

Waters Quattro Premier XE Combined APPI and APCI Source Operator's Guide

71500112702/Revision A

Waters
THE SCIENCE OF WHAT'S POSSIBLE.™

Copyright © Waters Corporation 2007
All rights reserved

Copyright notice

© 2007 WATERS CORPORATION. PRINTED IN THE UNITED STATES OF AMERICA AND IRELAND. ALL RIGHTS RESERVED. THIS DOCUMENT OR PARTS THEREOF MAY NOT BE REPRODUCED IN ANY FORM WITHOUT THE WRITTEN PERMISSION OF THE PUBLISHER.

The information in this document is subject to change without notice and should not be construed as a commitment by Waters Corporation. Waters Corporation assumes no responsibility for any errors that may appear in this document. This document is believed to be complete and accurate at the time of publication. In no event shall Waters Corporation be liable for incidental or consequential damages in connection with, or arising from, its use.

Trademarks

Waters is registered trademark, and MassLynx and Quattro Premier are trademarks of Waters Corporation.

Viton is a registered trademark of DuPont Dow Elastomers.

PEEK is a trademark of Victrex Corporation.

Other trademarks or registered trademarks are the sole property of their respective owners.

Customer comments

Waters' Technical Communications department invites you to tell us of any errors you encounter in this document or to suggest ideas for otherwise improving it. Please help us better understand what you expect from our documentation so that we can continuously improve its accuracy and usability.

We seriously consider every customer comment we receive. You can reach us at tech_comm@waters.com.



Contacting Waters

Contact Waters[®] with enhancement requests or technical questions regarding the use, transportation, removal, or disposal of any Waters product. You can reach us via the Internet, telephone, or conventional mail.

Waters contact information

Contacting medium	Information
Internet	The Waters Web site includes phone numbers for Waters locations worldwide. Go to www.waters.com , and click About Waters > Worldwide Offices.
Telephone	In the USA or Canada, phone 508 478-2000.
Conventional mail	Waters Corporation 34 Maple Street Milford, MA 01757 USA

Safety considerations

Some reagents and samples used with Waters instruments and devices can pose chemical, biological, and radiological hazards. You must know the potentially hazardous effects of all substances you work with. Always follow Good Laboratory Practice, and consult your organization's safety representative for guidance.

When you develop methods, follow the "Protocol for the Adoption of Analytical Methods in the Clinical Chemistry Laboratory," *American Journal of Medical Technology*, 44, 1, pages 30–37 (1978). This protocol addresses good operating procedures and the techniques necessary to validate system and method performance.

Considerations specific to the Quattro Premier XE Combined APPI and APCI Source

Solvent leakage hazard

The source exhaust system is designed to be robust and leak-tight. Waters recommends you perform a hazard analysis, assuming a maximum leak into the laboratory atmosphere of 10% LC eluate.



Warning:

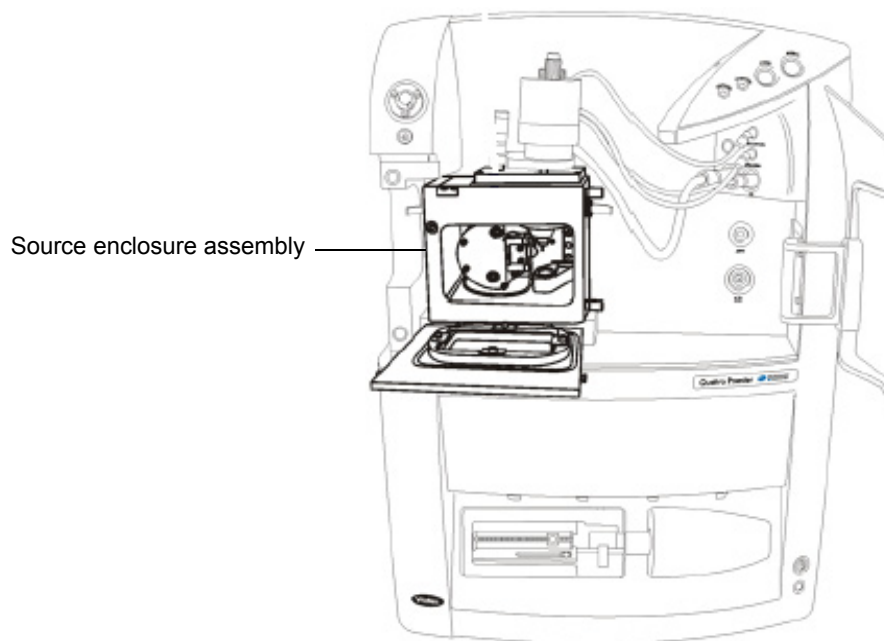
- To confirm the integrity of the source exhaust system, renew the source O-rings at intervals not exceeding one year.
- To avoid chemical degradation of the source O-rings, which can withstand exposure only to certain solvents (see [“Materials of Construction and Compliant Solvents” on page B-1](#)), and determine whether any solvents you use that are not listed are chemically compatible with the composition of the O-rings.

High temperature hazard



Warning: To avoid burn injuries, avoid touching the source enclosure with your hand when operating or servicing the instrument.

Mass spectrometer high temperature hazard



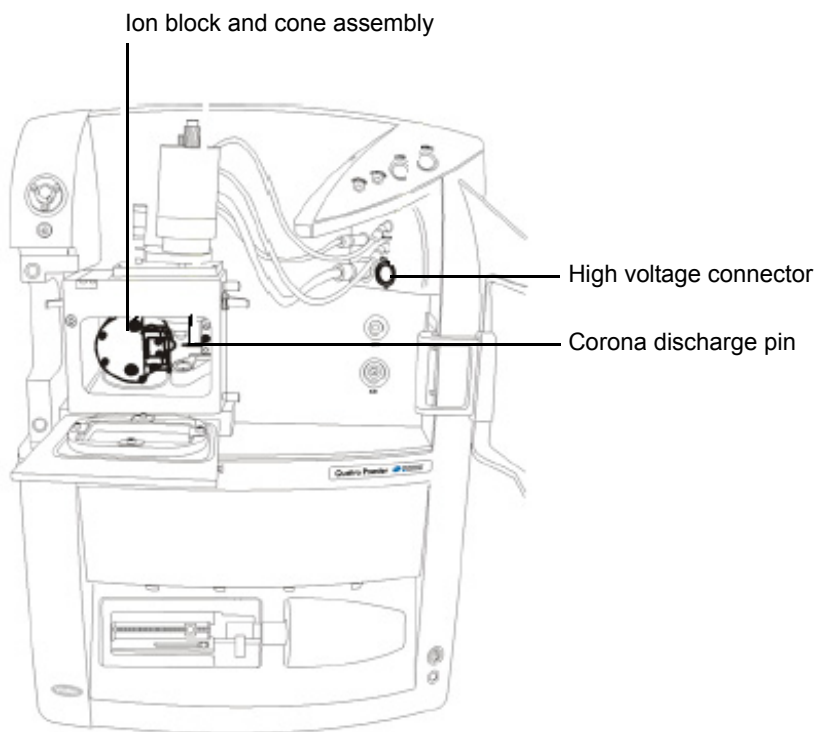
High voltage hazard



Warning:

- To avoid electric shock, do not remove the mass spectrometer's protective panels. The components they cover are not user-serviceable.
- To avoid nonlethal electric shock when the instrument is in Operate mode, avoid touching the areas marked with the high voltage warning symbol. To touch those areas, first put the instrument in Standby mode.

Mass spectrometer in APCI ionization mode






Safety advisories

Consult [Appendix A](#) for a comprehensive list of warning and caution advisories.

Operating this instrument

When operating this instrument, follow standard quality control procedures and the guidelines presented in this section.

Symbols

Symbol	Definition
	Authorized representative of the European Community
	Confirms that a manufactured product complies with all applicable European Community directives
	For in vitro diagnostic use

Intended use

Waters designed the Quattro Premier™ XE Combined APPI and APCI Source option instrument to be used with a Quattro Premier XE Mass Spectrometer. The instrument is intended for use as a research tool to deliver authenticated mass measurement in both MS and MS/MS modes.

The Waters Quattro Premier XE Mass Spectrometer can be used for general in vitro diagnostic applications. However, only professionally trained and qualified laboratory personnel should use the instrument for those purposes.



The Waters Quattro Premier XE Combined APPI and APCI Source option is CE-marked according to the European Union In Vitro Diagnostic Device Directive 98/79/EC.

Calibrating

To calibrate LC systems, follow acceptable calibration methods using at least five standards to generate a standard curve. The concentration range for standards should include the entire range of quality-control samples, typical specimens, and atypical specimens.

To calibrate mass spectrometers, consult the calibration section of the operator's guide for the instrument you are calibrating.

Quality control

Routinely run three quality-control samples that represent subnormal, normal, and above-normal levels of a compound. Ensure that quality-control sample results fall within an acceptable range, and evaluate precision from day to day and run to run. Data collected when quality control samples are out of range might not be valid. Do not report these data until you are certain that the instrument performs satisfactorily.

When analyzing samples from a complex matrix such as soil, tissue, serum/plasma, whole blood, etc., note that the matrix components can adversely affect LC/MS results, enhancing or suppressing ionization. To minimize these matrix effects, Waters recommends you adopt the following measures:

- Prior to the instrumental analysis, use appropriate sample pretreatment such as protein precipitation, liquid/liquid extraction (LLE), or solid phase extraction (SPE) to remove matrix interferences.
- Whenever possible, verify method accuracy and precision using matrix-matched calibrators and QC samples.
- Use one or more internal standard compounds, preferably isotopically labeled analytes.

IVD authorized representative information

IVD authorized representative



Waters Corporation (Micromass UK Limited) is registered in the United Kingdom with the Medicines and Healthcare Products Regulatory Agency (MHRA) at Market Towers, 1 Nine Elms Lane, London, SW8 5NQ. The reference number is IVD000167.

