater and high voltage cables.
- 4 Disconnect the sheath gas line at the connector and unplug it.
- 5 Open the spray chamber.
- 6 Remove the spray chamber by lifting it along the axis of its hinges.
- 7 Remove the Agilent jet stream spray cap.
- 8 If you are changing to nanospray, also remove the capillary cap.

To remove a multimode source

- 1 Put instrument in Standby mode.
- 2 Disconnect the electrical connectors to the multimode source.

WARNING

The spray chamber operates at very high temperatures. Let the spray chamber cool for 10 minutes before you continue.

- 3 Disconnect the nebulizing gas tubing and LC tubing from the nebulizer.
- 4 Open the spray chamber.
- 5 Remove the spray chamber by lifting it along the axis of its hinges.

To remove an APCI or APPI source

- 1 Put instrument in Standby mode.
- 2 Disconnect the APCI or APPI heater cable.
- 3 For APCI source only, disconnect the APCI high voltage cable.

WARNING

The spray chamber operates at very high temperatures. Let the spray chamber cool for 10 minutes before you continue.

- 4 Disconnect the nebulizing gas tubing and LC tubing from the nebulizer.
- 5 Open the spray chamber.
- 6 Remove the spray chamber by lifting it along the axis of its hinges.

1 Basic Operation

To remove a nano ESI source

To remove a nano ESI source

WARNING

The spray chamber operates at very high temperatures. Let the spray chamber cool before you continue.

- 1 Put instrument in Standby mode.
- 2 Remove the nanospray needle assembly from the source.
- 3 Clean the nanospray needle with 100% acetonitrile. You can also use any solvent that dissolves the last sample run.

CAUTION

Do not let the sample recrystallize inside the needle, which leads to plugged needles. Follow the steps above to prevent plugged needles.

- 4 Disconnect the power cable from the lamp.
- 5 Open the spray chamber.
- 6 Remove the spray chamber by lifting it along the axis of its hinges.
- 7 Remove the capillary cap and drying gas diverter.
- 8 Install the standard capillary cap.

To remove a dual nano ESI source

WARNING

Do not touch the top of the dual nanospray source or the capillary cap. They may be very hot. Let the parts cool before you handle them.

- 1 Put instrument in Standby mode.
- 2 Remove the reference and LC nanospray needle assembly from the source.
- 3 Clean both nanospray needles with 100% acetonitrile. You can also use any solvent that dissolves the last sample run.

CAUTION

Do not let the sample recrystallize inside the needle, which leads to plugged needles. Follow the steps above to prevent plugged needles.

- 4 Disconnect the power cable from the lamp.
- 5 Open the spray chamber.
- 6 Remove the spray chamber by lifting it along the axis of its hinges.
- 7 Remove the capillary cap and drying gas diverter.
- 8 Install the standard capillary cap and spray shield. For the standard spray shield, the small drying gas exit hole should be oriented above the main hole, or entrance to the capillary cap.

To install an electrospray source

- 1 Install the ESI spray shield.

Make sure the small hole is at the top (“12 o'clock position”). If needed, use a T10 Torx drive to loosen the two screws in the end plate, and rotate the ESI spray shield clockwise until the hole is in the correct position. Gently tighten the Torx screws again.

- 2 Install the electrospray spray chamber.
- 3 Close the spray chamber.
- 4 Connect the nebulizing gas tubing and LC tubing to the analytical nebulizer.
- 5 Connect the nebulizing gas tubing and LC tubing to the reference nebulizer.

CAUTION

Do not touch the nebulizer tip to any surface. The needle is not protected. If you damage the needle, you get bad system performance.

- 6 In the left side of the **Q-TOF** tab, in the Method Editor window, select **Dual ESI** as the **Ion Source**.

- 7 Click **Apply**.

The title bar of the Q-TOF instrument module in the Instrument Status window changes from a red to a gray color.

- 8 Right-click the Q-TOF device pane in the Instrument Status window, then click **On** to turn on the instrument.
- 9 While you wait for the source to reach its working temperature, continue to create the acquisition method, or load a previously stored method.

If you load a method that was stored when using a different ion source, the Q-TOF instrument status turns red. Repeat [step 6](#) and [step 7](#) to enable the current source, and then save the method.

When the source reaches its working temperature, you can use the instrument for analysis.

To install an APCI source

- 1 Install the ESI spray shield.

Make sure the small hole is at the top (“12 o'clock position”). If needed, use a T10 Torx drive to loosen the two screws in the end plate, and rotate the ESI spray shield clockwise until the hole is in the correct position. Gently tighten the Torx screws again.

- 2 Close the ESI reference nebulizer gas tubing with a cap. A threaded plug is provided for this purpose.
- 3 Install the APCI spray chamber.
- 4 Close the spray chamber.
- 5 Connect the nebulizing gas tubing and LC tubing to the APCI nebulizer.
- 6 Connect the APCI heater cable and the APCI high voltage cable.
- 7 In the left side of the **Q-TOF** tab, in the Method Editor window, select **APCI** as the **Ion Source**.
- 8 Click **Apply**.
- 9 Put the instrument in **On** mode.

Let the source heat to its working temperature. Typically, this takes about 15 minutes.

- 10 Load or create the desired analytical method.

This will load the appropriate gas flows and temperature setpoints.

- 11 Rinse a clean bottle with acetonitrile.

The ship kit comes with an extra bottle (p/n 9300-2576) and bottle cap (p/n 9300-2575).

- 12 Pour the APCI/APPI Tuning Mix into the tuning mix bottle.
- 13 Attach the tuning mix bottle back onto the CDS.

To install an APPI source

- 1** Install the APPI USB to Serial Converter Cable (p/n 8121-1013) to the one of the available USB ports on the SmartCard 4 Plus on the left side of the Q-TOF instrument.
- 2** Rinse a clean bottle with acetonitrile.

The ship kit comes with an extra bottle (p/n 9300-2576) and bottle cap (p/n 9300-2575).
- 3** Pour the APCI/APPI Tuning Mix into the tuning mix bottle.
- 4** Attach the tuning mix bottle back onto the CDS.
- 5** Remove the currently installed source and install the G1971B APPI source onto the spray chamber mounts.
- 6** Connect the APPI Vaporizer heater cable to its connector on the left side of the Q-TOF. Then connect the APPI serial cable to the USB/Serial Converter cable that was installed in step 1 of this procedure.

To install a nano ESI, dual nano ESI or multimode source or HPLC-Chip/MS interface

- Refer to the *User Guide* for the specific source or interface.

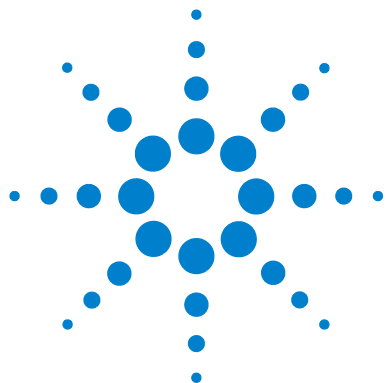
To install the Agilent Jet Stream inlet assembly

This topic applies to both the single and the dual Agilent Jet Stream source.

- 1 Install the Agilent Jet Stream spray shield.
- 2 Attach the Agilent Jet Stream inlet assembly to the desolvation chamber.
- 3 Close the latch on the Agilent Jet Stream inlet assembly.
- 4 Remove the plug from the reference nebulizer gas line and connect the sheath gas tubing to the gas line.
- 5 Connect the electrical connections.
- 6 Connect the nebulizer gas line and LC tubing to the nebulizer.
- 7 On the **Q-TOF** tab, on the left side of the **Method** Editor window, select **AJS ESI** or **Dual AJS ESI**, depending on your source.
- 8 Click **Apply**. The sheath gas turns on.
- 9 Click **On** to turn on the instrument. The Agilent Jet Stream inlet assembly will begin to heat to the setpoints.
- 10 Load an appropriate method or create one, and allow the system to stabilize.
- 11 If needed, install the ESI-L tuning mix in the reference B port of the CDS.

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To install the Agilent Jet Stream inlet assembly



2 Maintenance

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This chapter contains maintenance tasks for the 6500 Series Q-TOF LC/MS System.



Calibrant Delivery System and Divert Valve

This section describes maintenance tasks that are related to the calibrant delivery system and divert valve.

When you do maintenance procedures on the divert valve:

- Do not bend any capillary line.
- The position of the divert valve can be set only in the On mode.
- Put the instrument in the Off mode.
- Remove the covers before you begin.
- Install the covers of the instrument after you finish.

Table 1 Divert Valve Connection (see [Figure 2](#) and [Figure 3](#))

No.	Port	Connection	User action
1	Inlet	from the front inlet union behind the inlet cover	none
2	Inlet	from CDS	none (permanent connection from calibrant delivery system)
3	Outlet	to the ion source	connect the flexible capillary to the ion source
4	Loop	loop to port 6	none (permanent connection)
5	Waste	to the drain bottle	none
6	Loop	loop to port 4	none (permanent connected)

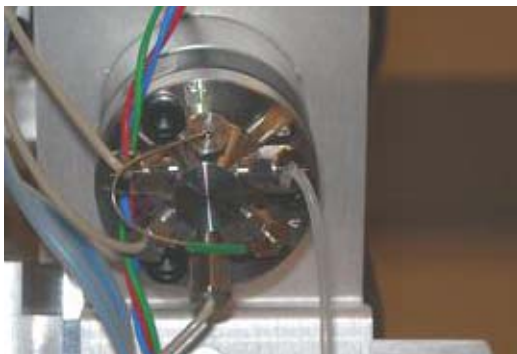


Figure 1 Divert valve with port position indicators

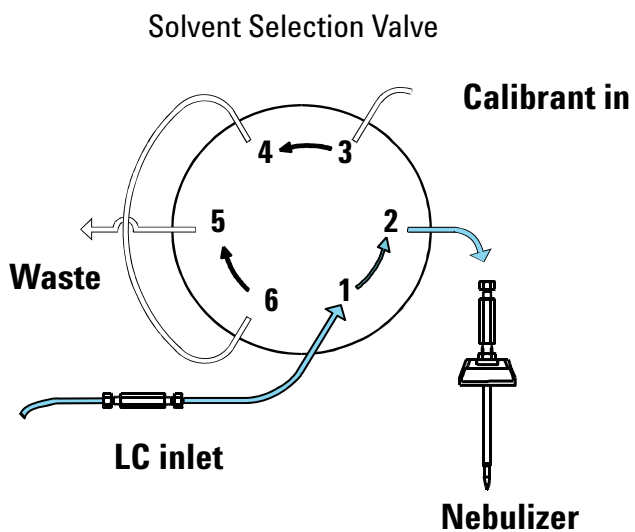


Figure 2 LC to LC/MS flow

2 Maintenance

Calibrant Delivery System and Divert Valve

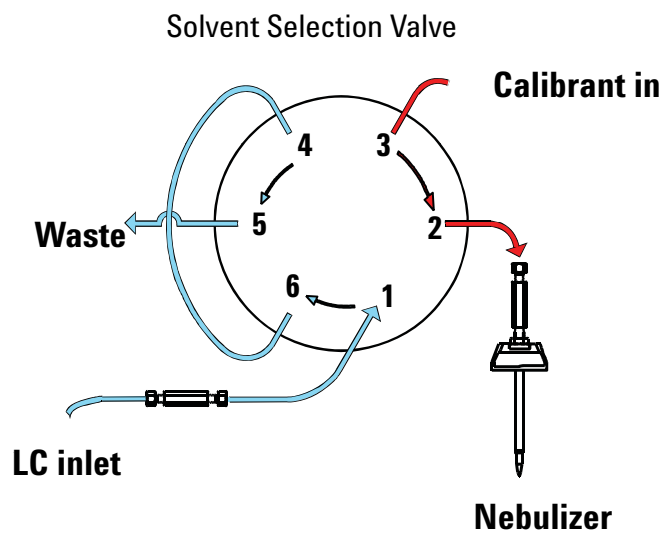


Figure 3 Calibrant to LC/MS flow

To prepare tuning mix

For many instruments, the standard tuning mix will produce correct results. However, in some instances, a dilution is required.

Dilute the tuning mix if:

- You get error messages that instruct you to dilute the calibrant.
- The tune report shows abundances greater than 750,000 counts. You need to dilute until the largest abundance is below 750,000 counts for a mass axis calibration. Typical tune mass abundances are in the range of 50,000 to 650,000 counts.

Do not dilute the tuning mix if:

- Your source is an APPI or APCI.

Before you begin, make sure you have:

- G1969-85000 ESI-L Low Concentration Tuning Mix (for Dual ESI or ESI with Jet Stream Technology)
- G1969-85020 MMI-L Low Concentration Tuning Mix (for multimode source)
- G1969-85003 Biopolymer Reference Mass Kit, which contains the HP-0321 solution (for ESI with Jet Stream Technology)
- HPLC-grade acetonitrile. Acetonitrile must be suitable for HPLC, spectrophotometry, and pesticide residue analysis.
- Water, 18 MΩ-cm resistivity or better and free of organics.
- Glass CDS bottle (p/n 9300-2576) and cap (p/n 9300-2575)

The materials shipped with the instrument are of sufficient purity for this purpose.

These instructions will make 100 mL of diluted tuning mix.

2 Maintenance

To prepare tuning mix

- 1 Add the components in the table below, *in the order listed*, to a clean CDS bottle. Refer to the table that is appropriate for your source or inlet assembly.

Make sure you add the components in the order listed below to avoid precipitation of any components of the tuning mix.

Table 2 ESI with Jet Stream Technology

Source	Positive Mode	Negative Mode
Undiluted Tuning Mix	10 ml ESI-L	2.5 mL ESI-L
Acetonitrile	88.5 mL	95.6 mL
Water	1.5 mL	1.9 mL
0.1 mM HP-0321 (included in the Biopolymer Reference Mass Kit)	5 µL	N/A

Table 3 Dual ESI

Components	Positive Mode	Negative Mode
Undiluted Tuning Mix	25 mL ESI-L	25 mL ESI-L
Acetonitrile	71.25 mL	71.25 mL
Water	3.75 mL	3.75 mL

Table 4 Multimode

Components	Positive Mode	Negative Mode
Undiluted Tuning Mix	25 mL MMI-L	25 mL MMI-L
Acetonitrile	71.25 mL	71.25 mL
Water	3.75 mL	3.75 mL

- 2 Mix the contents thoroughly and install the bottle on the instrument.
- 3 Change to the **Tune** context, then:
 - a Open the reference B valve.

- b** Allow at least one minute for the tuning mix to flush the previous solution from the calibrant system before you tune the instrument.

Store the custom tuning mix in the refrigerator when it is not being used for extended periods of time.

Use these guidelines to adjust the custom tuning mix:

- In the final tune report, make sure all abundances listed in the report are between 50,000 and 700,000 counts for proper calibration of the mass axis. Dilution of the tuning mix up to 200-fold can be needed for instruments with exceptional sensitivity. Be careful in your laboratory work when you dilute greater than 50-fold because contamination and sodium trifluoroacetate adducts can become problematic at higher dilutions.
- The amount of water added affects the response of 118 m/z , with higher amounts yielding a greater response and vice versa. You can add water up to the amount of 5% (v/v). Do not add more water than that because some components of the tuning mix can precipitate under these conditions.
- If tune mass abundances are less than 10,000 counts, the tuning mix is overdiluted. Dilutions at this level can result in poor mass accuracies.
- Use the HP-321 solution in a 2000:1 (v/v) ratio to the ESI-L Tuning Mix. (If 10 mL ESI-L Low Concentration tuning mix is used, add 5 μ L of the HP-321 solution.)
- Sodium TFA can cause problems during calibration, depending on how the calibrant is diluted and how much sodium is in the water. [Table 5](#) lists the ions that can result from sodium TFA (both positive and negative mode).*

Table 5 Elemental compositions and calculated masses of sodium trifluoroacetate ion clusters by electrospray ionization under positive-ion ($[(CF_3COONa)_nNa]^+$) and negative-ion ($[(CF_3COONa)_nCF_3COO]^-$) modes

n	Positive-ion calculated mass	Negative-ion calculated mass
1	158.96458*	248.96036*
2	294.93939*	384.93466*
3	430.91420*	520.90947*
4	566.88900*	656.88427*

2 Maintenance

To prepare tuning mix

Table 5 Elemental compositions and calculated masses of sodium trifluoroacetate ion clusters by electrospray ionization under positive-ion ($[(CF_3COONa)_nNa]^+$) and negative-ion ($[(CF_3COONa)_nCF_3COO]^-$) modes (continued)

n	Positive-ion calculated mass	Negative-ion calculated mass
5	702.86381*	792.85908*
6	838.83862*	928.83389*
7	974.81343*	1064.80870
8	1110.78824*	1200.78351
9	1246.76305*	1336.75832
10	1382.73786	1472.73313
11	1518.71267	1608.70794
12	1654.68747	1744.68274
13	1790.66228	1880.65755
14	1926.63709	2016.63236
15	2062.61190	2152.60717
16	2198.58671	2288.58198
17	2334.56152	2424.55679
18	2470.53633	2560.53160
19	2606.51114	2696.50640
20	2742.48594	2832.48121
21	2878.46075	2968.45602
22	3014.43556	3104.43083
23	3150.41037	3240.40564
24	3286.38518	3376.38045
25	3422.35999	3512.35526

* Source: Mehdi Moini, Bruce L. Jones, Robin M. Rogers, and Longfei Jiang, "Sodium Trifluoroacetate as a Tune/Calibration Compound for Positive- and Negative-Ion Electrospray Ionization Mass Spectrometry in the Mass Range of 100–4000 Da," *Journal of The American Society for Mass Spectrometry* Sept. 1998: 977–980.