Waters Corporation (Micromass UK Ltd.)
Floats Road
Wythenshawe
Manchester M23 9LZ
United Kingdom

Telephone: +44-161-946-2400
Fax: +44-161-946-2480
Contact: Quality manager

Table of Contents

Copyright notice	ii
Trademarks	ii
Customer comments	iii
Contacting Waters	iv
Safety considerations	iv
Considerations specific to the Quattro Premier XE Combined APPI and APCI Source.....	v
Safety advisories	vii
Operating this instrument	viii
Symbols	viii
Intended use.....	viii
Calibrating	viii
Quality control	ix
IVD authorized representative information	x
IVD authorized representative	x
1 APPI, APCI, and Dual APPI/APCI Modes	1-1
APPI mode	1-2
APCI mode	1-3
Dual APPI/APCI mode	1-4
2 The Combined APPI/APCI Source	2-1
Combined APPI/APCI Source	2-2
APCI probe	2-2
APPI lamp drive assembly	2-2
Installing the Combined APPI/APCI Source	2-5
Installing the Combined APPI/APCI Source software upgrade.....	2-5
Installing the APPI lamp drive assembly and APCI probe	2-5

Removing the Combined APPI/APCI Source	2-8
Removing the APCI probe and APPI lamp drive assembly.....	2-8
3 Operating in APPI, APCI, and Dual APPI/APCI Modes	3-1
Operating in APPI mode	3-2
Operating in APCI mode	3-10
Operating in Dual APPI/APCI mode	3-13
4 Maintenance Procedures	4-1
General	4-2
Maintenance schedule	4-2
Safety and handling	4-3
Removing O-rings and seals	4-3
Changing the UV lamp bulb	4-4
Cleaning the lamp window	4-7
Replacing the APPI lamp drive assembly O-rings	4-9
Removing the APPI lamp drive assembly O-rings.....	4-9
Fitting the new APPI lamp drive assembly O-rings.....	4-12
A Safety Advisories	A-1
Warning symbols	A-2
Task-specific hazard warnings.....	A-2
Warnings that apply to particular instruments, instrument components, and sample types	A-3
Caution symbol	A-5
Warnings that apply to all Waters instruments	A-5
Electrical and handling symbols	A-13
Electrical symbols.....	A-13
Handling symbols	A-14

B Materials of Construction and Compliant Solvents	B-1
Preventing contamination	B-2
Items exposed to solvent	B-2
Solvents used to prepare mobile phases	B-3
Index	Index-1

1

APPI, APCI, and Dual APPI/APCI Modes

This chapter describes the Quattro Premier™ XE Combined APPI and APCI Source operation modes.

Contents

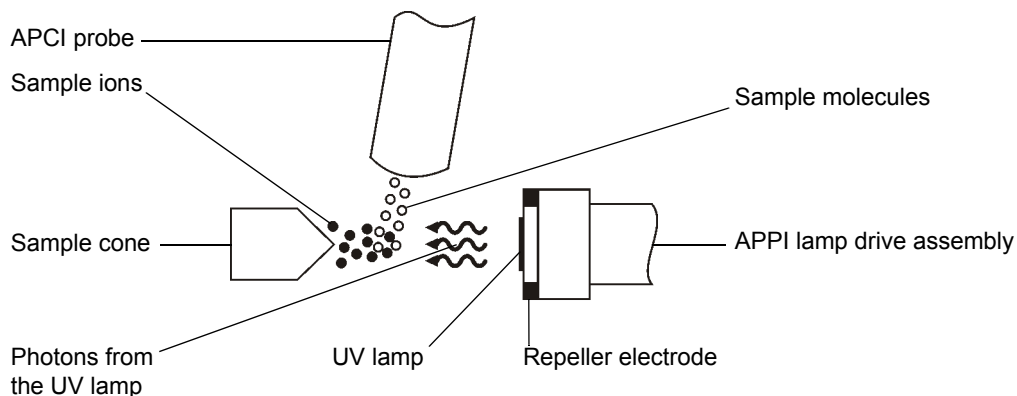
Topic	Page
APPI mode	1-2
APCI mode	1-3
Dual APPI/APCI mode	1-4

APPI mode

In atmospheric pressure photoionization (APPI) mode, the source is fitted with an APCI probe, and the APPI lamp drive assembly is advanced into the source.

See also: “APCI probe” on page 2-2 and “APPI lamp drive assembly” on page 2-2.

APPI mode



The APCI probe introduces vaporized sample into the source where photons generated by an ultra-violet (UV) lamp (mounted in the APPI lamp drive assembly) produce sample ions. Direct photoionization of a sample molecule occurs when the photon energy exceeds the ionization potential of the sample molecule.

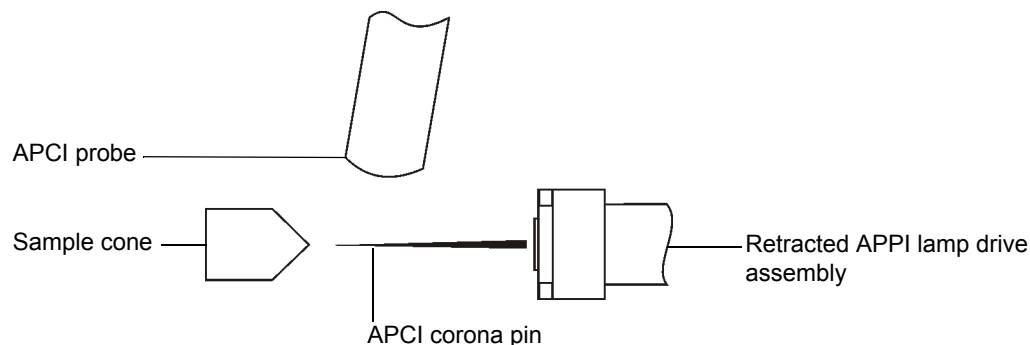
A repeller electrode (mounted on the APPI lamp drive assembly) deflects and focuses the sample ions towards the sample cone.

APCI mode

Atmospheric Pressure Chemical Ionization (APCI) produces singly-charged protonated or deprotonated molecules for a large range of nonvolatile analytes.

In APCI mode, the source fitted with an APCI corona pin. The APPI lamp drive assembly is not used, and is retracted from the source.

APCI mode



The APCI probe introduces vaporized sample into the source. The sample passes between the sample cone and the corona pin, which typically operates with a discharge current of 5 μA . The corona discharge generates ions that react with the mobile phase molecules to produce stable reagent ions. Analyte molecules in the mobile phase react with the reagent ions at atmospheric pressure and become protonated (in the positive ion mode) or deprotonated (in the negative ion mode). The sample and reagent ions pass through the sample cone.

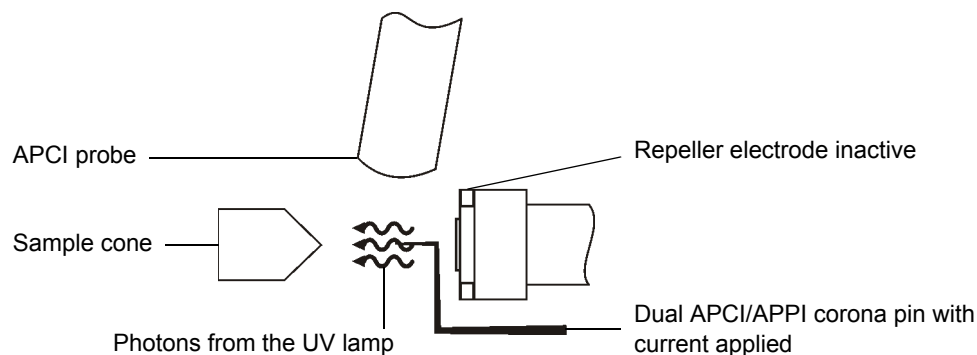
Dual APPI/APCI mode

Dual APPI/APCI mode enables rapid switching between ionization modes, and allows high throughput (for example, for sample screening).

The standard corona pin is replaced with a specially-shaped dual APPI/APCI corona pin, so that the APPI lamp holder can be advanced into the source for dual APPI/APCI operation.

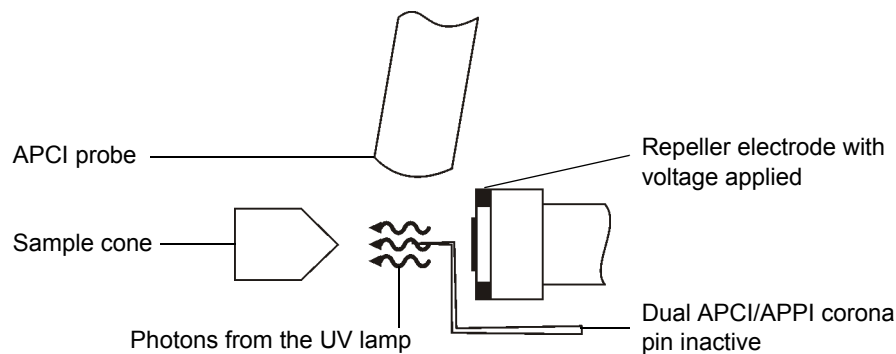
When the source is configured for dual operation in APCI mode, current is applied to the corona pin, but the repeller electrode is inactive.

Dual operation in APCI mode



When the source is configured for dual operation in APPI mode, the corona pin is inactive, and a voltage is applied to the repeller electrode.

Dual operation in APPI mode



2

The Combined APPI/APCI Source

This chapter describes the Quattro Premier XE Combined APPI and APCI Source components and how to install and remove the source.

Contents

Topic	Page
Combined APPI/APCI Source	2-2
Installing the Combined APPI/APCI Source	2-5
Removing the Combined APPI/APCI Source	2-8

Combined APPI/APCI Source

The Combined APPI/APCI Source comprises an APCI probe and the APPI lamp drive assembly.

APCI probe

The APCI probe is the standard probe used by the Quattro Premier XE for APCI operation.