Table 5 Elemental compositions and calculated masses of sodium trifluoroacetate ion clusters by electrospray ionization under positive-ion ($[(CF_3COONa)_nNa]^+$) and negative-ion ($[(CF_3COONa)_nCF_3COO]^-$) modes (continued)

n	Positive-ion calculated mass	Negative-ion calculated mass
26	3558.33480	3648.33007
27	3694.30961	3784.30487
28	3830.28441	3920.27968
29	3966.25922	4056.25449

*Peaks marked with asterisks were also observed under chemical ionization mode using a direct insertion probe.

To prepare the reference mass solution

The dilutions in this topic are used for installation and check-out. You may need to adjust the dilution for your own analysis.

Before you begin, check that you have:

- The G1969-85001 ES-TOF Reference Mass Solution Kit, which contains two ampoules each (2.2 mL/ampoule) of the following reference ions:
 - 100 mM (millimolar) ammonium trifluoroacetate in 90:10 acetonitrile:water. This solution is abbreviated 100 mM TFANH₄.
 - 5 mM (millimolar) purine in 90:10 acetonitrile:water
 - 2.5 mM (millimolar) hexakis(1H, 1H, 3H-tetrafluoropropoxy)phosphazine in 90:10 acetonitrile:water. This solution is abbreviated 2.5 mM HP-0921.
- Acetonitrile UV - B&J Brand High Purity Solvent for HPLC, Gas Chromatography, Pesticide Residue Analysis and Spectrophotometry. (Material number: 10071618, Cat. number 015-4).
- Nanopure D.I. Water (18 megaΩ-cm, organic-free)

The reference solution provides internal reference masses for reference mass correction in positive and negative ion modes of operation. For the purposes of mass accuracy performance verification, make the following reference mass solution.

- 1 Put on protective gloves.
- 2 Using a graduated cylinder, pour 950 mL of acetonitrile and 50 mL of water into the 1-liter Nalgene bottle (p/n 9301-6460) supplied in the Q-TOF LC/MS system ship kit.
- 3 Using a pipettor, add the following amounts of the individual calibrants to the 1-liter Nalgene bottle containing the acetonitrile/water solution made in [step 2](#).

Table 6

	Dual ESI	Agilent Jet Stream ESI
TFANH ₄	0.5 mL	
Purine	1.0 mL	0.4 mL
HP-0921	0.45 mL	1.0 mL

Before you break open each ampoule, invert the ampoule several times to mix. Inspect the ampoule's contents to ensure that all the solution is contained in the lower cylindrical base. Shake the ampoule, if needed, to dislodge any air pocket that may prevent solution from settling in the lower portion of the ampoule.

- 4 Cap and invert the bottle several times to thoroughly mix the reference mass solution.
- 5 Transfer 100 mL of this solution to CDS Reference Bottle "A".

Use of ES-TOF Reference Mass Solution

Use these guidelines to adjust the amounts of IRM compounds to add to this preparation.

- IRM abundances less than 1000 counts generally do not yield acceptable ion statistics for good correction. Ideally, abundances will be at the level of 10,000 counts or greater at any point in the analysis where correction is desired.
- The abundances of the reference mass compounds change during an HPLC gradient, with lesser abundances occurring at higher organic compositions. This is especially true when using acetonitrile as the organic component. Make sure the abundances are high enough during the entire gradient.
- Interference at one of the reference masses can cause problem with mass accuracy, most likely the reference mass 121 m/z at the low end of the scan range, where the background response is the highest. This causes an error in determining that reference mass value, leading to an error in assignment of other mass peaks in that scan. Sometimes, the problem can be lessened by increasing the amount of that reference mass component. Sometimes a different compound can be chosen to serve as the reference mass compound (e.g., a phthalate response at 391.284286 m/z). More often, the problem is remedied by altering the sample cleanup procedures to remove the interfering component(s).
- The values chosen for the reference mass correction depend on the adducts present during the analysis. Refer to the instruction sheet included with the internal reference mass kit for the accurate m/z values of the most common adducts.
- For instruments with Agilent Jet Stream Technology only: Higher sheath gas temperatures and sheath gas flows will increase the response of the 922 m/z reference mass compound.

2 Maintenance

To prepare the reference mass solution

The internal reference mass solution allows you to get accurate mass time-of-flight data. A minimum reference mass signal abundance of several thousand counts and maximum abundance of several hundred thousand counts will provide accurate reference mass corrections. If LC mobile phase modifiers are present (e.g. Na⁺, K⁺, acetate, formate), competition may cause multiple molecular species to attenuate the reference mass response. The actual concentrations of the mass reference compounds in the solution you prepare will depend upon several instrument operating parameters:

- LC gradient or isocratic operation
- LC flow rate, mobile phases and modifiers
- MS source settings including fragmentor and octopole RF voltages

The data acquisition mass range should be set wide enough to include all of the reference masses. For small molecule analysis, this range is typically m/z 50 to 1000 for positive mode and m/z 50 to 1100 for negative mode. Note that m/z 1034 is the TFA adduct of HP-0921.

Table 7 ES-TOF Reference Masses (shaded cells indicate principal ions)

Species	Positive Ion (m/z)	Negative Ion (m/z)	Formula Wt.	Molecular Formula
CF ₃ (TFA fragment)		68.995758		C F ₃
TFA anion		112.985587	131.06	C ₂ O ₂ F ₃ (N H ₄)
Purine	121.050873	119.036320	120.11	C ₅ H ₄ N ₄
HP-0921	922.009798	1033.988109	921.24	C ₁₈ H ₁₈ O ₆ N ₃ P ₃ F ₂₄
HP-0921 (+ formate)		966.000725		
HP-0921 (+ acetate)		980.016375		

To check calibrant levels

When required Monthly or weekly if you tune the instrument frequently

Tools required None

Parts required None

- 1 Examine each calibrant bottle. Enough tuning mix must be present to immerse the end of the intake tube.
- 2 If the tuning mix level is within a few millimeters of the end of the intake tube, refill the calibrant bottle.

NOTE

Record this procedure in the Maintenance Logbook.

2 Maintenance

To fill a tuning mix or reference mix bottle

To fill a tuning mix or reference mix bottle

When required As needed.

Tools required None

Parts required

- APCI-L Tuning Mix (p/n G1969-85010)
- ESI-L Tuning Mix (p/n G1969-85000)
- MMI-L Tuning Mix (p/n G1969-85020)
- Reference Mix (created from G1969-85001 Reference Mass Kit)

Instruments with Agilent Jet Stream Technology uses diluted ESI-L Tuning Mix. See [“To prepare tuning mix”](#) on page 35.

- 1 Turn the bottle to be refilled clockwise until it can be removed from the fixed bottle cap.
- 2 Refill the bottle with the appropriate tuning mix.
- 3 Put the intake tube into the refilled bottle as you lift the bottle into position.
- 4 Attach the calibrant bottle onto the fixed bottle cap. Turn the bottle counterclockwise to tighten.

CAUTION

Tighten the bottle by hand. Do not overtighten it. The bottle only needs to be snug.

NOTE

Record this procedure in the Maintenance Logbook.

The tuning mixes are not interchangeable, even though they will give similar mass spectra. Failure to change the tuning mix when the source or inlet assembly is changed can result in miscalibration of the instrument and erroneous mass assignments.

To check for leaks

When required When the sensor indicates a leak has occurred.

Tools required

- Cloths, clean, lint-free (p/n 05980-60051)
- Cotton swabs (p/n 5080-5400)
- Screwdriver, TORX, T-10 (p/n 8710-1623)

Parts required None

- 1 Remove the front cover and top cover from the instrument.
- 2 Remove the calibrant bottles.
- 3 Turn off the Spray Chamber nebulizer pressure, drying gas temp, and vaporizer temp (for APCI or multimode).
- 4 Disconnect the nebulizing gas tubing and the LC tubing from the nebulizer.
- 5 Remove the spray chamber from the instrument.

WARNING

The spray chamber operates at very high temperatures. Give the spray chamber time to cool before proceeding.

- 6 Remove the two screws and remove the cover of the calibrant delivery system.
- 7 Check the catch tray. If you see liquid, the pump has a leak. If no liquid is present, the leak sensor may be out of calibration. See the online Help for instructions to calibrate the leak sensor.
- 8 If a leak occurs during a long unattended run, the liquid from the leak may evaporate to give you the impression that no leak exists and the leak sensor is out of calibration. Turn the system back on and make sure no leak exists before you recalibrate the leak sensor.
- 9 Check the selection valve, the waste fitting, the inlet fitting, and the calibrant delivery system valves. If you find a leak, correct it and check the remaining locations.
- 10 Dry the catch tray and leak sensor.
- 11 When the catch tray and leak sensor are thoroughly dry, reassemble the instrument.

2 Maintenance

To replace the LC filter elements

To replace the LC filter elements

- When required** When back pressure is high on the LC pump or when the sensor indicates a leak has occurred.
- Tools required**
- Tweezers
 - Wrench, ½-inch
- Parts required** Filter Element, 5 µm (p/n 0100-2051)

- 1 Stop the flow of LC solvent to the instrument.
- 2 Remove the front and top covers.
- 3 Turn off the spray chamber nebulizer pressure, drying gas temp, and vaporizer temp (if APCI or multimode).
- 4 Remove the spray chamber.
- 5 Remove the upper left front cover to access the inlet filter assembly.



Figure 4 Inlet filter assembly

- 6 Remove the retaining screw at the top of the inlet filter assembly and pull the filter assembly forward out of the bracket.
- 7 While holding the knurled lower part of the assembly, twist the upper part counterclockwise until the two parts are separated.

To replace the MS selection valve rotor seal

- 8 Use tweezers to remove the filter element from the upper part of the assembly. The filter element is a stainless steel frit surrounded by a PTFE ring.
- 9 Insert the new filter element.
- 10 Reassemble the filter assembly.
- 11 Reinsert the assembly into the bracket and reinstall the top retaining screw.
- 12 Reinstall the covers and spray chamber.

To replace the MS selection valve rotor seal

When required Approximately annually or when no calibrant flow exists during tuning, or when the back pressure is high on the LC pump during acquisition.

Tools required Hex key wrench

Parts required Rotor seal (p/n 0100-1855)

- 1 Stop the flow of LC solvent to the instrument.
- 2 Remove the front cover.
- 3 Remove the top cover.
- 4 Remove the left side cover.
- 5 Remove the tubing connections from the six-port MS selection valve.

2 Maintenance

To replace the MS selection valve rotor seal

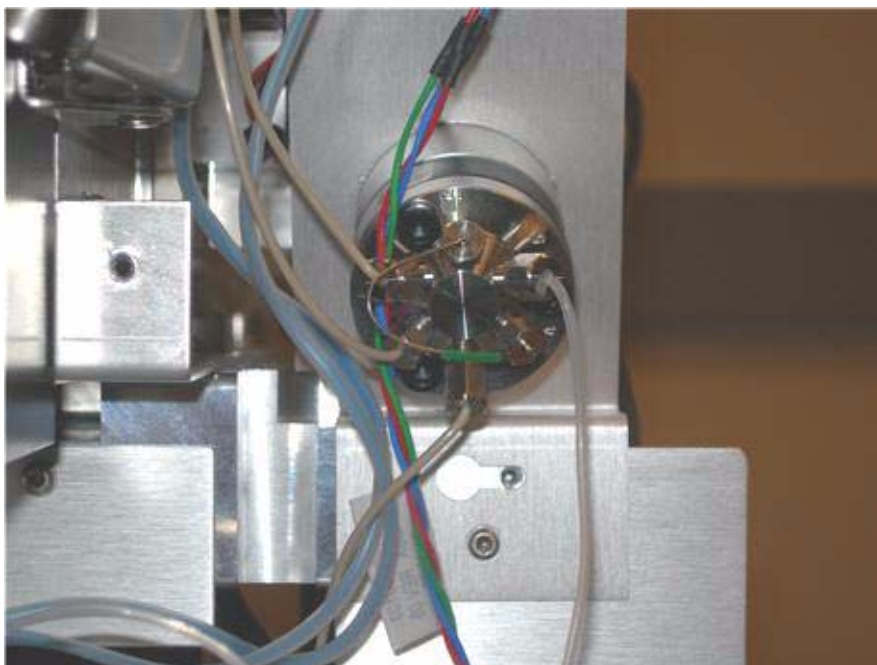


Figure 5 Six-port MS selection valve

- 6** Use the hex key wrench to remove the three hex head screws from the stator face of the selection valve.
- 7** Remove the rotor seal and replace it with a new one. Be sure to install it in the proper orientation.
- 8** Reinstall the stator face assembly.
- 9** Reconnect the tubing to the selection valve.
- 10** Reinstall the left, top and front covers.

Electrospray Ion Source

This section describes the removal, disassembly, cleaning, and reassembly of the API-interface and the assemblies that make up the source.

To flush the nebulizer

- When required** Daily or at the end of each shift (or more often) to flush traces of samples and buffers out of the tubing, valves and nebulizer.
- Tools required**
- Acetonitrile, HPLC-grade or better
 - Water, HPLC-grade or better
- Parts required** None

- 1 Make sure acetonitrile and water are two of the solvents installed in your liquid chromatograph.

NOTE

This procedure applies to both electrospray and APCI nebulizer.

- 2 Set the liquid chromatograph to pump a mixture of 90% acetonitrile and 10% water at 2 ml/minute.
- 3 Pump this mixture through the nebulizer for 3 minutes.

NOTE

This is a good general-purpose flushing mixture but you may need to adjust it based on the solvents, samples and buffers you are using. For example, a mixture of 50% acetonitrile and 50% water works well for removing salts.

2 Maintenance

To clean the electrospray spray chamber daily

To clean the electrospray spray chamber daily

When required Daily or at the end of each shift or anytime you suspect carryover contamination from one sample or analysis to another.

Tools required

- Cloths, clean, lint-free (p/n 05980-60051)
- Gloves, clean
- Isopropanol, reagent grade or better
- Mobile phase, current
- Wash bottle, clean
- Water, reagent-grade or better

Parts required None

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, a mixture of 50% isopropanol and 50% water works well as a general cleaning solution.

- 1 Prepare the mobile phase you have been using.
- 2 Turn off the spray chamber.

WARNING

The electrospray spray chamber operates at high temperatures. Allow sufficient time to cool down before cleaning.

- 3 Remove the electrospray nebulizer.
- 4 Open the spray chamber ([Figure 6](#)).

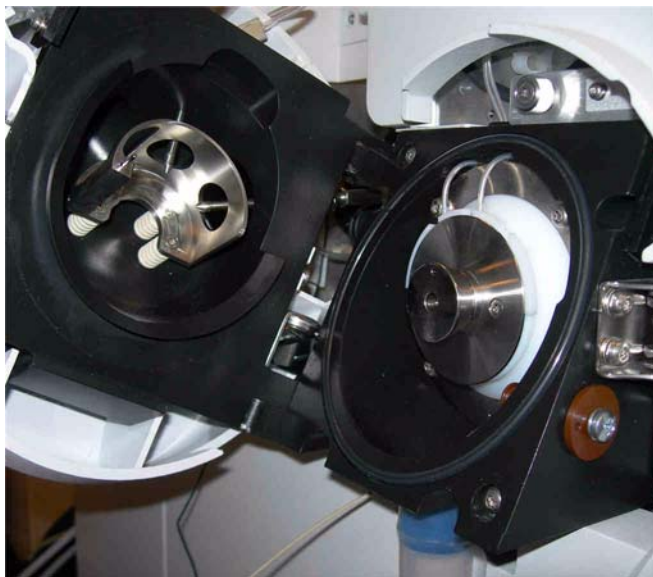


Figure 6 Opened electrospray spray chamber

- 5 Rinse the interior of the spray chamber with the current mobile phase or with a mixture of isopropanol and water.