See also: The *Waters Quattro Premier XE Mass Spectrometer Operator's Guide*.

APPI lamp drive assembly

The APPI lamp drive assembly comprises:

- A UV lamp.
- A repeller electrode.
- A lamp holder.
- A mounting shaft with indexing scales.
- An aluminum enclosure, housing drive electronics.
- An APPI source enclosure side plate.

See also: Figure “APPI lamp drive assembly and side plate” on page 2-3 and Figure “APPI lamp drive assembly showing the UV lamp and repeller electrode” on page 2-4.

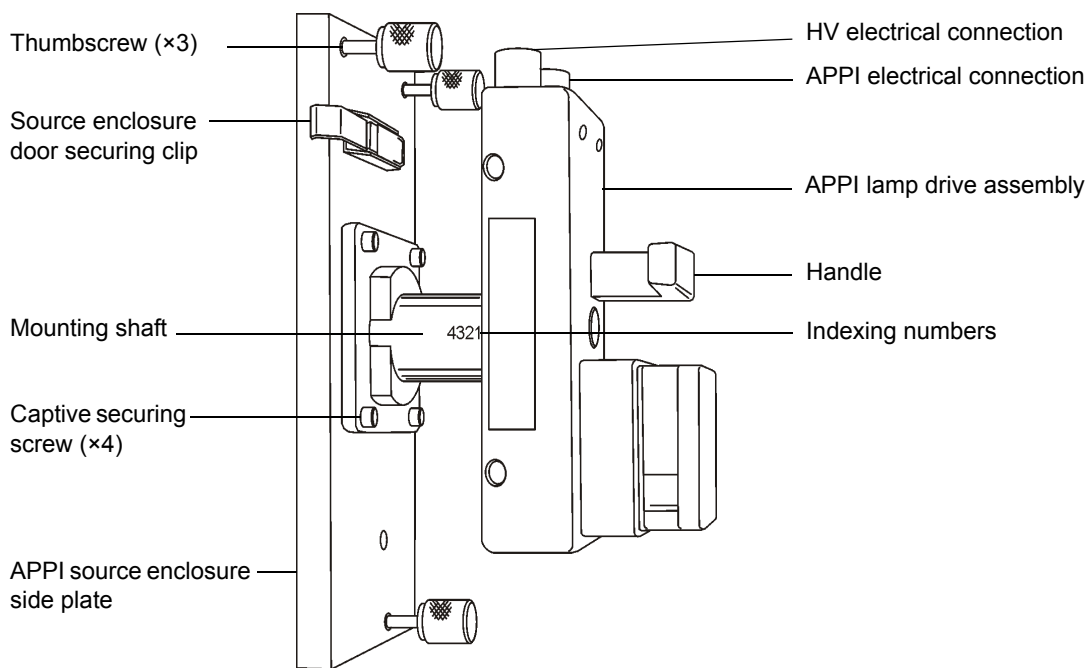
The APPI lamp drive assembly mounts onto the APPI source enclosure side plate, which in turn mounts onto the side of the instrument's source enclosure.

See also: Figure “APPI lamp drive assembly fitted to the source enclosure” on page 2-4.

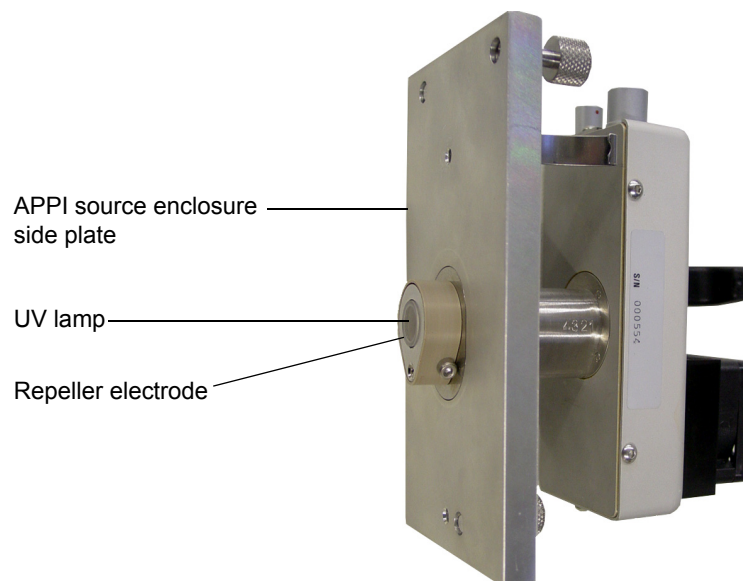
Switching on the UV lamp (from the MassLynx™ Tune window) provides a constant photon output. The intensity of incident radiation upon the sample molecules is varied by manually adjusting the distance between the UV lamp and probe tip, using the handle on the APPI lamp drive assembly to move the whole assembly on its mounting shaft. The mounting shaft's indexing numbers aid in setting this distance.

See also: “To obtain an ion beam and tune the instrument for APPI mode” on page 3-6.

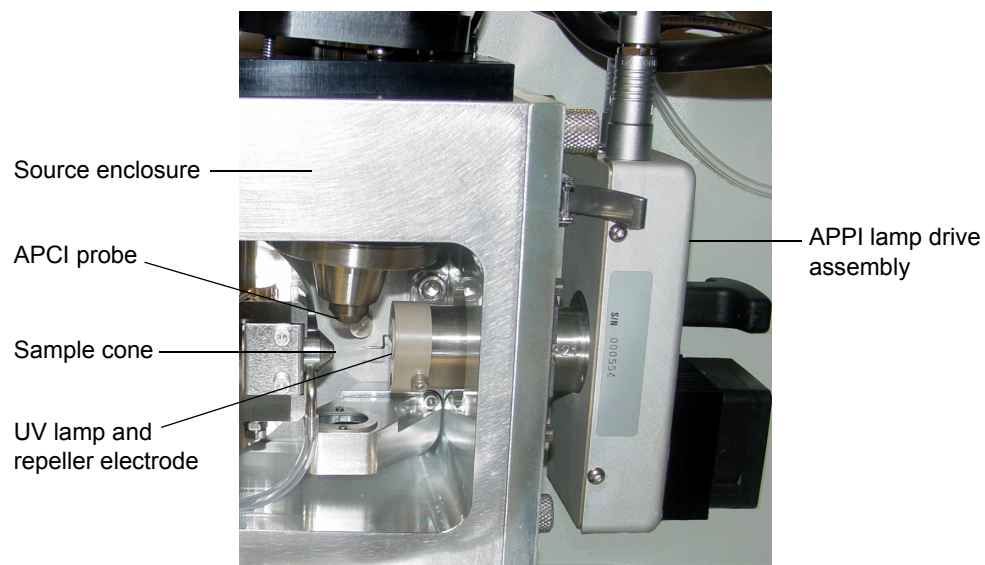
APPI lamp drive assembly and side plate



APPI lamp drive assembly showing the UV lamp and repeller electrode



APPI lamp drive assembly fitted to the source enclosure



Installing the Combined APPI/APCI Source

Installing the Combined APPI/APCI Source software upgrade

Required materials

Software Upgrade CD-ROM

To install the Combined APPI/APCI Source

If the Combined APPI/APCI Source has not been previously installed on the instrument, insert the Software Upgrade CD-ROM into the MassLynx workstation CD drive and follow the on-screen instructions.

Tip: If this software upgrade has not been installed, the APPI options will not be available in the MassLynx Tune window Ion Mode menu.


Installing the APPI lamp drive assembly and APCI probe

Note: To complete this procedure, you must perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator's Guide*.

Required materials

- Chemical-resistant, powder-free gloves
- Needle-nose pliers

To install the APPI lamp drive assembly and APCI probe on the instrument

1. On the MassLynx Tune window, click Press for Standby, and confirm that the instrument status indicator is red.
2. Wait for three minutes for the desolvation gas to cool the probe.
3. Click  to stop the nitrogen flow.



Warning: To avoid self-contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components.



Warning: To avoid electric shock, ensure that the instrument is in standby while working with the instrument's front access door open.



Warning: To avoid burn injuries, take care while working with the instrument's front access door open. The probe and source may be hot.

4. Open the instrument's front access door.



Warning: To avoid puncture wounds, take care if removing an ESI probe; the probe tip is sharp.

5. If an ESI probe is fitted, remove the probe.

See also: The *Waters Quattro Premier XE Mass Spectrometer Operator's Guide*.



Caution: To avoid damage, do not apply any downward force to the source enclosure door while the door is open.

6. Unfasten the source enclosure door's securing clips, and open the door.



Warning: To avoid puncture wounds, take great care if removing a corona pin; the pin tip is sharp.

7. If a corona pin is fitted, use the needle-nose pliers to remove the pin.
8. Fit the blanking plug to the pin's mounting contact.
9. Unscrew the three thumbscrews that secure the right side panel to the source enclosure.
10. Remove the side panel from the source enclosure.
11. Ensure that the source enclosure side flange O-ring is in place on the right side of the source enclosure.

12. Fit the APPI lamp drive assembly onto the right side of the source enclosure.



Caution: The securing thumbscrews must each be sequentially tightened a small amount until they are all fully tight; this ensures that the APPI lamp drive assembly is uniformly seated on the source enclosure.

13. Tighten the three securing thumbscrews.

See also: Figure “APPI lamp drive assembly and side plate” on page 2-3.

14. Close the source enclosure door and fasten the door securing clips.

15. Connect the APPI drive cable (part number 4170075CC1), between the APPI lamp drive assembly APPI electrical connection and the APPI connector on the instrument front panel.

See also: The *Waters Quattro Premier XE Mass Spectrometer Operator’s Guide*.

16. Connect the HT cable (part number M955286BC1), between the APPI lamp drive assembly’s HV electrical connection and the HV connector on the instrument front panel.

17. Install the APCI probe to the source and ensure that it is working correctly.

See also: The *Waters Quattro Premier XE Mass Spectrometer Operator’s Guide*.