WARNING

Some mobile phases are dangerous. Use the degree of caution appropriate for the mobile phase being used.

- 6 Wipe the interior of the spray chamber with a clean, lint-free cloth.
- 7 Rinse the area around the spray shield.

CAUTION

Do not spray directly toward the tip of the capillary. This can cause pressure surges in the vacuum system.

- 8 Dampen a clean cloth with the mobile phase.
- 9 Wipe the spray shield and the area around the spray shield.
- 10 Close the spray chamber.

2 Maintenance

To clean the electrospray spray chamber daily

NOTE

Use the weekly cleaning procedure if symptoms of contamination persist or if the spray shield or capillary cap show significant discoloration that cannot be removed by the regular, daily cleaning.

To clean the electrospray spray chamber weekly

When required Weekly or whenever symptoms indicate that contamination exists in the spray chamber and normal daily cleaning does not correct the problem.

Tools required

- Abrasive paper, 4000 grit (p/n 8660-0827)
- Cloths, clean, lint-free (p/n 05980-60051)
- Cotton swabs (p/n 5080-5400)
- Gloves, clean
- Isopropanol, reagent grade or better
- Mobile phase, current
- Wash bottle, clean
- Water, reagent-grade or better

Parts required None

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, a mixture of 50% isopropanol and 50% water works well as a general cleaning solution.

1 Turn off the spray chamber.

WARNING

The electrospray spray chamber operates at high temperatures. Allow sufficient time to cool down before cleaning.

-
- 2 Remove the electrospray nebulizer.
 - 3 Open the spray chamber and remove it from the instrument.
 - 4 Fill the spray chamber with clean mobile phase, or with a mixture of isopropanol and water.

2 Maintenance

To clean the electrospray spray chamber weekly

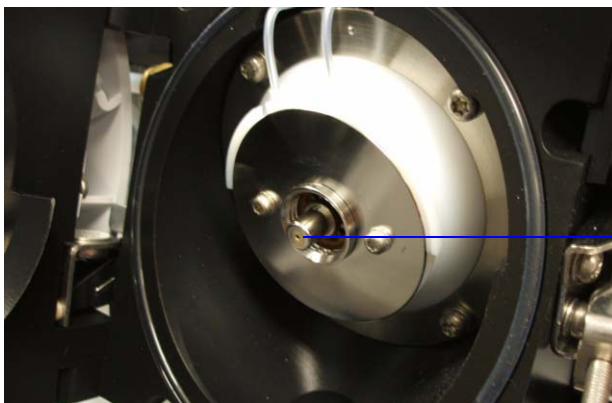


Figure 7 Filling the spray chamber

WARNING

Some mobile phases are dangerous. Use the degree of caution appropriate for the mobile phase being used.

- 5** Scrub the insulators and the interior of the spray chamber with a clean cotton swab.
- 6** Empty the spray chamber.
- 7** Reinstall the spray chamber on the instrument.
- 8** Remove the spray shield.
- 9** Use abrasive paper to gently clean the end of the capillary cap.

**Capillary cap****Figure 8** End of capillary cap

- 10** Dampen a clean cloth and wipe the end of the capillary cap.
- 11** Reinstall the spray shield.
- 12** Use abrasive paper to gently clean the spray shield.
- 13** Dampen a clean cloth and wipe the spray shield.
- 14** Rinse the area around the spray shield.

**Figure 9** Rinsing the area around the spray shield

2 Maintenance

To clean the electrospray spray chamber weekly

CAUTION

Do not spray directly toward the tip of the capillary. This can cause pressure surges in the vacuum system.

15 Wipe the area around the spray shield.

16 Close the spray chamber.

17 Reinstall the electrospray nebulizer and the reference nebulizer.

To remove the electrospray nebulizer

When required	When you need to access the nebulizer for maintenance.
Tools required	Gloves, clean
Parts required	None

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, a mixture of 50% isopropanol and 50% water works well as a general cleaning solution.



Figure 10 Electrospray nebulizer

- 1 Shut off the flow of LC solvent.
- 2 Shut off the flow of nebulizing gas.
- 3 Slide back the plastic cover from over the nebulizer.
- 4 Disconnect the LC tubing and nebulizing gas tubing from the nebulizer.
- 5 Turn the nebulizer counterclockwise until it disengages from the retaining screws.
- 6 Gently lift the nebulizer out of the spray chamber.

WARNING

The tip of the nebulizer may be very hot. Allow it to cool before handling it.

2 Maintenance

To replace the electrospray nebulizer needle in the analytical or the reference nebulizer sprayer

To replace the electrospray nebulizer needle in the analytical or the reference nebulizer sprayer

- When required** When the needle is plugged. Common symptoms of a plugged needle are increased LC back pressure or off-axis spraying or dripping from the nebulizer or when the reference nebulizer needle is not spraying.
- Tools required**
- Adjustment fixture (p/n G1946-20215)
 - Gloves, clean
 - Pliers, long nose (p/n 7810-0004)
 - Wrench 3-mm, open-end (p/n 8710-2699)
 - Wrench ¼-inch x 5/16-inch, open-end (p/n 8710-0510)
- Parts required** Electrospray nebulizer needle kit (includes needle, ferrule, and needle holder, p/n G2427A)



Figure 11 Electrospray nebulizer needle in needle holder

- 1 Install the nebulizer in the adjustment fixture.
- 2 Examine the needle for signs of wear or corrosion. If the needle appears corroded or damaged, continue to the next step.

To replace the electrospray nebulizer needle in the analytical or the reference nebulizer sprayer

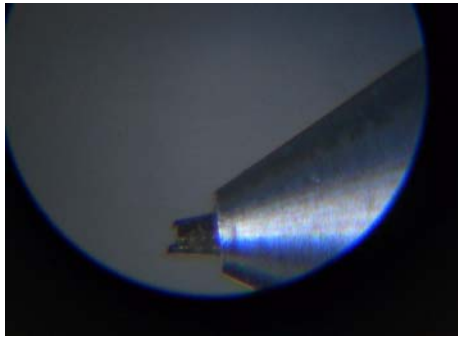


Figure 12 Corroded needle in nebulizer

- 3 Loosen the locknut next to the zero-dead-volume (ZDV) union.
- 4 Remove the union from the nebulizer.
- 5 Loosen the locknut of the needle holder.
- 6 Unscrew the needle holder and pull it out of the nebulizer.
- 7 Slide the non-tapered end of the needle through the new needle holder from the narrower side.

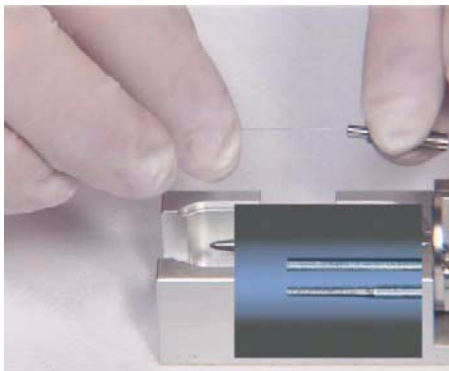


Figure 13 Sliding the non-tapered end of the needle through the new needle holder

- 8 Push a new ferrule, flat-side first, onto the needle.
- 9 Be sure the needle does not extend from the ferrule.
- 10 Reinstall the locknut and the union. Hand tighten the union.

2 Maintenance

To replace the electrospray nebulizer needle in the analytical or the reference nebulizer sprayer

- 11 Hold the needle holder steady with a 3-mm wrench. Tighten the union one-quarter to one-half turn to compress the ferrule.

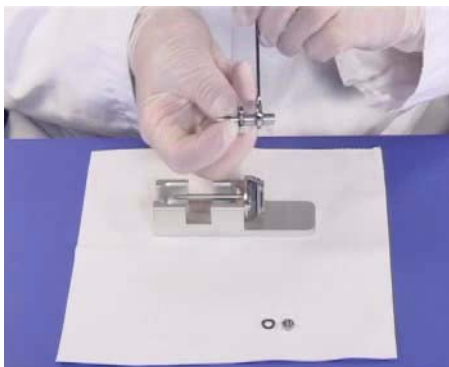


Figure 14 Tightening the union screw to compress the ferrule

- 12 Tighten the locknut against the union.
- 13 Pull carefully on the needle to ensure the needle is held firmly in place.
- 14 Replace locknut and washer.
- 15 Insert the needle into the nebulizer shaft.

CAUTION

Take care when inserting the needle. The tapered end of the needle must pass through the restrictions in the nebulizer shaft. The tip of the needle can be damaged if excessive force is applied.

- 16 Adjust the electrospray needle position before reinstalling the nebulizer in the spray chamber.

NOTE

Record this procedure in the Maintenance Logbook.

To adjust the electrospray nebulizer needle

When required After replacing the electrospray nebulizer needle or if symptoms indicate the needle is not correctly adjusted,

Tools required

- Adjustment fixture (p/n G1946-20215)
- Gloves, clean
- Magnifier (p/n G1946-80049)
- Wrench 3-mm, open-end (p/n 8710-2699)
- Wrench ¼-inch x 5/16-inch, open-end (p/n 8710-0510)

Parts required None

1 Install the nebulizer in the adjustment fixture.



Figure 15 Nebulizer installment with the adjustment fixture.

- 2** Loosen the needle holder locknut.
- 3** Position the magnifier so you can see the tip of the nebulizer.
- 4** Adjust the needle holder until the needle is even with the tip of the nebulizer.

2 Maintenance

To adjust the electrospray nebulizer needle

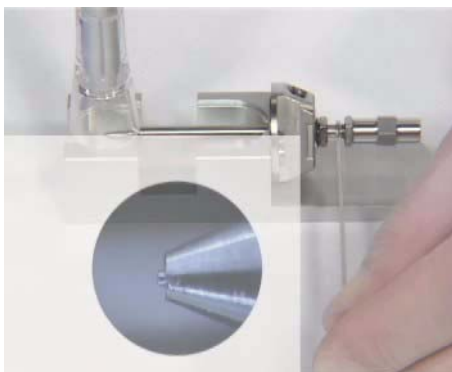


Figure 16 Adjusting the needle holder

- 5** Tighten the locknut. Make sure this does not change the position of the needle.
- 6** Remove the nebulizer from the adjustment fixture and reinstall it in the electrospray spray chamber.
- 7** Be very careful not to hit the tip of the nebulizer against anything. Any damage will have a large, negative effect on system performance.

NOTE

Record this procedure in the Maintenance Logbook.

To reinstall the electrospray nebulizer

When required As needed.

Tools required None

Parts required None

- 1 Insert the nebulizer part way into the spray chamber.

CAUTION

Do not hit the tip of the needle as you insert the nebulizer. The tip of the needle is easily damaged.

- 2 Reconnect the nebulizing gas tubing to the nebulizer.
- 3 Finish inserting the nebulizer into the spray chamber.
- 4 Turn the nebulizer clockwise and lock it in place.
- 5 Reconnect the LC tubing to the nebulizer.

CAUTION

Do not overtighten the LC fitting. Overtightening the fitting can crush the tubing, creating a restriction.

- 6 Close the nebulizer cover.

To remove the desolvation assembly

When required	When you need to access the optics assembly.
Tools required	<ul style="list-style-type: none">• Wrench, ½-inch x 9/16-inch, open-end (p/n 8710-0877)• Screwdriver, TORX, T-20 (p/n 8710-1615)
Parts required	None

WARNING

The spray chamber and desolvation assembly operate at very high temperatures. Give them time to cool before proceeding.

- 1 Vent the system.
- 2 Unplug the instrument power cord from the power outlet after venting is complete.
- 3 Remove the front, top and left side covers.
- 4 Disconnect the connections to the Aux module on top of the vacuum manifold, and lift off and remove the Aux module. Disconnect the drying gas tubing from the desolvation assembly.
- 5 Disconnect the drying gas heater cable from the desolvation assembly.
- 6 Disconnect the drain hose from the desolvation assembly.
- 7 Disconnect the PEEK nut on the tubing from the calibrant delivery system to the desolvation assembly.
- 8 Remove the two retaining screws that keep the desolvation assembly attached to the support rods.

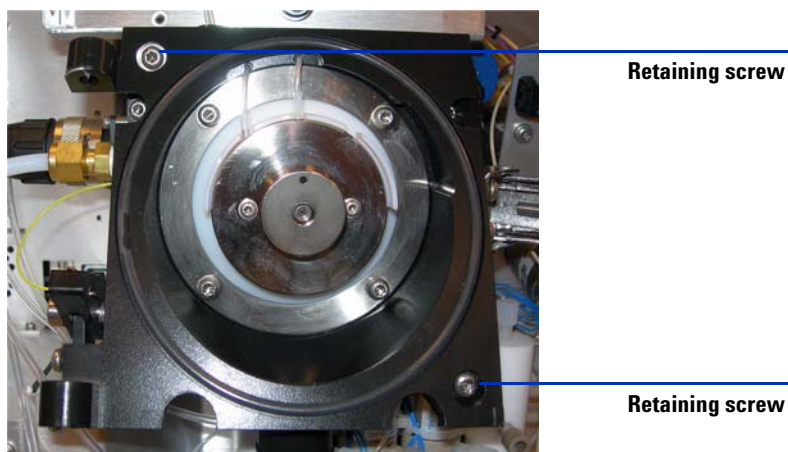


Figure 17 Remove the retaining screws. (6510 and 6520)

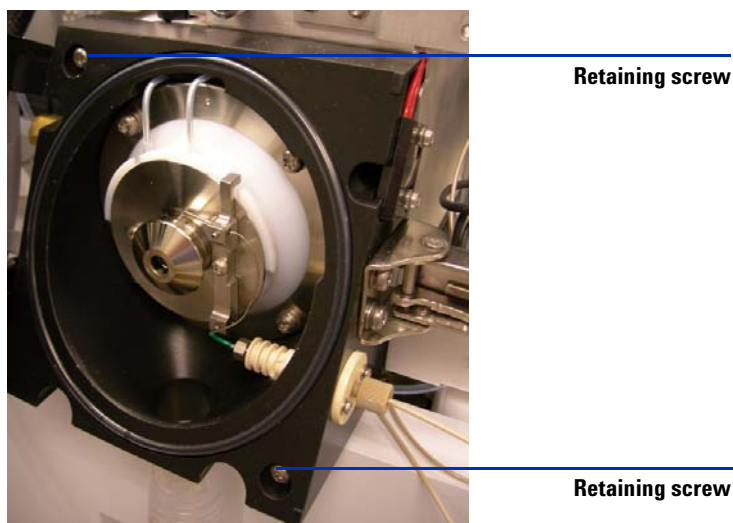


Figure 18 Remove the retaining screws. (6520B/6530/6530/6540/6550 with IRM)

9 Slide the desolvation assembly off of the support rods.

NOTE

The capillary column is contained in the desolvation assembly. It does not need to be removed in order to remove the desolvation assembly.

2 Maintenance

To clean skimmer 1 (for 6520/6530/6538/6540)

To clean skimmer 1 (for 6520/6530/6538/6540)

When required When symptoms indicate it is necessary.

Tools required Cloth, clean, lint-free (p/n 05980-60051)
Gloves, clean
Isopropanol, reagent grade or better
Water, reagent-grade or better

Parts required None

- 1 Examine the skimmer for any visual contamination. See [Figure 57](#).



Figure 19 Sample splatter on skimmer

- 2 Remove the desolvation assembly.
- 3 Dampen a clean cloth with a mixture of Isopropanol and water.
- 4 Wipe the skimmer.

The skimmer must be shiny after it is wiped. If the contamination or sample residue on the skimmer cannot be removed, then the ion optics must be removed and cleaned more thoroughly. Please contact Agilent Customer Service for more information.

To clean skimmer 1 (for 6520/6530/6538/6540)



Figure 20 Example of a clean skimmer.

CAUTION

The tip of the skimmer is delicate. Do not damage it.

5 Reinstall the desolvation assembly.

2 Maintenance

To reinstall the desolvation assembly

To reinstall the desolvation assembly

When required As necessary.

Tools required Wrench, 1/2-inch x 9/16-inch, open-end (p/n 8710-0877)

Parts required None

- 1 Put the desolvation assembly on the support rods and slide it back until it seals against the vacuum manifold.
- 2 Install the two retaining screws.
- 3 Reconnect the drain hose to the desolvation assembly.
- 4 Reconnect the drying gas heater cable to the desolvation assembly.
- 5 Reconnect the nebulizing gas tubing to the desolvation assembly.
- 6 Reinstall the Aux module on top of the vacuum manifold.
- 7 Reconnect the connections to the Aux module.

ESI with Agilent Jet Stream Technology

This section describes the removal, disassembly, cleaning, and reassembly of the electrospray interface with Agilent Jet Stream Technology.

To flush the nebulizer daily

When required	Daily or at the end of each shift (or more often) to flush traces of samples and buffers out of the tubing, valves and nebulizer
Tools required	<ul style="list-style-type: none"> • Acetonitrile, HPLC-grade or better • Water, HPLC-grade or better
Parts required	None

- 1 Make sure acetonitrile and water are two of the solvents installed in your liquid chromatograph.
- 2 Set the liquid chromatograph to pump a mixture of 90% acetonitrile and 10% water at 2 ml/minute.
- 3 Pump this mixture through the nebulizer for 3 minutes.

NOTE

This is a good general-purpose flushing mixture but you may need to adjust it based on the solvents, samples and buffers you are using. For example, a mixture of 50% acetonitrile and 50% water works well for removing salts.

2 Maintenance

To flush the nebulizer monthly

To flush the nebulizer monthly

When required Monthly or as needed at the end of each shift (or more often) to flush traces of samples and buffers out of the tubing, valves and nebulizer

Tools required

- HPLC Flushing Solvent
- Cyclohexane, HPLC-grade or better
- Acetonitrile, HPLC grade or better
- Alternatively if available: isooctane, HPLC-grade or better

Parts required None

- 1 Make sure HPLC flushing, cyclohexane, and acetonitrile are three of the solvents installed in your liquid chromatograph.
- 2 Pump HPLC flushing solvent for 10 minutes at 5 mL/minute.
- 3 Switch to cyclohexane, and pump for 10 minutes at 5 mL/minute.
- 4 Pump this mixture through the nebulizer for 3 minutes.
- 5 Prepare enough acetonitrile and flush overnight.

NOTE

This is a good general-purpose flushing mixture but you may need to adjust it based on the solvents, samples and buffers you are using. For example, a mixture of 50% acetonitrile and 50% water works well for removing salts.

To clean the spray chamber daily for the ESI with Agilent Jet Stream

When required Daily or at the end of each shift or anytime you suspect carryover contamination from one sample or analysis to another

Tools required

- Cloths, clean, lint-free (p/n 05980-60051)
- Gloves, clean
- Isopropanol, reagent grade or better
- Mobile phase, current
- Wash bottle, clean
- Water, reagent-grade or better

Parts required None

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, use a mixture of 50% isopropanol and 50% water as a general cleaning solution.

- 1 Prepare the mobile phase you have been using.
- 2 Turn off the spray chamber.

WARNING

The electrospray with Agilent Jet Stream Technology spray chamber operates at high temperatures. Allow sufficient time to cool down before cleaning.

- 3 Remove the nebulizer.
- 4 Open the spray chamber (Figure 6).

2 Maintenance

To clean the spray chamber daily for the ESI with Agilent Jet Stream

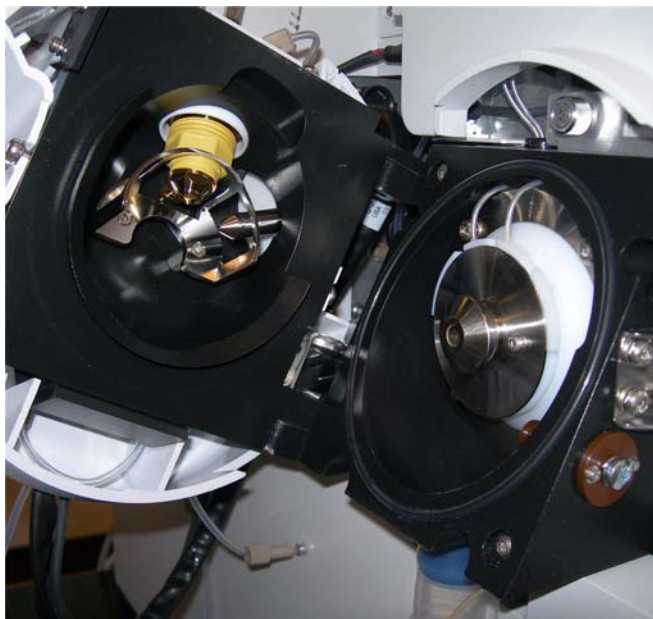


Figure 21 Opened electrospray Agilent Jet Stream Technology spray chamber

- 5 Rinse the interior of the spray chamber with the current mobile phase or with a mixture of isopropanol and water.

WARNING

Some mobile phases are dangerous. Use the degree of caution appropriate for the mobile phase being used.

- 6 Wipe the interior of the spray chamber with a clean, lint-free cloth.
- 7 Rinse the area around the spray shield.

CAUTION

Do not spray directly toward the tip of the capillary. This can cause pressure surges in the vacuum system.

- 8 Dampen a clean cloth with the mobile phase.
- 9 Wipe the spray shield and the area around the spray shield.

To clean the spray chamber daily for the ESI with Agilent Jet Stream

10 Close the spray chamber.

11 Reinstall the electrospray nebulizer.

NOTE

Use the weekly cleaning procedure if symptoms of contamination persist or if the spray shield or capillary cap show significant discoloration that cannot be removed by the regular, daily cleaning.

To clean the spray chamber weekly for the ESI with Agilent Jet Stream

When required Weekly or whenever symptoms indicate that contamination exists in the spray chamber and normal daily cleaning does not correct the problem

Tools required

- Abrasive paper, 8000 grit (p/n 8660-0852)
- Cloths, clean, lint-free (p/n 05980-60051)
- Cotton swabs (p/n 5080-5400)
- Gloves, clean
- Isopropanol, reagent grade or better
- Mobile phase, current
- Wash bottle, clean
- Water, reagent-grade or better

Parts required None

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, a mixture of 50% isopropanol and 50% water works well as a general cleaning solution.

1 Turn off the spray chamber.

WARNING

The electrospray with Agilent Jet Stream Technology spray chamber operates at high temperatures. Allow sufficient time to cool down before cleaning.

2 Remove the electrospray nebulizer.

3 Open the spray chamber and remove it from the LC/MS.

4 Fill the spray chamber with clean mobile phase, or with a mixture of isopropanol and water.

To clean the spray chamber weekly for the ESI with Agilent Jet Stream

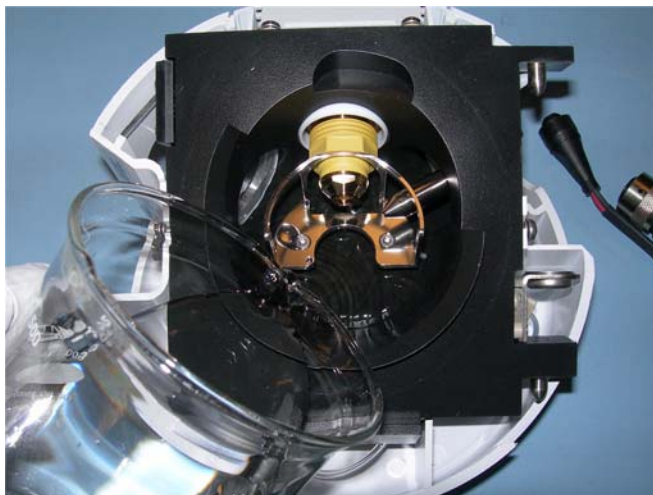


Figure 22 Filling the spray chamber

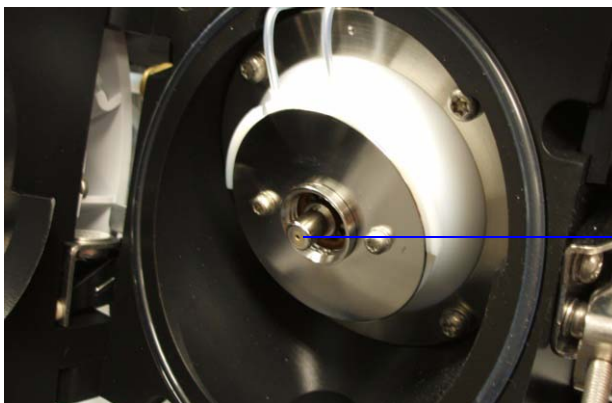
WARNING

Some mobile phases are dangerous. Use the degree of caution appropriate for the mobile phase being used.

- 5 Scrub the insulators and the interior of the spray chamber with a clean cotton swab.
- 6 Empty the spray chamber.
- 7 Reinstall the spray chamber on the instrument.
- 8 Remove the spray shield.
- 9 Use abrasive paper to gently clean the end of the capillary cap.

2 Maintenance

To clean the spray chamber weekly for the ESI with Agilent Jet Stream



Capillary cap

Figure 23 End of capillary cap

10 Dampen a clean cloth and wipe the end of the capillary cap.

11 Reinstall the spray shield.

12 Use abrasive paper to gently clean the spray shield.

13 Dampen a clean cloth and wipe the spray shield.

14 Rinse the area around the spray shield.



Figure 24 Rinsing the area around the spray shield

To clean the spray chamber weekly for the ESI with Agilent Jet Stream

CAUTION

Do not spray directly toward the tip of the capillary. This can cause pressure surges in the vacuum system.

15 Wipe the area around the spray shield.

16 Close the spray chamber.

17 Reinstall the electrospray nebulizer.

2 Maintenance

To remove the nebulizer for the ESI with Agilent Jet Stream

To remove the nebulizer for the ESI with Agilent Jet Stream

When required When you need to access the nebulizer for maintenance

Tools required Gloves, clean

Parts required None

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, a mixture of 50% isopropanol and 50% water works well as a general cleaning solution.



Figure 25 Electrospray nebulizer

- 1 Shut off the flow of LC solvent.
- 2 Shut off the flow of nebulizing gas.
- 3 Slide back the plastic cover from over the nebulizer.
- 4 Disconnect the LC tubing and nebulizing gas tubing from the nebulizer.
- 5 Turn the nebulizer counterclockwise until it disengages from the retaining screws.
- 6 Gently lift the nebulizer out of the spray chamber.

WARNING

The tip of the nebulizer may be very hot. Allow it to cool before handling it.

To replace the nebulizer needle for the ESI with Agilent Jet Stream

- When required** When the needle is plugged. Common symptoms of a plugged needle are increased LC back pressure or off-axis spraying or dripping from the nebulizer.
- Tools required**
- Adjustment fixture (p/n G1946-20215)
 - Gloves, clean
 - Pliers, long nose (p/n 7810-0004)
 - Wrench 3-mm, open-end (p/n 8710-2699)
 - Wrench ¼-inch x 5/16-inch, open-end (p/n 8710-0510)
- Parts required** Nebulizer accessory kit, ES with Agilent Jet Stream p/n G1958-60136

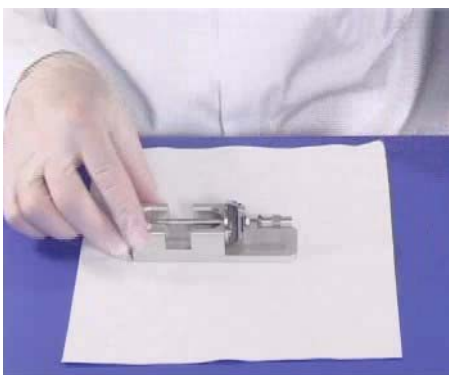


Figure 26 Electrospray nebulizer needle in needle holder

- 1 Install the nebulizer in the adjustment fixture.
- 2 Examine the needle for signs of wear or corrosion. If the needle appears corroded or damaged, continue to the next step.

2 Maintenance

To replace the nebulizer needle for the ESI with Agilent Jet Stream

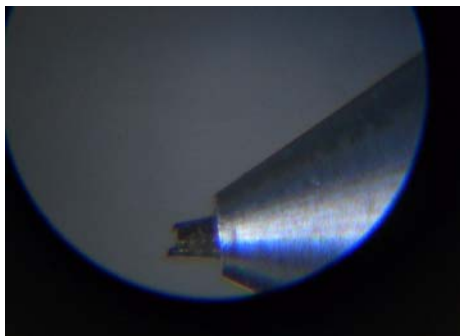


Figure 27 Corroded needle in nebulizer

- 3 Loosen the locknut next to the zero-dead-volume (ZDV) union.
- 4 Remove the union from the nebulizer.
- 5 Loosen the locknut of the needle holder.
- 6 Unscrew the needle holder and pull it out of the nebulizer.
- 7 Slide the non-tapered end of the needle through the new needle holder from the narrower side.



Figure 28 Blunt end of ESI needle

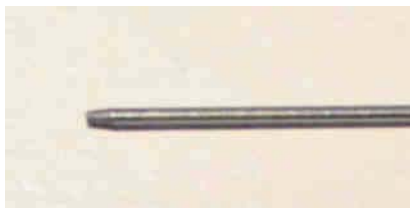


Figure 29 Sharp end of ESI needle (zoomed)

To replace the nebulizer needle for the ESI with Agilent Jet Stream



Figure 30 Sliding the non-tapered end of the needle through the new needle holder

- 8** Push a new ferrule, flat-side first, onto the needle.
- 9** Be sure the needle does not extend from the ferrule.
- 10** Reinstall the locknut and the union. Hand tighten the union.
- 11** Hold the needle holder steady with a 3-mm wrench. Tighten the union one-quarter to one-half turn to compress the ferrule.



Figure 31 Tightening the union screw to compress the ferrule

- 12** Tighten the locknut against the union.
- 13** Pull carefully on the needle to ensure the needle is held firmly in place.
- 14** Replace locknut and washer.
- 15** Insert the needle into the nebulizer shaft.

CAUTION

Take care when inserting the needle. The tapered end of the needle must pass through the restrictions in the nebulizer shaft. The tip of the needle can be damaged if excessive force is applied.

2 Maintenance

To replace the nebulizer needle for the ESI with Agilent Jet Stream

- 16 Adjust the electrospray needle position before reinstalling the nebulizer in the spray chamber.

NOTE

Record this procedure in the Maintenance Logbook.

To adjust the nebulizer needle for the ESI with Agilent Jet Stream

When required After replacing the electrospray nebulizer needle or if symptoms indicate the needle is not correctly adjusted

Tools required

- Adjustment fixture (p/n G1946-20215)
- Gloves, clean
- Magnifier (p/n G1946-80049)
- Wrench 3-mm, open-end (p/n 8710-2699)
- Wrench ¼-inch x 5/16-inch, open-end (p/n 8710-0510)

Parts required None

- 1 Install the nebulizer in the adjustment fixture.



Figure 32 Nebulizer installation with adjustment fixture

- 2 Loosen the T6 screw that locks the needle holder in place.
- 3 Position the magnifier so you can see the tip of the nebulizer.
- 4 Adjust the needle holder until the needle is even with the tip of the nebulizer.

2 Maintenance

To adjust the nebulizer needle for the ESI with Agilent Jet Stream

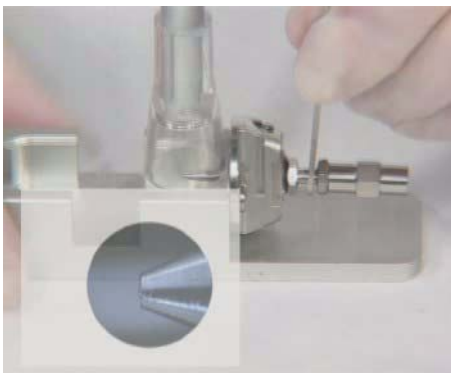


Figure 33 Adjusting the needle holder

- 5** Tighten the T6 screw. Make sure this does not change the position of the needle.
- 6** Remove the nebulizer from the adjustment fixture and reinstall it in the electrospray spray chamber.
- 7** Be very careful not to hit the tip of the nebulizer against anything. Any damage will have a large, negative effect on system performance.

NOTE

Record this procedure in the Maintenance Logbook.

To reinstall the nebulizer for the ESI with Agilent Jet Stream

When required As needed

Tools required None

Parts required None

- 1 Insert the nebulizer part way into the spray chamber.