18. Close the instrument’s front access door.



Warning: To confirm the integrity of the source exhaust system, you must perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator’s Guide*.

19. Perform a pressure test on the source.

Removing the Combined APPI/APCI Source

Removing the APCI probe and APPI lamp drive assembly

Note: To complete this procedure, you must perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator's Guide*.

Required materials

- Chemical-resistant, powder-free gloves
- Needle-nose pliers

To remove the APCI probe and APPI lamp drive assembly from the instrument

1. On the MassLynx Tune window, click Press for Standby, and confirm that the instrument status indicator is red.
2. Wait for three minutes for the desolvation gas to cool the probe.

3. Click  to stop the nitrogen flow.



Warning: To avoid self-contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components.



Warning: To avoid electric shock, ensure that the instrument is in standby while working with the instrument's front access door open.



Warning: To avoid burn injuries, take great care while working with the instrument's front access door open. The probe and source may be hot.

4. Remove the APCI probe from the source.

See also: The *Waters Quattro Premier XE Mass Spectrometer Operator's Guide*.

5. Open the instrument's front access door.



Caution: To avoid damage, do not apply any downward force to the source enclosure door while the door is open.

6. Unfasten the source enclosure door's securing clips, and open the door.



Warning: To avoid puncture wounds, take great care if removing a corona pin; the pin tip is sharp.

7. If a corona pin is fitted, use the needle-nose pliers to remove the pin.
8. Fit the blanking plug to the pin's mounting contact.
9. Disconnect the HT cable, from between the APPI lamp drive assembly's HV electrical connection and the HV connector on the instrument front panel.
10. Disconnect the APPI drive cable, from between the APPI lamp drive assembly APPI electrical connection and the APPI connector on the instrument front panel.
11. Fully retract the mounting shaft in the APPI lamp drive assembly.
12. Unscrew the three thumbscrews that secure the APPI lamp drive assembly to the source enclosure.
13. Remove the APPI lamp drive assembly from the source enclosure.
14. Ensure that the source enclosure side flange O-ring is in place on the right side of the source enclosure.
15. Fit the right side panel to the source enclosure.



Caution: The securing thumbscrews must each be sequentially tightened a small amount until they are all fully tight; this ensures that the side panel is uniformly seated on the source enclosure.

16. Tighten the three securing thumbscrews.
17. Close the source enclosure door, and fasten the securing clips.
18. Fit the required probe to the source.

See also: The *Waters Quattro Premier XE Mass Spectrometer Operator's Guide*.

19. Close the instrument's front access door.



Warning: To confirm the integrity of the source exhaust system, you must perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator's Guide*.

20. Perform a pressure test on the source.

3

Operating in APPI, APCI, and Dual APPI/APCI Modes

This chapter describes operation of the Quattro Premier XE Combined APPI and APCI Source.

Contents:

Topic	Page
Operating in APPI mode	3-2
Operating in APCI mode	3-10
Operating in Dual APPI/APCI mode	3-13

Operating in APPI mode

Required materials


- Chemical-resistant, powder-free gloves
- Lint-free cloth
- Methanol or isopropyl alcohol
- Needle-nose pliers

To prepare the source for operation in APPI mode

1. If the Combined APPI/APCI Source is not already fitted on the instrument, install it as described in [“Installing the Combined APPI/APCI Source” on page 2-5](#).



Caution: To avoid damage to the UV lamp when preparing for operating in APPI mode, ensure that the lamp drive assembly is fully retracted from the source enclosure.

2. Fully retract the lamp drive assembly.
3. If the instrument has been in use:
 - a. On the MassLynx Tune window, click Press for Standby, and confirm that the instrument status indicator is red.
 - b. Wait for three minutes for the desolvation gas to cool the probe.
 - c. Click  to stop the nitrogen flow.



Warning: To avoid self-contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves while handling the components.



Warning: To avoid electric shock, ensure that the instrument is in standby while working with the instrument's front access door open.



Warning: To avoid burn injuries, take great care while working with the instrument's front access door open.



Caution: To avoid damage, do not apply any force to the source enclosure door while the door is open.

4. Unfasten the source enclosure door's securing clips and open the door.
5. If a corona pin is fitted, use the needle-nose pliers to remove the pin.

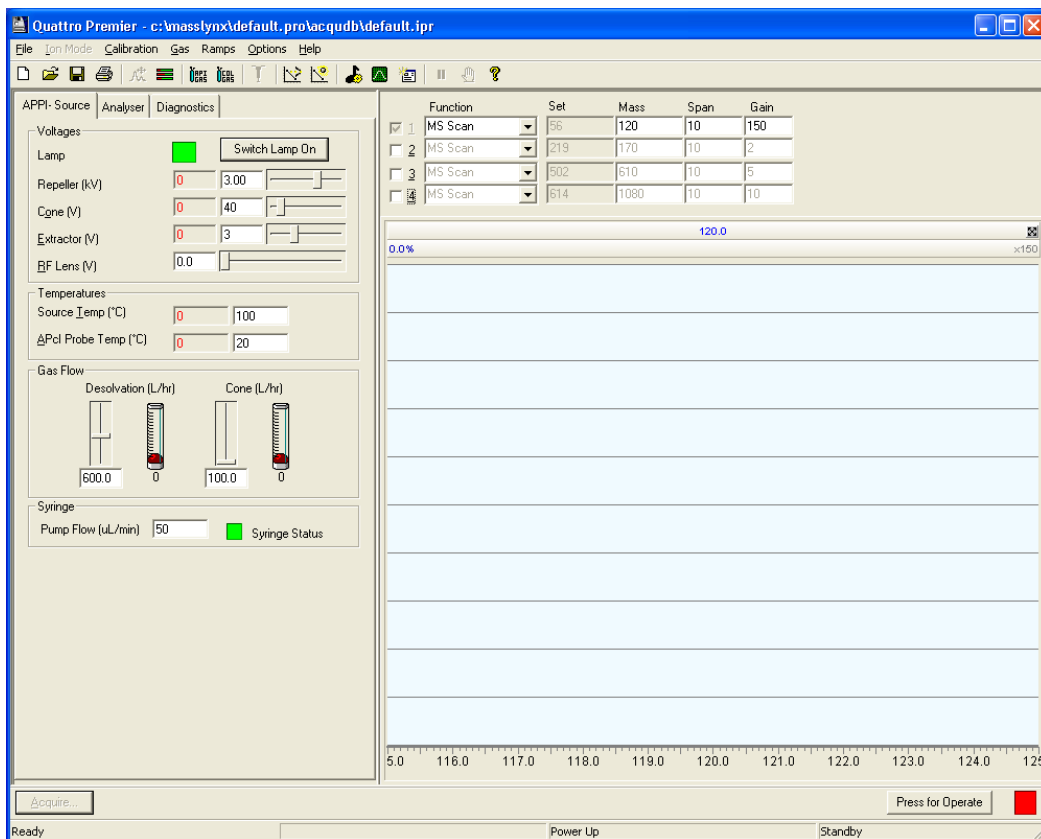
Tip: Store the corona pin in a safe location.


6. Use methanol or isopropyl alcohol, applied to the lint-free cloth, to carefully clean the lamp window.
7. Close the source enclosure door, and fasten the securing clips.
8. Close the instrument's front access door.


To confirm that the UV lamp is operating correctly

1. On the MassLynx Tune window, click Ion Mode > APPI+.

The MassLynx Tune window APPI+ Source tab



2. Click  to start the nitrogen flow.
3. Click Press for Operate, and confirm that the instrument status indicator is green.
4. Click Switch Lamp On, and confirm that the Lamp readback is green.
5. Click Switch Lamp Off, and confirm that the Lamp readback is red.
6. Click Press for Standby, and confirm that the instrument status indicator is red.

7. Wait for three minutes for the desolvation gas to cool the probe.
8. Click  to stop the nitrogen flow.

To make the HPLC pump and column connections

1. On the MassLynx Tune window, click Press for Standby, and confirm that the instrument status indicator is red.



Warning: To avoid self-contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves while handling the components. The HPLC pump and column connections may be contaminated with biologically hazardous materials.



Warning: To avoid electric shock, ensure that the instrument is in standby before making the connections between the HPLC pump, LC column, syringe pump, and APCI probe.



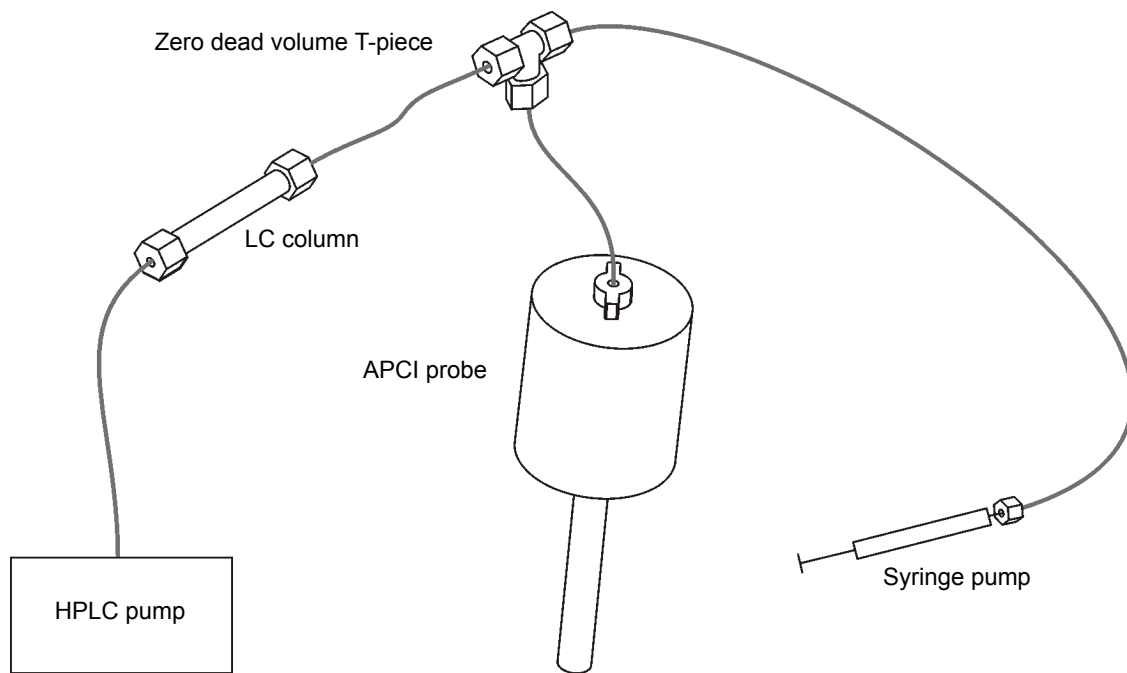
Warning: To avoid possible high-pressure liquid jet spray, wear safety goggles when making the connections between the HPLC pump, LC column, syringe pump, and APCI probe.