CAUTION

Do not hit the tip of the needle as you insert the nebulizer. The tip of the needle is easily damaged.

- 2 Reconnect the nebulizing gas tubing to the nebulizer.
- 3 Finish inserting the nebulizer into the spray chamber.
- 4 Turn the nebulizer clockwise and lock it in place.
- 5 Reconnect the LC tubing the nebulizer.

CAUTION

Do not overtighten the LC fitting. Overtightening the fitting can crush the tubing, creating a restriction.

- 6 Close the nebulizer cover.

APCI Source

This section describes how to open and close the APCI source and maintain it. To learn how to install and remove the APCI source, see [“To install an APCI source”](#) on page 27 and [“To remove an APCI or APPI source”](#) on page 23.

To clean the APCI spray chamber daily

When required Daily at the end of each shift or anytime you suspect carryover contamination from one sample or analysis to another.

Tools required

- Cloths, clean, lint-free (p/n 05980-60051)
- Gloves, clean
- Isopropanol, reagent grade or better
- Mobile phase, current
- Wash bottle, clean
- Water, reagent-grade or better

Parts required None

WARNING

The APCI spray chamber operates at high temperatures. Allow sufficient time to cool down before handling.

Some mobile phases are dangerous. Use the degree of caution appropriate for the mobile phase being used.

CAUTION

Do not spray the mobile phase upward into the vaporizer.

Do not spray directly toward the tip of the capillary. This can cause pressure surges in the vacuum system.

NOTE

- Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, use a mixture of 50% isopropanol and 50% water as a general cleaning solution.
- Use the weekly cleaning procedure if symptoms of contamination persist, or if the spray shield or capillary cap shows significant discoloration that cannot be removed by the regular daily cleaning.

- 1 Turn off the spray chamber.
- 2 Remove the corona needle.
- 3 Make sure the needle has cooled and then carefully clean it with abrasive paper.
- 4 Open the spray chamber.



Figure 34 Opened spray chamber

- 5 Rinse the interior of the spray chamber with the current mobile phase or with a mixture of isopropanol and water.
- 6 Wipe the interior of the spray chamber and the end of the vaporizer with a clean cloth.
- 7 Remove the spray shield.
- 8 Use abrasive paper to gently clean the end of the capillary cap.
- 9 Dampen a clean cloth and wipe the end of the capillary cap.

2 Maintenance

To clean the APCI spray chamber daily

- 10** Reinstall the spray shield.
- 11** Use abrasive paper to gently clean the spray shield.
- 12** Dampen a clean cloth and wipe the spray shield.
- 13** Rinse the area around the spray shield.
- 14** Wipe the area around the spray shield with a clean cloth.
- 15** Close the spray chamber.
- 16** Reinstall the corona needle.

To clean the APCI spray chamber weekly

When required Weekly or whenever symptoms indicate contamination in the spray chamber and the normal daily cleaning does not correct the problem.

Tools required

- Abrasive paper, 4000 grit (p/n 8660-0827)
- Cloth, clean, lint-free, 05980-60051
- Cotton swabs, 5080-5400
- Gloves, clean
- Isopropanol, reagent grade or better
- Mobile phase, current
- Wash bottle
- Water, reagent-grade or better

Parts required None

1 Prepare the mobile phase you have been using.

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, use a mixture of 50% isopropanol and 50% water as a general cleaning solution.

2 Turn off the spray chamber.

3 The APCI spray chamber operates at high temperatures. Allow sufficient time to cool down.

4 Remove the corona needle.

5 Make sure the needle has cooled and then carefully clean it with abrasive paper.

6 Open the spray chamber.

7 Rinse the interior of the spray chamber with the current mobile phase or with a mixture of isopropanol and water.

Some mobile phases are dangerous. Use caution that is appropriate for the current mobile phase.

WARNING

Do not spray the mobile phase upward into the vaporizer.

2 Maintenance

To clean the APCI spray chamber weekly

- 8 Wipe the interior of the spray chamber and the end of the vaporizer with a clean cloth.
- 9 Remove the spray shield.
- 10 Use abrasive paper to gently clean the end of the capillary cap.
- 11 Dampen a clean cloth and wipe the end of the capillary cap.
- 12 Reinstall the spray shield.
- 13 Use abrasive paper to gently clean the spray shield.
- 14 Dampen a clean cloth and wipe the spray shield.
- 15 Rinse the area around the spray shield.

CAUTION

Do not spray directly toward the tip of the capillary. This can cause pressure surges in the vacuum system.

- 16 Wipe the area around the spray shield with a clean cloth.
- 17 Close the spray chamber.
- 18 Reinstall the corona needle.

To remove the APCI nebulizer

When required When you need to access the nebulizer for maintenance.

Tools required • Gloves, clean

Parts required None



Figure 35 APCI nebulizer

- 1 Shut off the flow of LC solvent.
- 2 Shut off the flow of nebulizing gas.
- 3 Disconnect the LC tubing and nebulizing gas tubing from the nebulizer.
- 4 Turn the nebulizer counterclockwise until it disengages from the retaining screws.
- 5 Gently lift the nebulizer out of the spray chamber.

WARNING

The tip of the nebulizer may be very hot. Allow it to cool before handling it.

2 Maintenance

To replace the APCI nebulizer needle

To replace the APCI nebulizer needle

- When required** When the needle is plugged. Common symptoms of a plugged needle are increased LC back pressure or off-axis spray from the nebulizer (difficult to see in an APCI system).
- Tools required**
- Adjustment fixture (p/n G1946-20215)
 - Gloves, clean, lint-free (large, p/n 8650-0030; small, p/n 8650-0029)
 - Pliers, long-nose (p/n 8710-0004)
 - Wrench 3-mm, open-end (p/n G1946-20203)
 - Wrench ¼-inch x 5/16-inch, 2 required (p/n 8710-0510)
- Parts required** Nebulizer needle kit, APCI (includes needle, ferrule, and needle holder, p/n G2428A).

- 1 Install the nebulizer in the adjustment fixture.

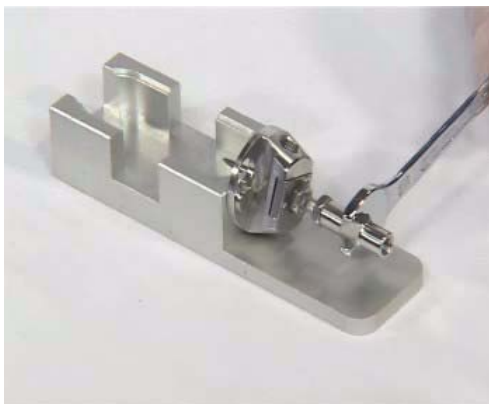


Figure 36 Installing the nebulizer in the adjustment fixture

- 2 Examine the needle for signs of wear or corrosion. If the needle appears corroded or damaged, continue to the next step.

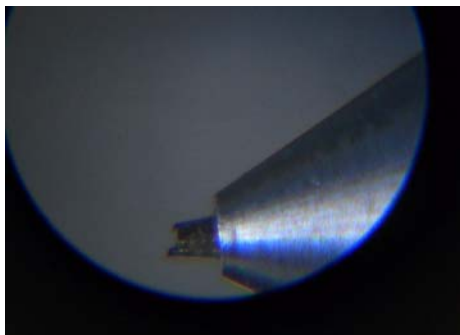


Figure 37 Corroded needle in nebulizer

- 3 Loosen the locknut next to the zero-dead-volume (ZDV) union.
- 4 Remove the union from the nebulizer.
- 5 Loosen the locknut of the needle holder.
- 6 Unscrew the needle holder and pull it out of the nebulizer.
- 7 Slide the non-tapered end of the needle through the new needle holder from the narrower side.

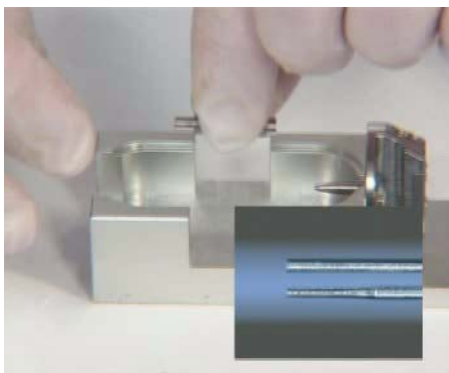


Figure 38 Sliding the non-tapered end of the needle through the new needle holder

- 8 Push a new ferrule, flat-side first, onto the needle.
- 9 Be sure the needle does not extend from the ferrule.
- 10 Reinstall the locknut and the union. Hand tighten the union.

2 Maintenance

To replace the APCI nebulizer needle

- 11 Hold the needle holder steady with a 3-mm wrench and tighten the union one-quarter to one-half turn to compress the ferrule.

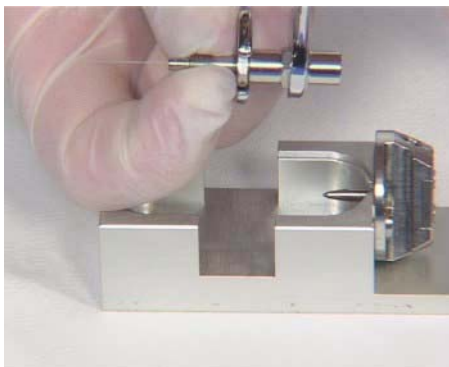


Figure 39 Tightening the union to compress the ferrule

- 12 Tighten the locknut against the union.
- 13 Pull carefully on the needle to ensure the needle is held firmly in place.
- 14 Replace locknut and washer.
- 15 Insert the needle into the nebulizer shaft.

CAUTION

Take care when inserting the needle. The tapered end of the needle must pass through the restrictions in the nebulizer shaft. The tip of the needle can be damaged if excessive force is applied.

- 16 Adjust the APCI needle position before reinstalling the nebulizer in the spray chamber.

NOTE

Record this procedure in the Maintenance Logbook.

To adjust the APCI nebulizer needle

When required After replacing the APCI nebulizer needle or if symptoms indicate the needle may not be correctly adjusted.

Tools required

- Adjustment fixture (p/n G1946-20215)
- Gloves, clean
- Magnifier (p/n G1946-80049)
- Wrench 3-mm, open-end (p/n 8710-2699)
- Wrench ¼-inch x 5/16-inch, 2 required (p/n 8710-0510)

Parts required None

1 Install the nebulizer in the adjustment fixture.



Figure 40 Installing the nebulizer in the adjustment fixture

- 2 Loosen the needle holder locknut.
- 3 Position the magnifier so you can view the tip of the nebulizer.
- 4 Adjust the needle holder until the needle is even with the tip of the nebulizer.

2 Maintenance

To adjust the APCI nebulizer needle

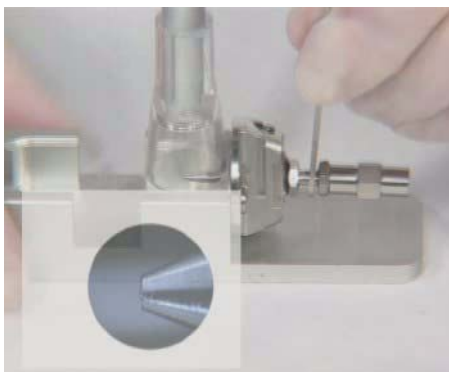


Figure 41 Adjusting the needle holder

- 5** Tighten the locknut. Make sure this does not change the position of the needle.
- 6** Remove the nebulizer from the adjustment fixture and reinstall it in the APCI spray chamber.
- 7** Be very careful not to hit the tip of the nebulizer against anything. Any damage will have a large, negative effect on system performance.

NOTE

Record this procedure in the Maintenance Logbook.

To reinstall the APCI nebulizer

When required As needed.

Tools required None

Parts required None

- 1 Insert the nebulizer into the spray chamber.
- 2 Turn it clockwise to lock it into place.
- 3 Reconnect the nebulizing gas tubing to the nebulizer.
- 4 Reconnect the LC tubing to the zero-dead-volume union.
- 5 Do not overtighten the LC fitting. Overtightening the fitting can crush the tubing, creating a restriction.

2 Maintenance

To clean the corona needle

To clean the corona needle

When required When you observe decrease sensitivity, decreased signal stability, and increase corona voltage during APCI operation.

Tools required

- Abrasive paper, 4000 grit (p/n 8660-0827)
- Cloths, clean, lint-free (p/n 05980-60051)
- Gloves, clean
- Isopropanol, reagent grade or better

Parts required None

1 Pull the corona needle assembly out of the spray chamber.

WARNING

The needle and related parts get very hot during operation. Make sure they have cooled before proceeding.



Figure 42 Dirty APCI corona needle.

- 2 Fold a piece of abrasive paper over the base of the needle.
- 3 Pull and twist the abrasive paper along the needle and off the tip of the needle.

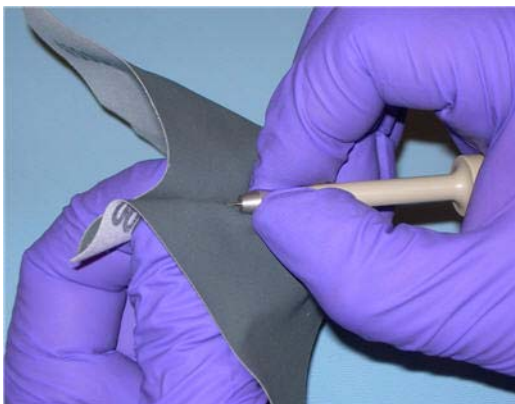


Figure 43 Pulling and twisting abrasive paper along the tip of the needle.

CAUTION

Do not bend or blunt the tip of the needle, or it will decrease system performance. Sharpening the needle is not needed.

- 4 Repeat [step 2](#) and [step 3](#) several times, or until the needle looks clean and shiny.
- 5 Starting at the base of the needle, wipe the needle with a clean cloth. The cloth can be dry or dampened with isopropanol.



Figure 44 APCI corona needle after cleaning.

- 6 Reinstall the corona needle assembly in the spray chamber.

To replace the corona needle

CAUTION

Do not hit the tip of the needle as you insert the nebulizer. The tip of the needle is easily damaged.

If this procedure fails to restore system performance, replace the corona needle.

When required When symptoms indicate poor corona needle performance and cleaning the needle does not restore performance.

Tools required

- Cloths, clean, lint-free (p/n 05980-60051)
- Gloves, clean
- Isopropanol, reagent grade or better

Parts required Corona needle (p/n G2429A)

1 Pull the corona needle assembly out of the spray chamber.

WARNING

The needle and related parts get very hot during operation. Make sure they have cooled before proceeding.

2 Unscrew the needle collar from the corona needle shaft.

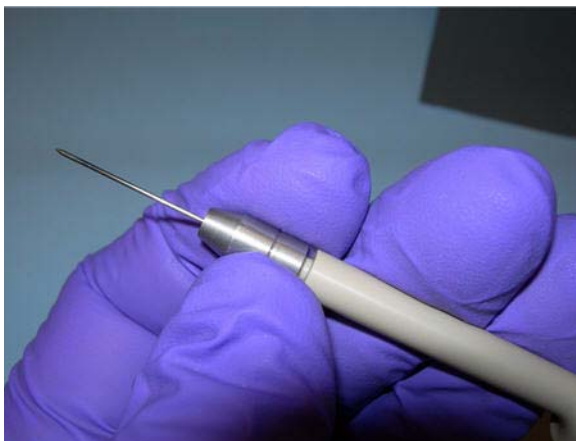


Figure 45 Unscrew the corona needle from the shaft.

- 3 Remove the old corona needle from the collar.
- 4 Install a new needle, with its integral ferrule, in the collar.

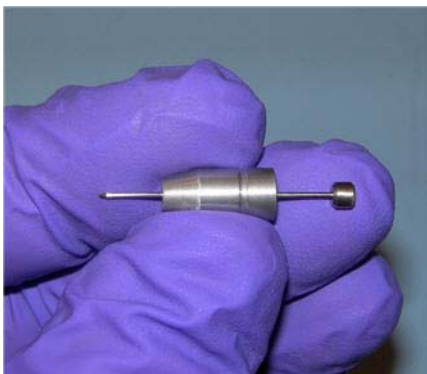


Figure 46 Replace the APCI corona needle.

- 5 Turn the collar onto the needle holder and tighten by hand.
- 6 Reinstall the corona needle assembly in the spray chamber.

CAUTION

Do not hit the tip of the needle as you insert the nebulizer. The tip of the needle is easily damaged.

NOTE

Record this procedure in the Maintenance Logbook.