2. Complete the connections between the HPLC pump, syringe pump, and APCI probe.

See also: [Figure “Pump and column connections to the APCI probe” on page 3-6.](#)

3. Set up the HPLC pump with LC mobile phase (methanol at 200 $\mu\text{L}/\text{min}$).

Pump and column connections to the APCI probe



To obtain an ion beam and tune the instrument for APPI mode

1. On the MassLynx Tune window, click Ion Mode > APPI+.
2. On the APPI+ Source tab, set Repeller to 0 kV.
3. Manually advance the lamp drive assembly mounting shaft to indexing indent 3.

Rationale: This position gives the best compromise when first obtaining an ion beam. Advancing the UV lamp further will increase the beam intensity but is more likely to contaminate the lamp window.



Caution: Do not touch the repeller electrode with the probe:

- A short circuit to the electrode would prevent proper ion detection.
 - The probe is hot and may damage the UV lamp assembly.
4. Position the APCI probe so that it sprays midway between the lamp window and the sample cone tip.

APCI probe position



5. Set the parameters to the recommended values shown in the following table.

Recommended Tune window APPI+ Source tab parameters


Parameter	Recommended value
Voltages	
Repeller (kV)	1.50
Cone (V)	55
Extractor (V)	2
RF Lens (V)	0.0
Temperatures	
Source Temp (°C)	120
APCI/APPI Probe Temp (°C)	500
Gas Flow	
Desolvation (L/hr)	50.0
Cone (L/hr)	150.0

6. Click the Analyser tab.
7. Set the parameters to the values shown in the following table.

Recommended Tune window Analyser tab parameters (MS scan)

Parameter	Recommended value
Analyser	
LM Resolution 1	15.0
HM Resolution 1	15.0
Ion Energy 1	1.0
Entrance	30
Collision	3
Exit	30.0
LM Resolution 2	15.0
HM Resolution 2	15.0
Ion Energy 2	1.0
Multiplier*	650
Collision Cell Pressure (mbar)	0

* The value stated for Multiplier is typical; in practice, you should use the value determined by the Waters Field Service Engineer during installation of the instrument.

8. Click  to start the nitrogen flow.
9. On the APPI+ Source tab, observe the Desolvation and Cone gas flows, and confirm that they have stabilized and are correct.
10. Click Press for Operate, and confirm that the instrument status indicator is green.
11. On the Tune window APPI+ Source Tab, click Switch Lamp On, and confirm that the Lamp readback is green.
12. Load the sample syringe with sample. In this example, naphthalene (concentration 100 pg/μL) is used.

13. Select the correct syringe type.

See also: The *Waters Quattro Premier XE Operator's Guide*.

14. Set Syringe, Pump Flow to 10 $\mu\text{L}/\text{min}$.

15. Click  to start the syringe pump.

16. On the Tune window, click the Function 1 box.

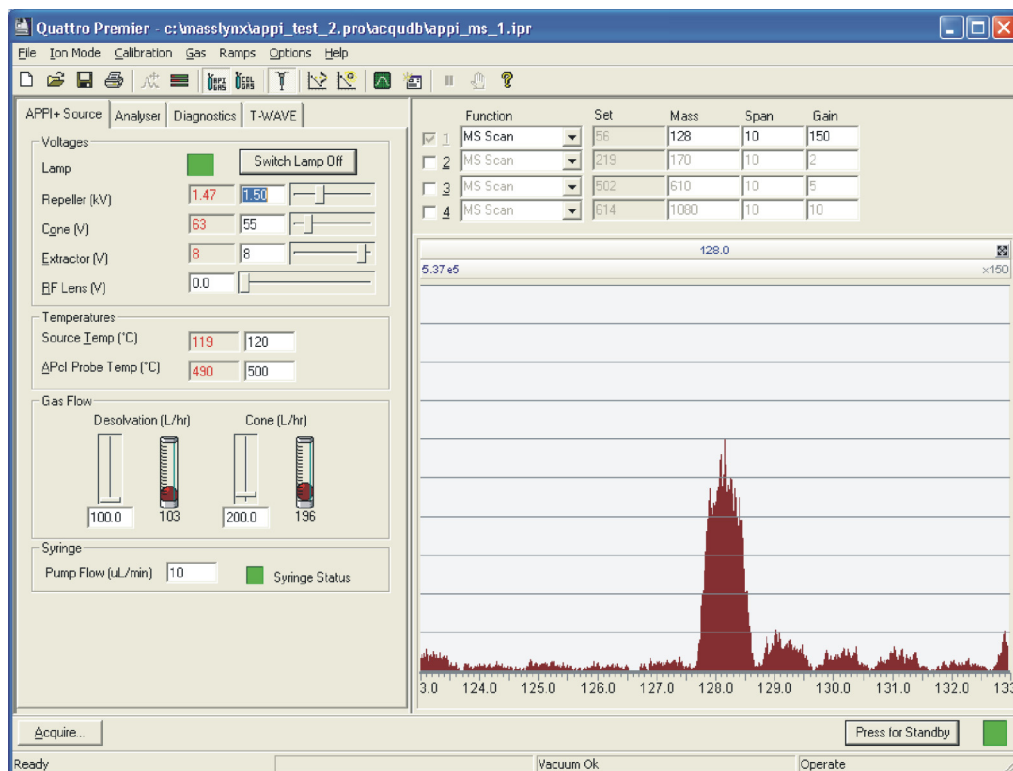
17. In the adjacent drop-down list, click MS Scan.

18. Enter: Mass 128.0, Span 10, and Gain 150.

Tip: These values are recommended, and can vary from instrument to instrument.

19. Observe the naphthalene peak at m/z 128.0 ($\text{M}+\text{H}^+$) displayed on the Tune window.

Tune window with naphthalene peak





Caution: Do not touch the repeller electrode with the probe:

- A short circuit to the electrode would prevent proper ion detection.
- The probe is hot and may damage the UV lamp assembly.

20. Tune the instrument as detailed in the *Waters Quattro Premier XE Mass Spectrometer Operator's Guide*. Also, optimize the UV lamp position, and adjust the Tune window Source tab Repeller (kV) parameter, to give the maximum peak intensity.

Operating in APCI mode

Required materials

- Chemical-resistant, powder-free gloves
- Lint-free cloth
- Methanol or isopropyl alcohol
- Needle-nose pliers

To prepare the source for operation in APCI mode

1. If the Combined APPI/APCI Source is not already fitted on the instrument, install it as described in [“Installing the Combined APPI/APCI Source” on page 2-5](#).



Caution: To avoid damage to the UV lamp when preparing for operating in APCI mode, ensure that the lamp drive assembly is fully retracted from the source enclosure.

2. Fully retract the lamp drive assembly.
3. If the instrument has been in use:
 - a. On the MassLynx Tune window, click Press for Standby, and confirm that the instrument status indicator is red.
 - b. Wait for three minutes for the desolvation gas to cool the probe.

- c. Click  to stop the nitrogen flow.



Warning: To avoid self-contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves while handling the components. The probe and source may be contaminated with biologically hazardous materials.



Warning: To avoid electric shock, ensure that the instrument is in standby while working with the instrument's front access door open.



Warning: To avoid burn injuries, take great care while working with the instrument's front access door open. The probe and source may be hot.



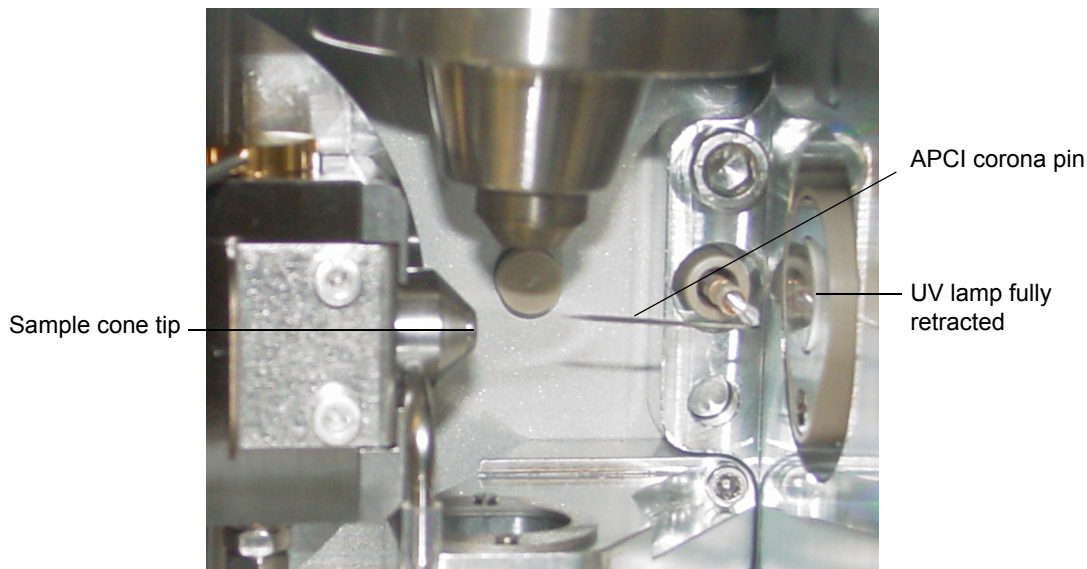
Caution: To avoid damage, do not apply any force to the source enclosure door while the door is open.