Multimode Source and HPLC-Chip/MS Interface

This section describes how to clean and adjust the multimode source and maintain the HPLC-Chip/MS interface.

To clean the multimode source daily

When required Daily or anytime you suspect carryover contamination from one sample or analysis to another, or when you must access the end cap and capillary cap for cleaning and inspection.

Tools required

- Gloves
- Wash bottle, clean

Parts required

- Abrasive paper, 4000 grit (p/n 8660-0827)
- Cloths, clean, lint-free (p/n 05980-60051)
- Cotton swabs (p/n 5080-5400)
- Mobile phase from the current method *or* clean isopropanol, reagent grade or better
- Water, reagent-grade or better

1 Turn off the spray chamber, nebulizer pressure, drying gas flow, drying gas temp, and vaporizer temp.

WARNING

Do not touch the multimode source or the capillary cap. They may be very hot. Allow the multimode source to cool down before you handle them.

-
- 2 Remove the nebulizer and the APCI corona needle.
 - 3 Remove the cosmetic cover. You will have to remove the thermocouple probe before you can wipe the spray chamber. Otherwise, leave the thermocouple intact.
 - 4 Open the spray chamber.

- 5 Rinse the interior of the spray chamber using the wash bottle filled with the current mobile phase or with a mixture of isopropanol and water.

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, a solution of 50% isopropanol and 50% water works well as a general cleaning solution.

WARNING

Some mobile phases are dangerous. Use the degree of caution appropriate for the mobile phase being used.

- 6 Wipe the interior of the spray chamber with a clean, lint-free cloth.

WARNING

Sharp edges can be found inside the spray chamber, such as the separator. Pay close attention when wiping the interior of the spray chamber.

- 7 Rinse the area around the spray shield. Do not spray directly toward the tip of the capillary. This can cause pressure surges in the vacuum system.
- 8 Dampen a clean cloth with the mobile phase. Wipe the spray shield, field shaping electrodes and the area around the spray shield.
- 9 Replace the nebulizer and the APCI corona needle.
- 10 Install the thermocouple probe and adjust it so that it protrudes 15 mm from the inner spray chamber wall.
- 11 Replace the cosmetic cover.
- 12 Close the spray chamber.

NOTE

Use the weekly cleaning process if symptoms of contamination persist, or if the spray shield or capillary cap show significant discoloration that can not be removed by the normal daily cleaning procedure.

To clean the multimode source weekly

The cleaning procedure for cleaning the multimode source weekly is similar to the daily procedure. The main difference is that the multimode source is removed from the instrument in the weekly procedure.

When required Weekly if the normal daily cleaning procedure is not sufficient

Tools required

- Gloves
- Wash bottle, clean

Parts required

- Abrasive paper, 4000 grit (p/n 8660-0827)
- Cloths, clean, lint-free (p/n 05980-60051)
- Cotton swabs (p/n 5080-5400)
- Mobile phase from the current method *or* clean isopropanol, reagent grade or better
- Water, reagent-grade or better

- 1 Remove the multimode source.
- 2 Fill the spray chamber with clean mobile phase, or with a mixture of isopropanol and water.

NOTE

Recent residue should be soluble in the mobile phase. If you are not sure what mobile phase was used recently, a solution of 50% isopropanol and 50% water works well as a general cleaning solution.

WARNING

Some mobile phase are hazardous chemicals. Use the degree of caution appropriate for the mobile phase being used.

- 3 Scrub the corona insulator and the interior of the spray chamber with a clean cotton swab.
- 4 Empty the spray chamber.
- 5 Wipe the interior of the spray chamber with a clean, lint-free cloth

WARNING

Sharp edges can be found inside the spray chamber, such as the separator. Pay close attention when wiping the interior of the spray chamber.

- 6** Remove the spray shield. Use abrasive paper to gently clean the end of the capillary cap.
- 7** Dampen a clean cloth and wipe the end of the capillary cap.
- 8** Reinstall the spray chamber.
- 9** Use abrasive paper to gently clean the spray shield. Dampen a clean cloth and wipe the spray shield.
- 10** Rinse the area around the spray shield then wipe the area around the spray shield.
- 11** Reinstall the spray chamber on the instrument.
- 12** Replace the nebulizer and APCI corona needle.
- 13** Install the thermocouple probe and adjust it so that it protrudes 15mm from the inner spray chamber wall.
- 14** Replace the cosmetic cover.
- 15** Close the spray chamber.

2 Maintenance

To adjust the multimode nebulizer

To adjust the multimode nebulizer

- When required** When the needle is plugged. Common symptoms of a plugged needle are increased LC back pressure or off-axis spraying or dripping from the nebulizer.
- Tools required**
- Adjustment fixture (p/n G1946-20215)
 - Gloves, clean
 - Pliers, long nose (p/n 7810-0004)
 - Wrench 3-mm, open-end (p/n 8710-2699)
 - Wrench ¼-inch x 5/16-inch, open-end (p/n 8710-0510)
- Parts required** Nebulizer needle kit, Electrospray (includes needle, ferrule, and needle holder, p/n G2427A)



Figure 47 Electrospray nebulizer needle in needle holder

- 1 Install the nebulizer in the adjustment fixture.
- 2 Loosen the locknut next to the zero-dead-volume (ZDV) union.
- 3 Remove the union from the nebulizer.
- 4 Loosen the locknut of the needle holder.
- 5 Unscrew the needle holder and pull it out of the nebulizer.
- 6 Slide the non-tapered end of the needle through the new needle holder from the narrower side.

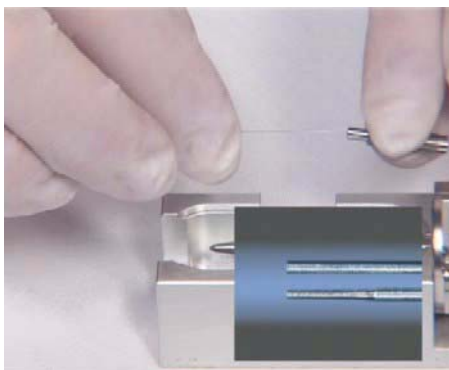


Figure 48 Sliding the non-tapered end of the needle through the new needle holder

- 7 Push a new ferrule, flat-side first, onto the needle.
- 8 Be sure the needle does not extend from the ferrule.
- 9 Reinstall the locknut and the union. Hand tighten the union.
- 10 Hold the needle holder steady with a 3-mm wrench. Tighten the union one-quarter to one-half turn to compress the ferrule.



Figure 49 Tightening the union screw to compress the ferrule

- 11 Tighten the locknut against the union.
- 12 Pull carefully on the needle to ensure the needle is held firmly in place.
- 13 Replace locknut and washer.
- 14 Insert the needle into the nebulizer shaft.

2 Maintenance

To adjust the multimode nebulizer

CAUTION

Take care when inserting the needle. The tapered end of the needle must pass through the restrictions in the nebulizer shaft. The tip of the needle can be damaged if excessive force is applied.

15 Adjust the electrospray needle position before reinstalling the nebulizer in the spray chamber.

NOTE

Record this procedure in the Maintenance Logbook.

To change HPLC-Chip capillaries

When When broken, blocked or kinked

Tools Required

- Cube wrench (p/n G4240-83800)
- Hex key 3 mm, 12-cm long (p/n 8710-2411)

Parts List

- Fused silica/PEEK capillary (see Parts)

1 Unload the HPLC-Chip

WARNING

Do this procedure only if the Q-TOF LC/MS is mounted on the MS or is sitting flat on a table because the center of gravity shifts, and the instrument will tip over without adequate support.

- 2 Press the cover release button once. When the lock opens, pull the front panel down.
- 3 Unlock the stages assembly and flip it out.
- 4 Remove the capillary cover (A) and open the thumb screw of the strain relief (B). See [Figure 50](#).

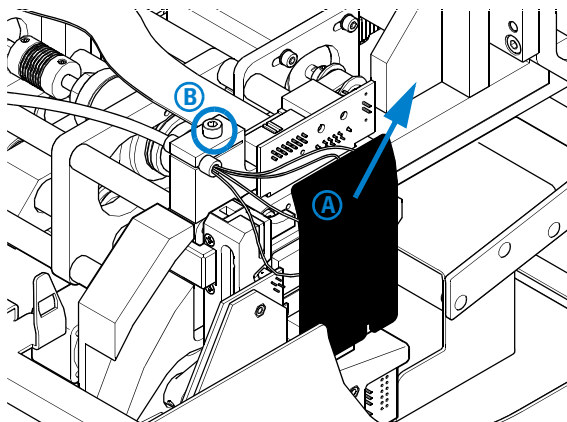


Figure 50 Stages assembly

- 5 Loosen the slotted PEEK fitting using the Cube wrench and pull the capillary out. See [Figure 51](#).

2 Maintenance

To change HPLC-Chip capillaries

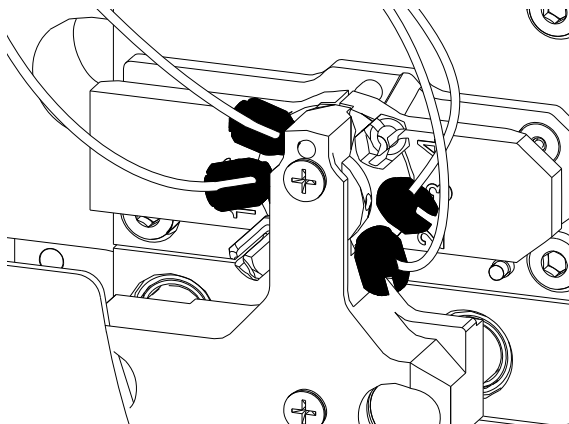


Figure 51 Slotted PEEK fitting

- 6** Push the new capillary through the capillary guide until the stopper is flush with the end of the guide tube. Tighten the thumb screw firmly.

The strain relief will only function properly if all 4 capillaries are in place.

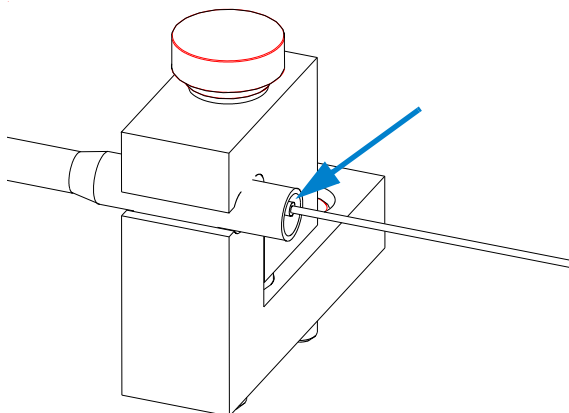


Figure 52 New capillary in the capillary guide

- 7** Connect the capillaries as follows to the HPLC-Chip valve stator:
For forward-flush mode (default)

- port 1 - not used
- port 2 - 15 μm (orange) to nanopump
- port 3 - 75 μm (blue) to infusion pump
- port 4 - not used
- port 5 - 100 μm (black) to waste
- port 6 - 25 μm (yellow) to port 6 of the μ -WPS

For backflush mode

- port 1 - not used
- port 2 - 15 μm (orange) to nanopump
- port 3 - 75 μm (blue) to infusion pump
- port 4 - not used
- port 5 - 25 μm (yellow) to port 6 of the μ -WPS
- port 6 - 100 μm (black) to waste

8 Route the capillaries exactly as shown in [Figure 53](#).

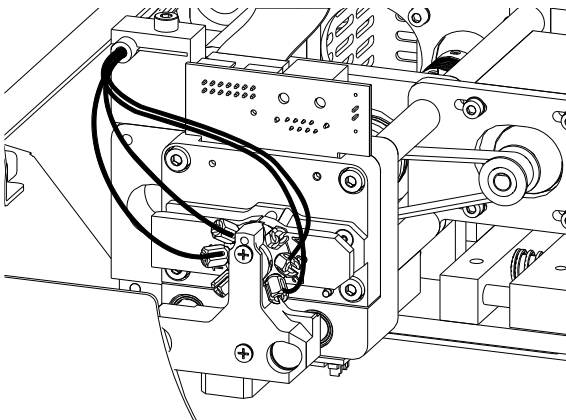


Figure 53 Routing capillaries

9 Reinstall the capillary cover. Do not overtighten the cover screws!

2 Maintenance

To change HPLC-Chip capillaries

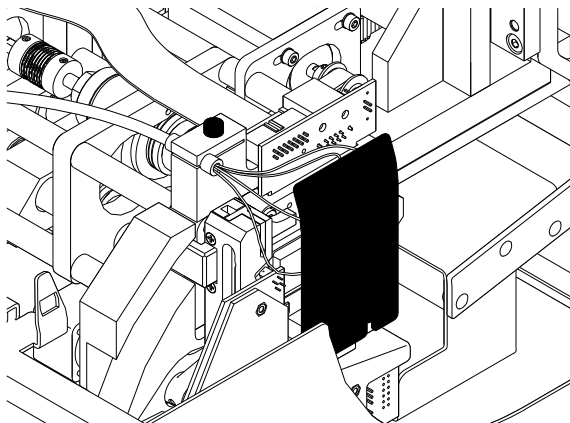


Figure 54

10 Flip the stages assembly up and close the front panel.

Ion Transfer Capillary

This section describes the steps to remove, clean and reinstall the ion transfer capillary. These steps apply to both single- and multi-bore capillaries.

To remove the capillary

When required When you need to clean or replace the capillary.

Tools required Gloves, clean

Parts required None

- 1 Vent the system.
- 2 Unplug the instrument power cord from the power outlet after venting is complete.

WARNING

The 6550 uses two external power cords to provide input power. Make sure you unplug the input power cord for the main power supply and the input power cord for the power extension box (into which the two rough pumps are plugged) before you continue.

- 3 Open the spray chamber.

WARNING

The spray chamber operates at very high temperatures. Give the spray chamber time to cool before proceeding.

- 4 Remove the spray shield.
- 5 Remove the capillary cap from the end of the capillary.
- 6 Carefully pull the capillary out of the desolvation assembly.

2 Maintenance

To remove the capillary



Figure 55 Pulling the capillary out of the desolvation assembly

CAUTION

Carefully pull the capillary out along its long axis. The capillary is glass or of similar material, and you can break it by putting vertical or horizontal pressure on it.

To clean the capillary

- When required** When you observe decreased sensitivity and decreased signal stability
- Tools required**
- 5190-1401 Cleaning Powder, Dielectric Capillary
 - 100mL polypropylene graduated cylinder, or glass-graduated cylinder with two 1 mL pipette tip
- Parts required** Powdered Precision Cleaner (Alconox catalog number 1104)
- 1 Dissolve 1 g Alconox Powdered Precision Cleaner in 100 mL deionized water.

This concentration is the recommended concentration for “manual or ultrasonic cleaning”.
 - 2 Place the ion transport capillary upright in a 100 mL polypropylene graduated cylinder and fill with Alconox solution.
 - 3 Sonicate the graduated cylinder with the ion transport capillary in an ultrasonic cleaner for 10 to 15 minutes.



You may use a 1 mL pipette over the end of the ion transport capillary to protect the metallized plating. Trim the pipette tip to approximately 4 cm so that the capillary can be immersed in the cleaning solution.

2 Maintenance

To clean the capillary



To maintain proper cleanliness, handle the ion transport capillaries with protective gloves.

- 4 Rinse the ion transport capillary and graduated cylinder several times with deionized water.
- 5 Fill the graduated cylinder with deionized water and sonicate the graduated cylinder with the ion transport capillary for 10 to 15 minutes.
- 6 Remove the ion transport capillary from the graduated cylinder and remove the pipette tip (if one was used).
- 7 Blow out excess water from the ion transport capillary bore using AeroDuster or oil-free pressurized gas.
- 8 Install the ion transport capillary in the LC/MS Desolvation Assembly:
 - a Lubricate the ion transport capillary surface with isopropanol and insert carefully into Desolvation Assembly. Support the front and rear of the capillary and keep it level during installation.

When 2 to 3 cm of the capillary remains extended from the Desolvation Assembly, the capillary “holds up” on the rear contact spring. Continue to apply pressure until approximately 1 cm remains extended from the Desolvation Assembly.

- b Lubricate the ion transport capillary tip with isopropanol and install the Capillary Cap.
 - c Install the threaded Spray Shield by turning clockwise.

- 9 Close the spray chamber and begin an instrument pump down.

NOTE

If a new capillary was installed, record this procedure in the Maintenance Logbook.

2 Maintenance

To reinstall the capillary

To reinstall the capillary

When required After cleaning the capillary or when installing a new capillary.

Tools required Gloves, clean

Parts required Isopropanol, HPLC grade or better

- 1 Lubricate the capillary entrance end with isopropanol.
- 2 Slide the capillary out straight into the desolvation assembly. The capillary must be aligned correctly so that its end will fit into a fixed capillary cap inside the desolvation assembly.



Figure 56 Reinstalling the capillary

CAUTION

Putting vertical or horizontal pressure on the capillary can break it.

- 3 Reinstall the capillary cap over the outer end of the capillary.
- 4 Reinstall the spray shield.
- 5 Close the spray chamber.

To clean skimmer 1 (for 6520/6530/6538/6540)

When required When symptoms indicate it is necessary.

Tools required Cloth, clean, lint-free (p/n 05980-60051)
Gloves, clean
Isopropanol, reagent grade or better
Water, reagent-grade or better

Parts required None

- 1 Examine the skimmer for any visual contamination. See [Figure 57](#).



Figure 57 Sample splatter on skimmer

- 2 Remove the desolvation assembly.
- 3 Dampen a clean cloth with a mixture of Isopropanol and water.
- 4 Wipe the skimmer.

The skimmer must be shiny after it is wiped. If the contamination or sample residue on the skimmer cannot be removed, then the ion optics must be removed and cleaned more thoroughly. Please contact Agilent Customer Service for more information.

2 Maintenance

To clean skimmer 1 (for 6520/6530/6538/6540)



Figure 58 Example of a clean skimmer.

CAUTION

The tip of the skimmer is delicate. Do not damage it.

5 Reinstall the desolvation assembly.

Manifold

This section describes how to open and close the manifold, and to clean the ion optics assembly.

To open the manifold

When required As needed for maintenance.

Tools required None

Parts required None

- 1 Vent the system.
- 2 Unplug the instrument power cord from the power outlet after venting is complete.

For 6550: Unplug both power cords from the power outlet.
- 3 Remove the front cover from the instrument.
- 4 Remove the top cover from the instrument.
- 5 Remove the left side covers.
- 6 Disconnect the connections to the Aux module, and lift off and remove the Aux module. Put on an antistatic wrist strap. Attach the wrist strap to a grounded surface such as the back panel of the instrument.
- 7 Remove the two thumb screws and two T-20 flat head screws.
- 8 Lift off the vacuum manifold cover.

2 Maintenance

To close the manifold

To close the manifold

When required As needed after manifold maintenance.

Tools required None

Parts required None

NOTE

If you worked on any components in the manifold, check to be sure the electrical connections are correct before closing the manifold.

- 1 Position the manifold cover on the vacuum manifold.
- 2 Reinstall the top cover of the instrument.
- 3 Reinstall the Aux module on to the top of the vacuum manifold.
- 4 Reconnect the connections to the Aux module.
- 5 Reinstall the left side covers. Reinstall the front cover of the instrument.
- 6 Pump down the instrument.

To clean the ion optics assembly

When required When the system has difficulty tuning, or when the system has poor sensitivity.

Tools required

- Gloves, clean
- Cloths, clean, lint-free (p/n 05980-60051)
- Beakers, 500 ml, 2 ea
- Tweezers
- Screwdriver, TORX, T-10 (p/n 8710-1623)
- Ball driver, 1.5 mm (p/n 8710-1570)
- Methanol, reagent grade or better
- Isopropanol, reagent grade or better
- Acetone, reagent grade or better

Parts required None

- 1 Vent the system.
- 2 Remove the source.
- 3 Remove the desolvation assembly.
- 4 Remove the vacuum manifold cover.
- 5 Unplug all of the ion optics cables so that the ion optics assembly can be removed. Pay close attention to the orientation of the cables and their respective locations.
- 6 Use your finger to push on the skimmer spacer to get the ion optics to pop out of the instrument. Be careful to catch it so it doesn't fall on the floor. See [Figure 59](#).

2 Maintenance

To clean the ion optics assembly

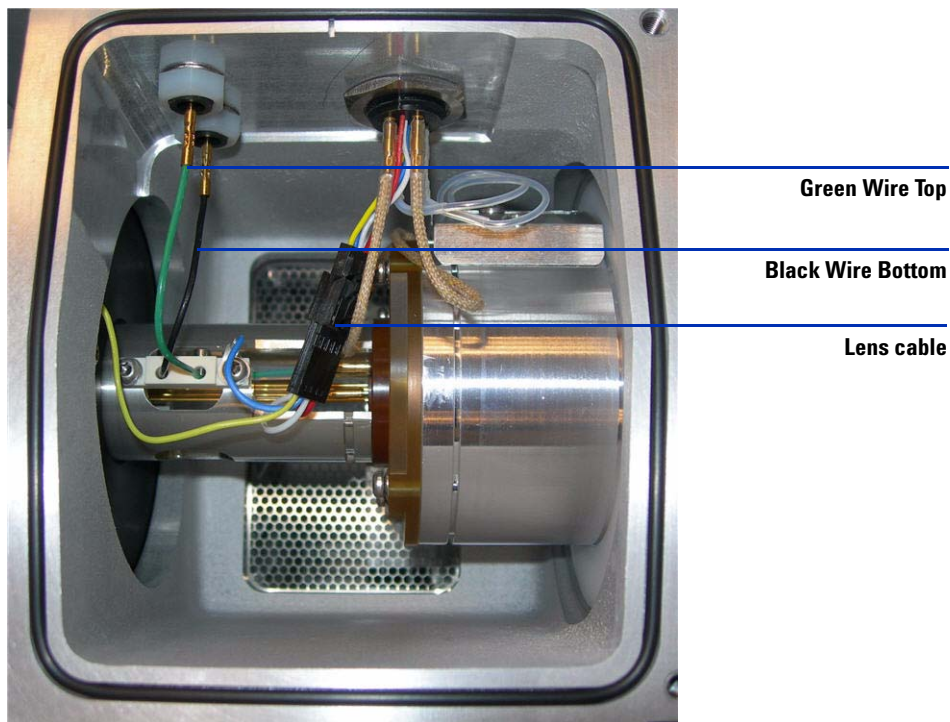


Figure 59 Optics assembly

- 7 Place the ion optics assembly on a clean cloth ([Figure 60](#)). Reposition assembly holding the skimmer spacer and remove the two screws that hold skimmer 1 and carefully be removed skimmer 1 ([Figure 61](#)). You may need to use a flat blade screwdriver to gently pry skimmer 1 from its seat.

CAUTION

Be careful! The screwdriver blade can damage the octopole rods. If you damage the octopole rods, you must replace the entire assembly.



Figure 60 Ion optics assembly

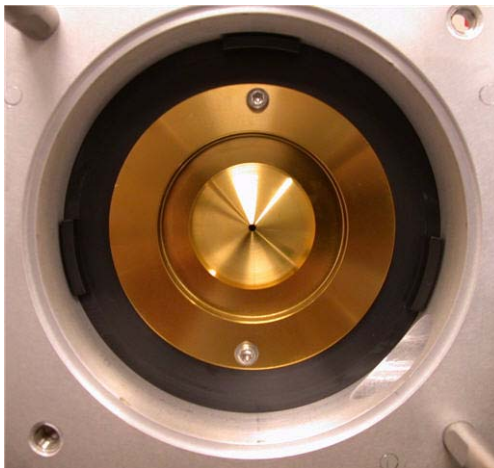


Figure 61 Skimmer 1 (detail)

- 8 Remove the two screws holding the octopole to the skimmer space (Figure 62). Be careful not to let the ion optics fall on the table. Support the octopole by holding it up by the octopole tube.

2 Maintenance

To clean the ion optics assembly



Figure 62 Octopole rods extending through Skimmer Spacer.

- 9 Disconnect wiring harness and connections ([Figure 63](#)). The red wire is for lens 2 and the white wire is for lens 1.

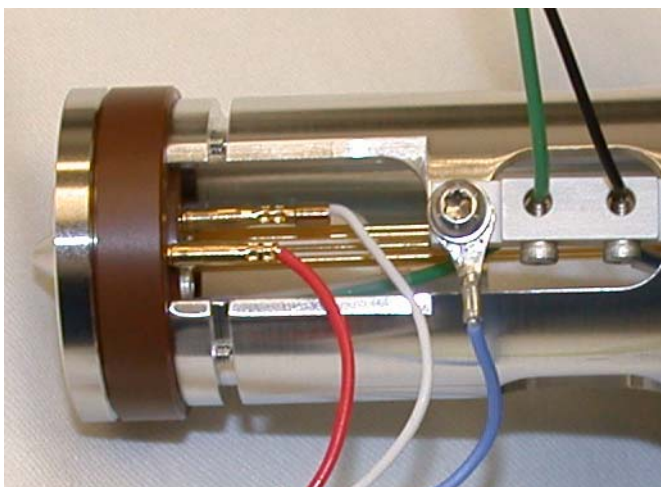


Figure 63 Lens 1 and Lens 2 wires

- 10 Leave the yellow wires attached to skimmer spacer ([Figure 64](#)). Leave the ion optics in the skimmer spacer and use it as a stand to remove lens 2, spacer insulator, and lens 1. Be careful not to damage the octopole rods.



Figure 64 Skimmer spacer

11 Use the 1.5 mm ball driver to remove the two screws that hold Lens 2 (Figure 65). Then remove the spacer insulator (Figure 66).



Figure 65 Lens 2

2 Maintenance

To clean the ion optics assembly

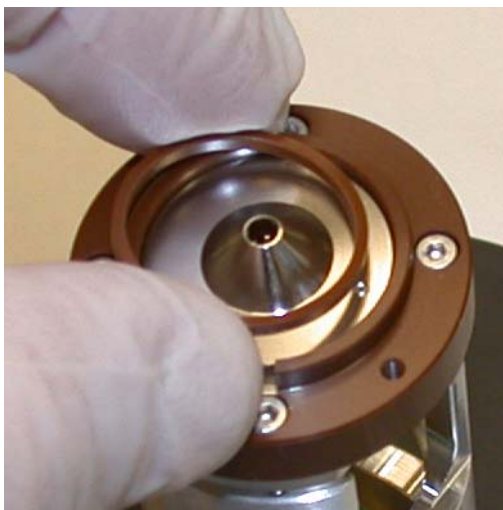


Figure 66 Spacer insulator

12 Remove Lens 1.

13 Pull the octopole out of the skimmer spacer. The octopole is now ready to be sonicated. There should be no further disassembly of the octopole.

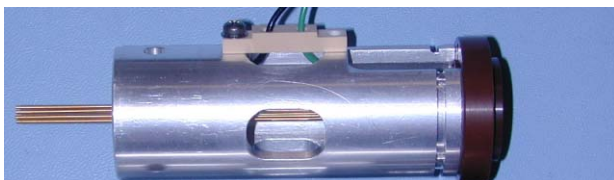


Figure 67 Octopole assembly

14 Take the entire octopole assembly and place it in a beaker of high purity isopropanol. Sonicate for 5 minutes. Pour out the isopropanol and refill the beaker with 100% acetone. Sonicate for another 5 minutes. Pour out the acetone and refill with 100% methanol. Sonicate for another 5 minutes.

15 Place Skimmer, Lens 1 and Lens 2 in a beaker of high purity isopropanol. Sonicate for 5 minutes. Pour out the isopropanol and refill the beaker with 100% acetone. Sonicate for another 5 minutes. Pour out the acetone and refill with 100% methanol. Sonicate for another 5 minutes. The skimmers and lenses can be wiped with lint-free cloth with solvent (methanol).

NOTE

- Do not abrasively clean the skimmer because it is plated, and abrasive cleaning will damage the plating.
 - Do not expose the skimmer O-ring to these solvents.
 - Do not reuse the solvents between sets of components.
 - Sonicating the assembly will *not* damage the octopole or octopole wires unless you sonicate it for a long period.
-

- 16** Remove the parts from the beaker, place them on a lint-free cloth and allow them to air dry.
- 17** Wipe the skimmer spacer completely with a lint-free cloth dampened with methanol. Make sure to wipe off any oil droplets.
- 18** Inspect the octopole rods to make sure they are not broken. Using a small ball driver or pair of tweezers, gently touch each octopole rod on its end to make sure that it has not come detached from the connection on the end support. Do this on both ends of the octopole rods.
- 19** Reinstall the octopole assembly into the skimmer spacer. Position the octopole assembly so that the screws on skimmer side of skimmer spacer can be installed.
- 20** Reinstall skimmer 1. Don't forget the black O-ring that goes behind skimmer 1.
- 21** Install lens 1, space insulator and lens 2. Re-attach the wiring harness. Connect all previously disconnected wires (see [Figure 60](#)).

[Figure 68](#) shows the exploded view of the ion optics assembly.

2 Maintenance

To clean the ion optics assembly

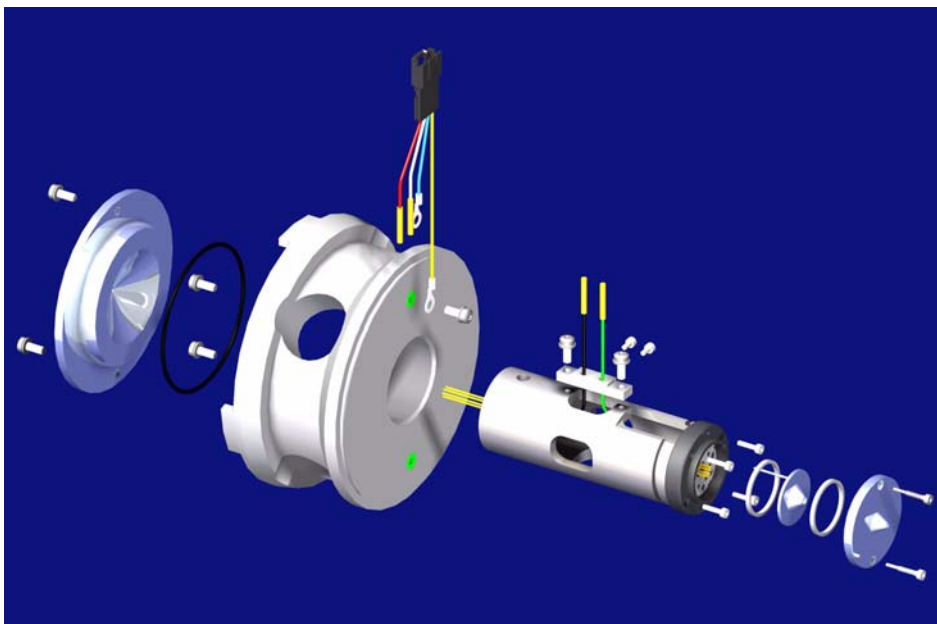


Figure 68 An exploded view of the ion optics assembly

22 After reassembly of the ion optics assembly (see [Figure 69](#)), reinstall the ion optics assembly into the vacuum manifold. Connect the green and black octopole leads, and reconnect the lens cable connector.



Figure 69 The re-assembled ion optics assembly

- 23** Reinstall the desolvation assembly onto the front of the vacuum manifold. Reinstall the Aux module onto the top of the vacuum manifold, and reconnect the connections to the Aux module. Reconnect the drying gas heater cable and the drying gas line to the side of the desolvation assembly.

High Pressure Ion Funnel (6550 only)

With time and with heavy usage, the high pressure ion funnel needs to be cleaned to maintain its performance on the 6550 Q-TOF.

To remove the high pressure ion funnel

Parts Needed

- Needle nose pliers
- Torx T-20 wrench

- 1** Vent the LC/MS and unplug the system.
- 2** Let the ESI source with Agilent Jet Stream Technology cool down, then remove it.
- 3** Remove the two M4 screws that hold down the desolvation assembly, then remove the assembly.
- 4** Disconnect the five internal wires from the feed-throughs. Use needle nose pliers. See [Figure 70](#).

Connectors are fragile. Please be gentle when you remove these wires.