4. Unfasten the source enclosure door's securing clips and open the door.
5. If no corona pin is fitted, use the needle-nose pliers to remove the blanking plug from the corona pin mounting contact.
Tip: Store the blanking plug in a safe location.
6. If the dual APPI/APCI corona pin is fitted, use the needle-nose pliers to remove the pin.

Tip: Store the dual APPI/APCI corona pin in a safe location.

7. Use the needle-nose pliers to fit the APCI corona pin into the mounting contact. Ensure that the pin tip aligns with the sample cone tip.

APCI corona pin



8. Close the source enclosure door, and fasten the securing clips.
9. Close the instrument's front access door.

To obtain an ion beam and tune the instrument for APCI mode



Caution: To avoid damage to the UV lamp when operating in APCI mode, ensure that the lamp drive assembly is fully retracted from the source enclosure.

Obtain an ion beam and tune the instrument as described in the *Waters Quattro Premier XE Mass Spectrometer Operator's Guide*.

Operating in Dual APPI/APCI mode

Required materials


- Chemical-resistant, powder-free gloves
- Lint-free cloth
- Methanol or isopropyl alcohol
- Needle-nose pliers

To prepare the source for operation in dual APPI/APCI mode

1. If the Combined APPI/APCI Source is not already fitted on the instrument, install it as described in [“Installing the Combined APPI/APCI Source” on page 2-5](#).



Caution: To avoid damage to the UV lamp when preparing for operating in dual APPI/APCI mode, ensure that the lamp drive assembly is fully retracted from the source enclosure.

2. Fully retract the lamp drive assembly.
3. If the instrument has been in use:
 - a. On the MassLynx Tune window, click Press for Standby, and confirm that the instrument status indicator is red.
 - b. Wait for three minutes for the desolvation gas to cool the probe.
 - c. Click  to stop the nitrogen flow.



Warning: To avoid self-contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components.



Warning: To avoid electric shock, ensure that the instrument is in standby while working with the instrument's front access door open.



Warning: To avoid burn injuries, take great care while working with the instrument's front access door open. The probe and source may be hot.



Caution: To avoid damage, do not apply any force to the source enclosure door while the door is open.

4. Unfasten the source enclosure door's securing clips, and open the door.
5. Use methanol or isopropyl alcohol, applied to the lint-free cloth, to carefully clean the lamp window.
6. If no corona pin is fitted, use the needle-nose pliers to remove the blanking plug from the corona pin mounting contact.

Tip: Store the blanking plug in a safe location.

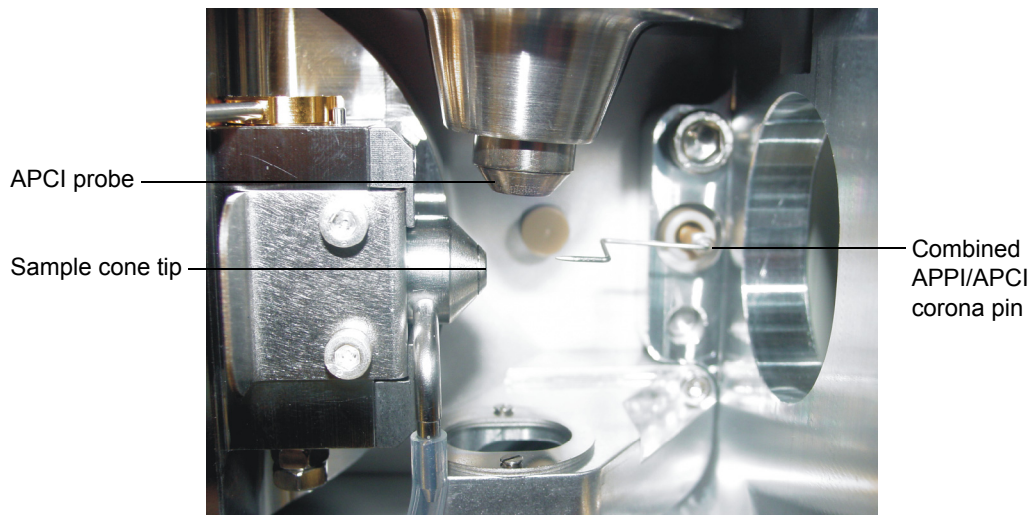
7. If the APCI corona pin is fitted, use the needle-nose pliers to remove the pin.

Tip: Store the APCI corona pin in a safe location.

8. Use the needle-nose pliers to fit the dual APPI/APCI corona pin into the mounting contact. Ensure that the pin tip aligns with the sample cone tip.

Combined APPI/APCI corona pin alignment

Note: For clarity, the lamp drive assembly is not shown.

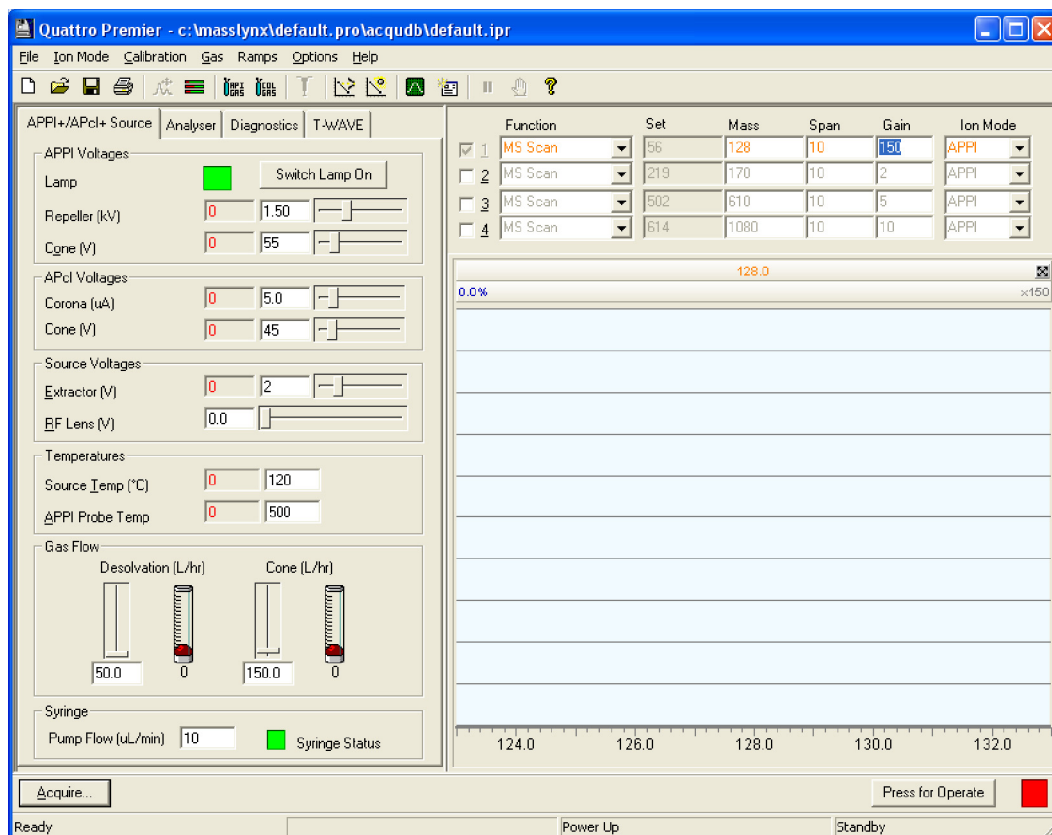




9. Close the source enclosure door, and fasten the securing clips.
10. Close the instrument's front access door.

To confirm that the UV lamp is operating correctly

1. On the MassLynx Tune window, click Ion Mode > APcI+ or Ion Mode > APPI+.
2. Click Options > Multiple Ion Modes >Dual APPI/APcI.

APPI+/APCI+ Source tab



3. Click  to start the nitrogen flow.
4. Click Press for Operate and confirm that the adjacent instrument status indicator is green.
5. Click Switch Lamp On and confirm that the Lamp readback is green.
6. Click Switch Lamp Off and confirm that the Lamp readback is red.
7. Click Press for Standby, and confirm that the instrument status indicator is red.
8. Wait for three minutes for the desolvation gas to cool the probe.
9. Click  to stop the nitrogen flow.

To obtain ion beams and tune the instrument for dual APPI/APCI mode

1. On the MassLynx Tune window, click Ion Mode > APcI+ or Ion Mode > APPI+.
2. Click Options > Multiple ion modes > Dual APPI/APcI.
3. On the APPI+/APcI+ source tab, Function 1 Ion Mode drop-down list, click APPI.



Caution: To avoid damage to the UV lamp when operating in dual APPI/APCI mode, ensure that the UV lamp does not touch the dual APPI/APCI corona pin.