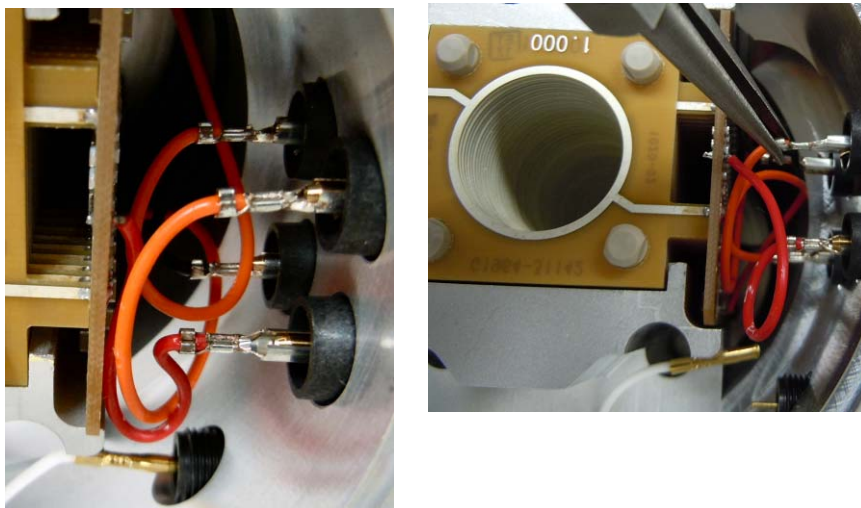


Figure 70 Five internal wires from the feed-through.

- 5** Loosen the two captive screws that secure the ion funnel to the housing. See [Figure 71](#).

The screws are captive, so they will not come all the way out.

- 6** Remove the high pressure ion funnel from the housing. (You can grab onto the heat sinks and pull the funnel out of the housing.)

2 Maintenance

To remove the high pressure ion funnel

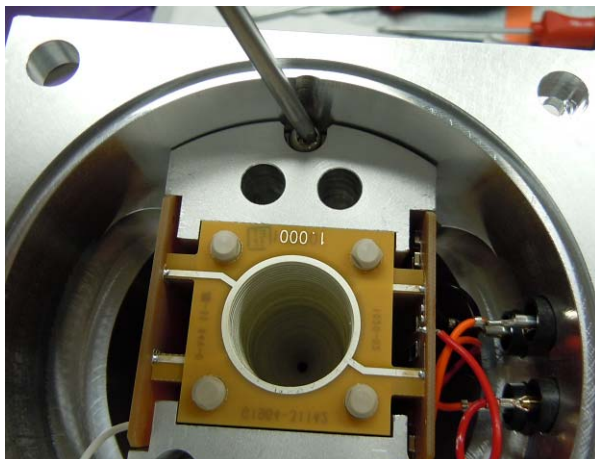


Figure 71 Loosening captive screw on the high pressure ion funnel.

To clean the high pressure ion funnel

- Parts Needed**
- 2000 mL clean beaker
 - Isopropanol (IPA)
 - One pair of glove

WARNING

This cleaning procedure requires the use of a sonicator and isopropanol. You must clean the high pressure ion funnel in an approved fume hood with proper airflow (lift)), or you can experience a flash fire or explosion. The front window sash must be in the closed position (down). All other electrical heating appliances such as hot plates must be turned off.

WARNING

Wear chemical-resistant gloves and safety glasses (goggles) for your safety.

- 1 Put the high pressure ion funnel on the table and on top of a clean cloth.
See [Figure 72](#).

2 Maintenance

To clean the high pressure ion funnel

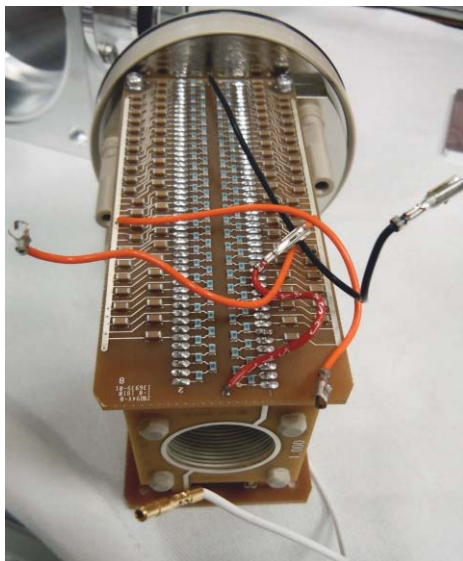


Figure 72 High pressure ion funnel on top of a clean cloth.

2 Slowly put the high pressure ion funnel in a glass beaker. See [Figure 73](#).



Figure 73 High pressure ion funnel in a glass beaker.

To clean the high pressure ion funnel

- 3 Slowly pour water into the beaker until the solvent covers the ion funnel completely. Sonicate the ion funnel for 5 minutes to remove any built up salts or water soluble residue.
- 4 Pour the water out of the beaker and into an appropriate waste container.
- 5 Slowly pour isopropanol into the beaker until the solvent covers the Ion Funnel completely.
- 6 Pour the isopropanol out of the beaker and into an appropriate waste container.



Figure 74 Pouring isopropanol into the glass beaker.

- 7 Sonicate the assembly in a beaker of isopropanol for 15 minutes.
- 8 Remove the high pressure ion funnel from beaker and allow the isopropanol to drain off the entire assembly.
- 9 Slowly pour methanol into the beaker until the solvent covers the ion funnel completely. Sonicate the ion funnel for 5 minutes.
- 10 Use clean compressed nitrogen to blow out the remaining methanol from between the funnel plates.

2 Maintenance

To reinstall the high pressure ion funnel process

To reinstall the high pressure ion funnel process

Parts Needed

- Needle nose pliers
- Torx T-20 wrench

- 1 Install the ion funnel into the housing and secure with the two captive screws.
- 2 Connect the five internal wires to the feed throughs:
 - Connect the two orange wires to the top connectors.
 - Connect the black wire to the bottom-rear connector.
 - Connect the red wire to the front-rear connector.
 - Connect the white wire to the bottom-most connector.

See [Figure 75](#).

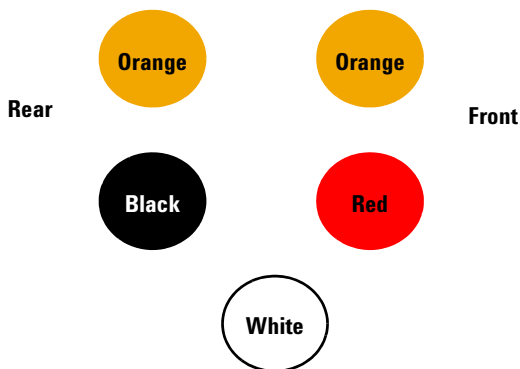


Figure 75 Internal wires to the feed through.

- 3 Install the desolvation assembly with two captive M4 screws.
- 4 Install the ESI with Agilent Jet Stream Technology.
- 5 Pump down the instrument.

Vacuum System

This section lists procedures to maintain the vacuum system of the instrument. Do these steps according to the maintenance schedule or as indicated by instrument symptoms.

To check the rough pump fluid level

Do these steps for LC/MS systems that use oil-based vacuum pumps.

Check the level and color of the pump fluid weekly.

- Check the fluid level in the window of the rough pump. The fluid level should be between the marks for Max and Min (see [Figure 76](#)).
- Check that the color of the pump fluid is clear or almost clear with few suspended particles.
- If the pump fluid is dark or full of suspended particles, replace it.

2 Maintenance

To check the rough pump fluid level

Oil fill level



Figure 76 Fluid level window on the rough pump

WARNING

Never add or replace the rough pump fluid while the pump is on. Hot oil can splash out and cause harm.

NOTE

Record this procedure in the Maintenance Logbook.

To check the oil mist filter

Check the oil mist filter **weekly**.

- Check the oil mist filter.

Check for any damage and if pump fluid has been collected in it.

- Check the oil mist filter for damage.

If the oil mist filter is damaged, replace it.

- Check whether oil has collected in the bottom of the oil mist filter.

If oil is found in the oil mist filter, open the gas ballast valve counterclockwise just enough to return the condensed oil back to the pump. Close the gas ballast valve clockwise.

NOTE

When you close the ballast valve, you increase the efficiency of the pump. However, you lose oil to the mist filter if you don't recycle. Check the status of your oil mist filter at least once per week to ensure that it does not fill with oil. If you lose too much oil in the rough pump, the vacuum will not be maintained, and the Q-TOF LC/MS will vent.

To add rough pump fluid

Add pump fluid when the pump fluid level is low. Before you begin, make sure you have:

- Funnel
- Gloves, chemical resistant, clean, lint free (p/n 9300-1751)
- Rough pump fluid (Inland 45 oil, p/n 6040-0834)

WARNING

Wear chemical-resistant gloves and safety glasses (goggles) for your safety.

WARNING

The fill cap and pump may be dangerously hot. Check that the fill cup and pump are cool before you touch them. The fill cap and pump may be dangerously hot. Check that the fill cup and pump are cool before you touch them.

WARNING

The fill cap and pump may be dangerously hot. Check that the fill cup and pump are cool before you touch them.

CAUTION

Use only the rough pump fluid appropriate for your pump (Inland 45 oil for Edwards E2M28). Any other fluids can substantially reduce pump life and invalidates the pump warranty.

- 1 Vent and turn off the instrument.
See [“To shut down the instrument”](#) on page 19.
- 2 Unplug the instrument power cord(s) from the electrical outlet.
Leave the power cord(s) unplugged while you do this procedure.
- 3 Remove the fill cap on the rough pump (see [Figure 77](#)).
- 4 Add new pump fluid until the fluid level is near, but not over the maximum mark beside the fluid level window (see [Figure 77](#)).
- 5 Reinstall the fill cap.
- 6 Wipe off all excess oil around and underneath of the pump.

7 Reconnect the power cord(s).

8 Start up the instrument.

See “To start the system in Standby mode” on page 15.

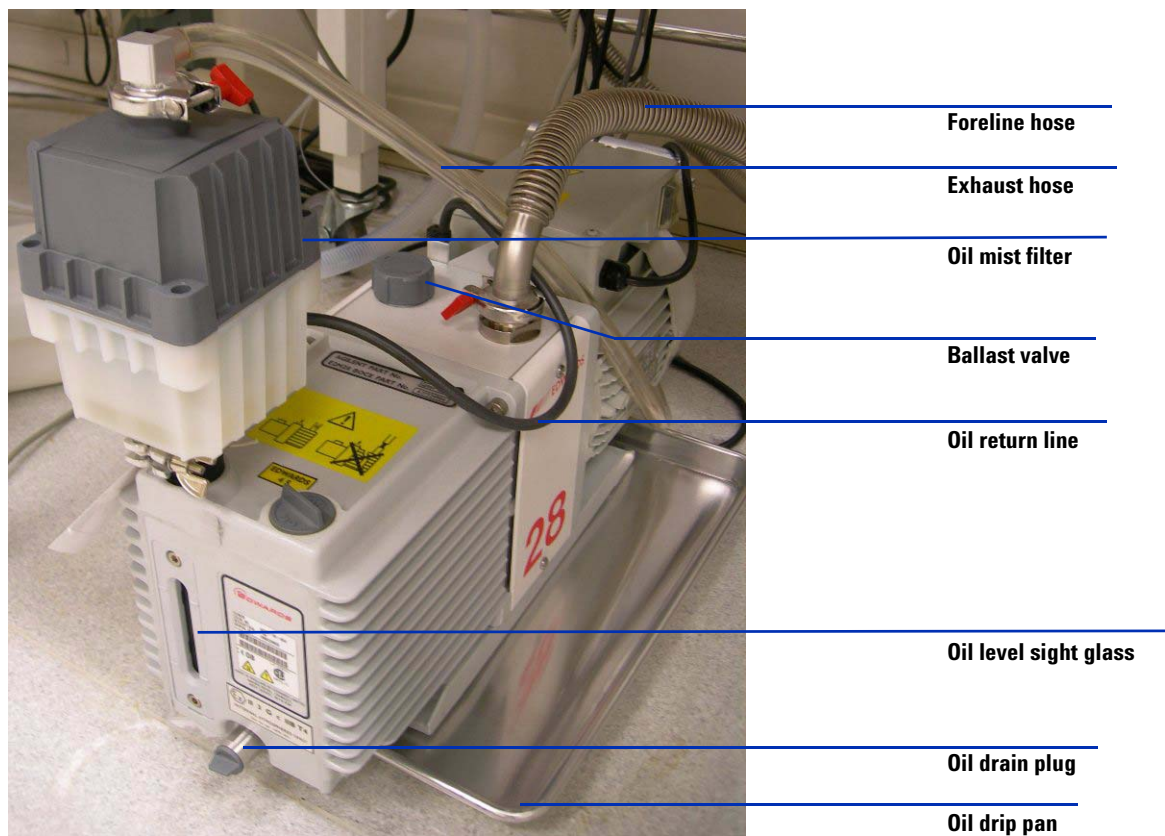


Figure 77 Rough pump.

To replace the rough pump fluid

Replace the pump fluid every six months. Replace it sooner if the fluid appears dark or cloudy.

Before you begin, make sure you have:

- Container for catching old pump fluid
- Funnel
- Gloves, chemical resistant, clean, lint free (p/n 9300-1751)

WARNING

Wear chemical-resistant gloves and safety glasses (goggles) for your safety.

WARNING

Never add or replace the rough pump fluid while the pump is on. Hot oil can splash out and cause harm.

WARNING

The fill cap and pump may be dangerously hot. Check that the fill cup and pump are cool before you touch them.

WARNING

Do not touch the fluid. The residues from some samples are toxic. Properly dispose of the fluid.

CAUTION

Use only the rough pump fluid appropriate for your pump (Inland 45 oil for Edwards E2M28). Any other fluids can substantially reduce pump life and invalidates the pump warranty.

1 Turn off the instrument.

See [“To shut down the instrument”](#) on page 19.

2 Unplug the power cord(s) from the instrument

Leave the power cord(s) unplugged while performing this procedure.

To replace the rough pump fluid

- 3 Place a container under the drain plug of the rough pump (see [Figure 77](#) on page 143).
- 4 Remove first the fill cap (see [Figure 77](#) on page 143), then open the drain plug.

Allow the fluid to drain completely.

- 5 Reinstall the drain plug.
- 6 Pour in new pump fluid until the fluid level is near, but not above the maximum mark beside the fluid level window (see [Figure 77](#) on page 143).
- 7 Reinstall the fill cap.
- 8 Reconnect the power cord(s).
- 9 Start up the instrument.

See [“To start the system in Standby mode”](#) on page 15.

- 10 After 30 minutes pump down, inspect the pump for leak.

Inspect for leak after overnight pump down.

2 Maintenance

To replace the fuses

To replace the fuses

When required	As needed.
Tools required	Flat Blade Screw Driver
Parts required	<ul style="list-style-type: none">• 8 Amp Fuse 2110-0969• 12.5 Amp Fuse 2110-1398

WARNING

Never replace a fuse with the instrument plugged into the power outlet, or you will run the risk of an electric shock.

- 1 Unplug the instrument power cord(s) from the power outlet.



Figure 78 Disconnect the instrument power cable.

- 2 Using a flat blade screw driver, remove the fuse holder of the blown fuse.

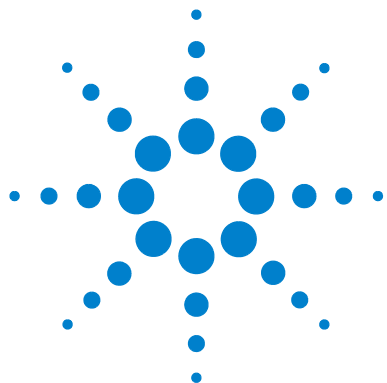


Figure 79 AC Board fuses

- 3 Replace with the appropriate fuse. See [“Replaceable Fuses”](#) on page 151.
- 4 Reinstall the fuse holder.
- 5 Plug in the instrument.
- 6 Push the front power switch to start an automatic pump down sequence.

2 Maintenance

To replace the fuses



3 Reference

Safety	150
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Replaceable Fuses	151

This chapter contains safety and other reference information for your 6500 Series Q-TOF LC/MS System.



Safety

If the 6500 Series Q-TOF LC/MS System is used in a manner not specified by Agilent Technologies, the protections provided by the instrument may be impaired.



Warning,
Risk of hazard,
Consult documentation



Warning,
Risk of Electric Shock



Warning,
Hot Surfaces,
Risk of Burns

Environmental Conditions

Equipment Class	Class 1 Laboratory Equipment
Pollution Degree	2
Installation Category	II
Environment	Indoor Use
Altitude	Not to exceed 3000 m
Electrical supply	200 - 240 V AC, 50/60 Hz, 2500 VA
Mains supply voltage	Fluctuations not to exceed 10% of nominal supply voltage
Operating Temperature	15 to 35°C (59 to 95°F)
Humidity	< 85% RH at 35°C

Replaceable Fuses

T8A 250V	2110-0969
T12.5A 250V	2110-1398

3 Reference

Replaceable Fuses

www.agilent.com

In This Book

This book contains tasks to help you maintain your 6500 Series Q-TOF LC/MS System.

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