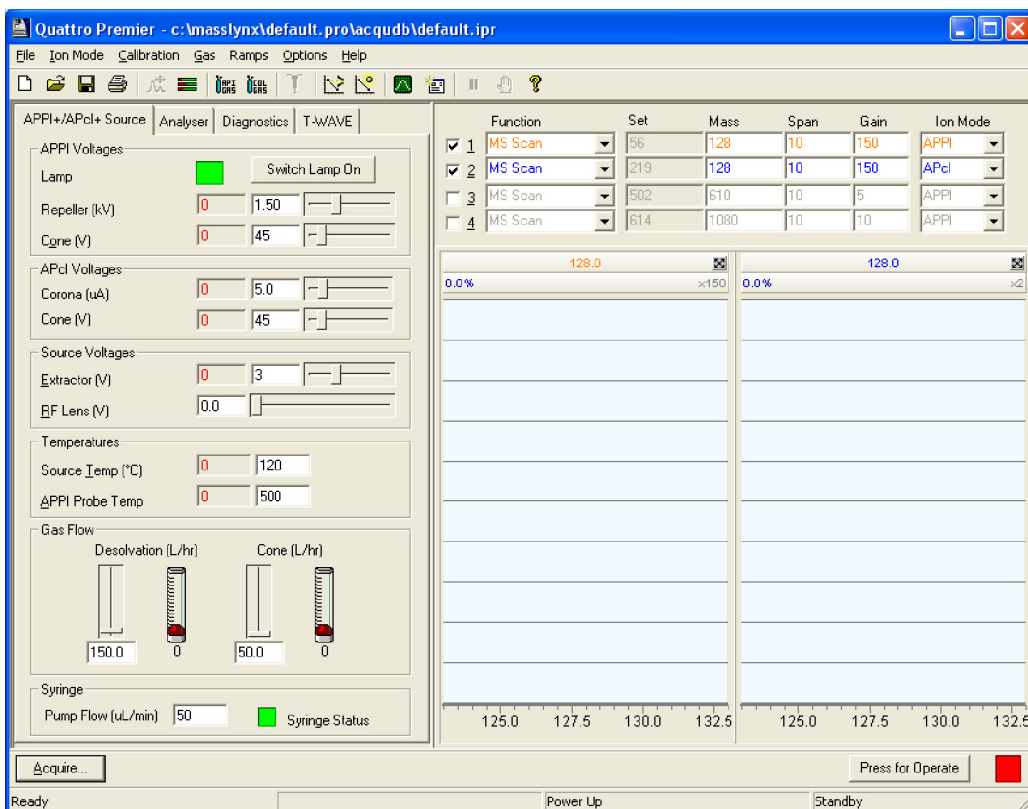
4. Obtain an ion beam and tune the instrument for APPI mode.

See also: “[To obtain an ion beam and tune the instrument for APPI mode](#)” on page 3-6.

Tip: The Tune window APPI+/APcI+ Source tab APCI Voltages frame is not used at this stage.

5. On the Tune window, select Function 2.
6. For Function 2, enter the same values for Mass, Span, and Gain as those entered for Function 1.
7. In the Function 2 Ion Mode drop-down list, click APcI.

APPI+/APCI+ Source Tab set for dual APPI/APCI mode



Caution: To avoid damage to the UV lamp when operating in dual APPI/APCI mode, ensure that the UV lamp does not touch the dual APPI/APCI corona pin.

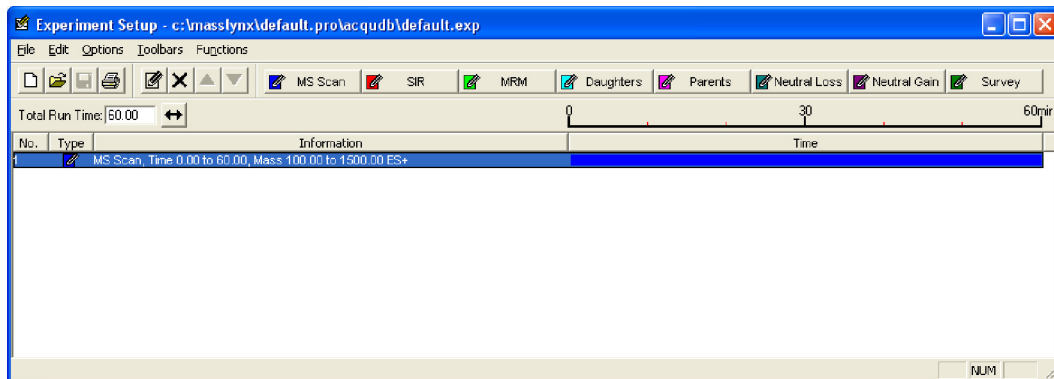
- Obtain an ion beam and tune the instrument for APCI mode.



See also: The procedure in the *Waters Quattro Premier XE Operator's Guide*.

To create an MS Method file

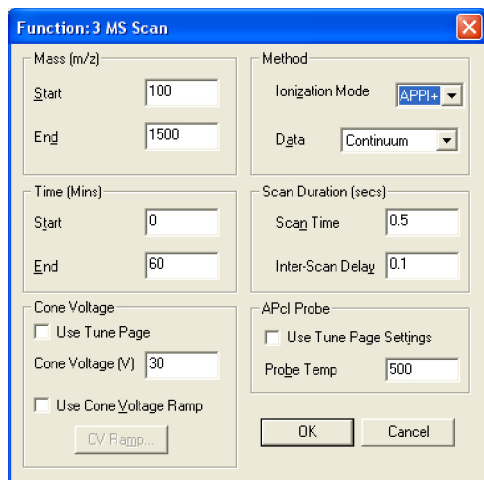
1. In the MassLynx window, click the MS Method icon.

MS Method Editor



2. In the MS Method Editor, click  to delete the current entry from the MS Method Editor.
3. Click  MS Scan.

MS Function Editor



4. In the MS Function Editor, Ionization Mode drop-down list, click the required APPI ionization mode (APPI+ or APPI-).
5. Enter the required parameters for the APPI acquisition in the other frames.
6. Click OK.

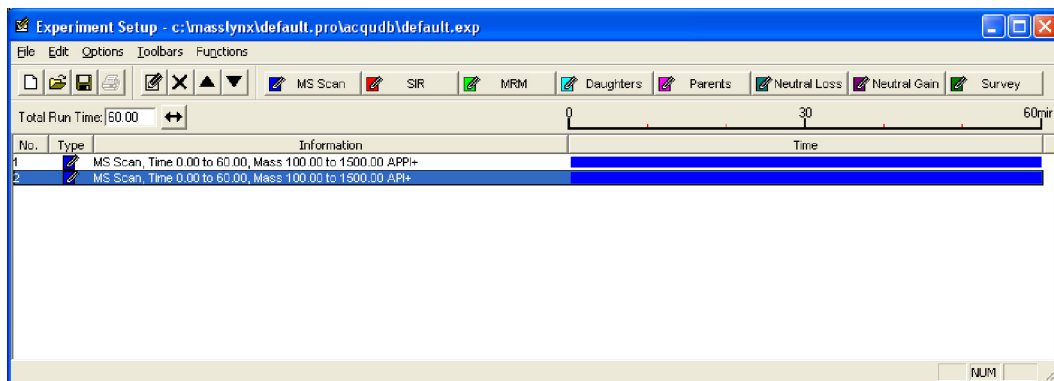
Result: The MS Function Editor closes, and the parameters are now included as the APPI entry in the MS Method Editor.


7. Repeat [step 3](#) through [step 6](#), in this case clicking the required APCI ionization mode (API+ or API-) in the Ionization Mode drop-down list.

Result: This adds the APCI entry to the MS Method Editor.

Tip: The parameter values entered in the Time (mins) frame must be identical for the APPI and APCI functions.

MS Method Editor with dual APPI/APCI functions



8. Click  to save the MS Method file.

4 Maintenance Procedures

This chapter describes the maintenance procedures for the Quattro Premier XE Combined APPI and APCI Source.

Contents

Topic	Page
General	4-2
Maintenance schedule	4-2
Safety and handling	4-3
Removing O-rings and seals	4-3
Changing the UV lamp bulb	4-4
Cleaning the lamp window	4-7
Replacing the APPI lamp drive assembly O-rings	4-9

General

Refer to the *Waters Quattro Premier XE Mass Spectrometer Operator's Guide* for details about maintaining the corona pins, source, sample cone, and APCI probe.

Maintenance schedule

The following table lists periodic maintenance schedules that ensure optimum instrument performance.

The maintenance frequencies shown apply to instruments that normally receive moderate use.

Maintenance schedule

Procedure	Frequency
Change the UV lamp bulb.	When the bulb fails.
Clean the lamp window.	When the window becomes visibly dirty, or when the sensitivity decreases to unacceptable levels.
Replace the APPI lamp drive assembly O-rings.	Annually.

Safety and handling

Bear in mind the following safety considerations when performing maintenance procedures.



Warning: To avoid self contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components.



Warning: Many of the procedures in this chapter involve the removal of contaminating deposits using flammable or caustic agents. You must be aware of the risks, and take suitable precautions.



Warning: To avoid electric shock, ensure that the instrument is in standby before commencing any maintenance.

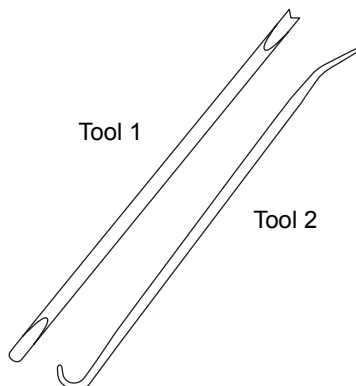


Warning: To avoid burn injuries, take great care while working with these components. The probe and source may be hot.

Removing O-rings and seals

When performing certain maintenance procedures, you will need to remove O-rings or seals from instrument components. An O-ring removal kit is provided with the instrument. You must dispose of all O-rings and seals that have been removed; do not re-use old O-rings or seals on the instrument.

O-ring removal kit



To remove an O-ring



Warning: To avoid self contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components. The probe, source, and APPI lamp drive assembly may be contaminated with biologically hazardous materials.



Caution: When removing an O-ring or seal from a component, be careful not to scratch the component with either removal tool.

1. Use the forked end of Tool 1 to impale the O-ring or seal.
2. Pull the O-ring or seal from its groove; if necessary, use Tool 2 as an aid.



Warning: The O-ring or seal can be contaminated with biohazardous and/or toxic materials. Ensure that it is correctly disposed of according to local environmental regulations.

3. Dispose of the O-ring or seal in accordance with local environmental regulations.

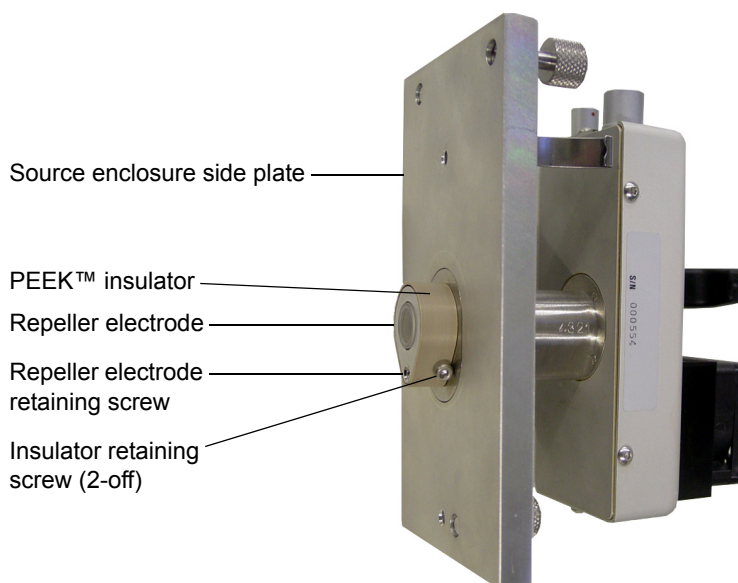
Changing the UV lamp bulb

Note: To complete this procedure, you must perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator's Guide*.

Required materials

- Chemical-resistant, powder-free gloves
- Small flat-blade screwdriver
- Small cross-head screwdriver
- Short length of length 4-mm nylon tube

APPI lamp drive assembly



To change the UV lamp bulb



Warning: To avoid self contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components. The probe, source, and APPI lamp drive assembly may be contaminated with biologically hazardous materials.



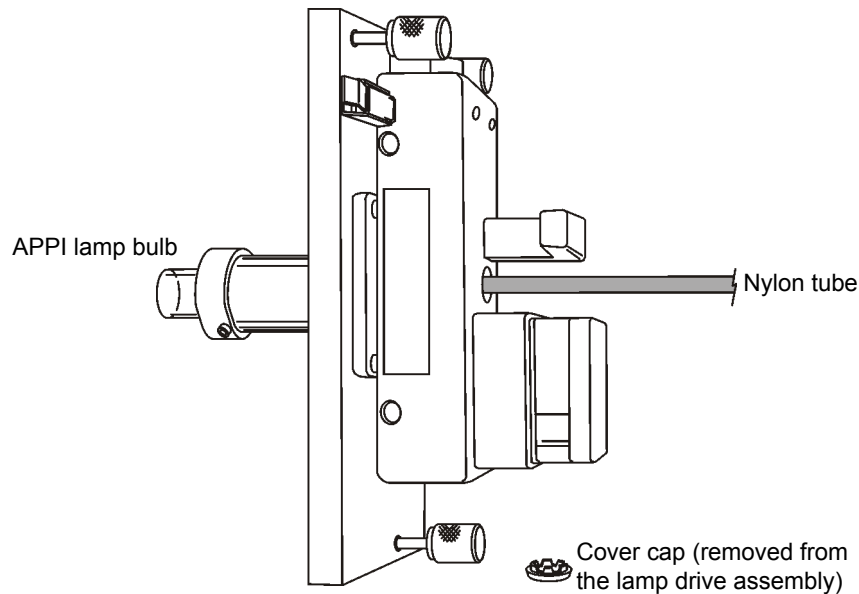
Warning: To avoid electric shock, ensure that the instrument is in standby before commencing this procedure.

1. Remove the APPI lamp drive assembly from the source enclosure.

See also: “To remove the APCI probe and APPI lamp drive assembly from the instrument” on page 2-8, [step 1](#) through [step 13](#).

2. Use the cross-head screwdriver to remove the repeller electrode retaining screw.
3. Remove the repeller electrode from the PEEK™ insulator.

4. Remove the cover cap from the back of the lamp drive assembly.



Caution: To avoid breaking the bulb, do not use a screwdriver to push the bulb out of the lamp drive assembly.

5. Insert the length of 4-mm nylon tube through the back of the lamp drive assembly, and push the bulb forward.
6. Withdraw the bulb from the lamp drive assembly.
7. Insert the new bulb into the lamp drive assembly.
8. Refit the cover cap to the lamp drive assembly.
9. Fit the repeller electrode to the PEEK insulator.
10. Use the cross-head screwdriver to fit and tighten the repeller electrode retaining screw.
11. Fully retract the lamp's mounting shaft in the APPI lamp drive assembly.



Warning: To confirm the integrity of the source exhaust system, you must perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator's Guide*.

12. Fit the APPI lamp drive assembly to the source enclosure and perform a source pressure test.

See also: “To install the Combined APPI/APCI Source” on page 2-5, step 12 through step 19.


Cleaning the lamp window

The transmission of the high-energy photons responsible for APPI relies on the cleanliness of the magnesium fluoride lamp window. The window should be cleaned to keep the surface clear of contamination and avoid reduced sensitivity.

Required materials

- Chemical-resistant, powder-free gloves
- Lint-free cloth
- Methanol or isopropyl alcohol

To clean the lamp window

1. On the MassLynx Tune window, click Press for Standby, and confirm that the instrument status indicator is red.
2. Wait for three minutes for the desolvation gas to cool the probe and source.
3. Click  to stop the nitrogen flow.



Warning: To avoid self contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components. The probe and source may be contaminated with biologically hazardous materials.



Warning: To avoid electric shock, ensure that the instrument is in standby while working with the instrument's front access door open.



Warning: To avoid burn injuries, take great care while working with the instrument's front access door open. The probe and source may be hot.



Caution: To avoid damage, do not apply any force to the source enclosure door while the door is open.

4. Open the instrument's front access door.
5. Unfasten the source enclosure door's securing clips, and open the door.
6. Use methanol or isopropyl alcohol, applied to the lint-free cloth, to carefully clean the lamp window.
7. Close the source enclosure door, and fasten the securing clips.
8. Close the instrument's front access door.

Replacing the APPI lamp drive assembly O-rings



Warning: To ensure the integrity of the source exhaust system, the APPI lamp drive assembly O-rings listed below must be renewed at intervals not exceeding one year, exactly as described in this section.

The following APPI lamp drive assembly O-rings must be renewed at intervals of no greater than one year:

- Lamp bulb sealing O-ring
- Mounting shaft O-ring
- Lamp mounting flange O-ring

Note: To complete this procedure, you will be required to perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator's Guide*.

Removing the APPI lamp drive assembly O-rings

Required materials

- Chemical-resistant, powder-free gloves
- 2.5-mm Allen wrench
- O-ring removal kit

To remove the APPI lamp drive assembly O-rings



Warning: To avoid self contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components. The probe and source may be contaminated with biologically hazardous materials.



Warning: To avoid electric shock, ensure that the instrument is in standby before commencing this procedure.

1. Remove the lamp bulb.

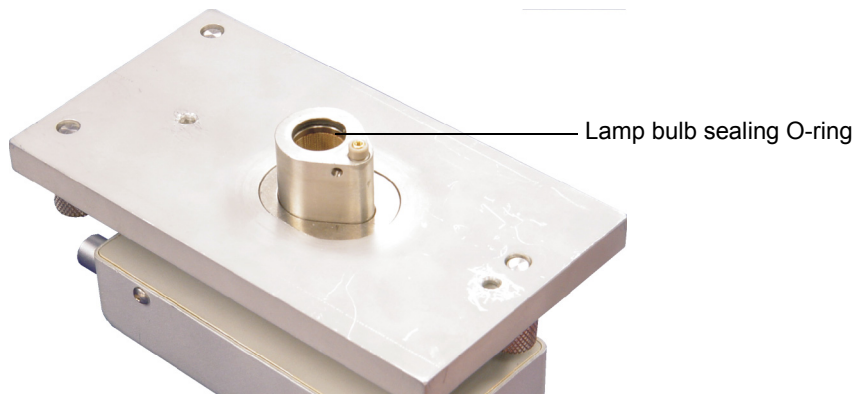
See also: “To change the UV lamp bulb” on page 4-5, step 1 through step 6.

2. Use the 2.5-mm Allen wrench to remove the two insulator retaining screws.

See also: [Figure “APPI lamp drive assembly” on page 4-5.](#)

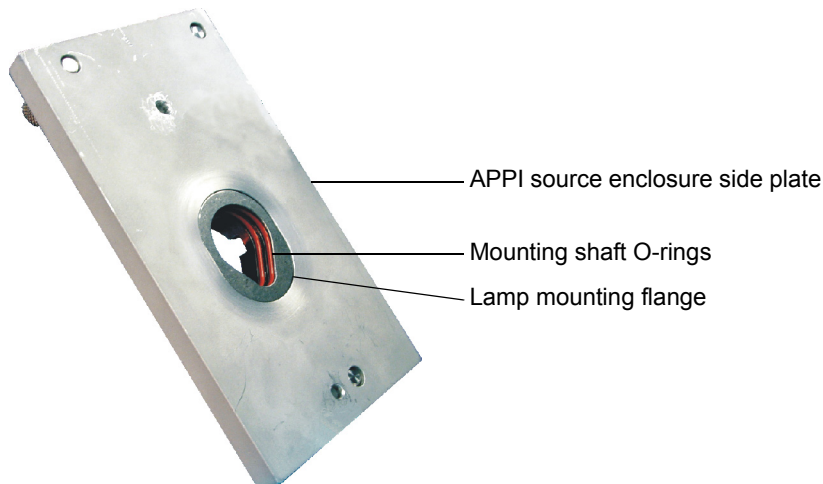
3. Remove the PEEK insulator from the mounting shaft.
4. Use the O-ring removal kit to carefully remove the lamp bulb sealing O-ring from inside the end of the mounting shaft.

See also: [“Removing O-rings and seals” on page 4-3.](#)

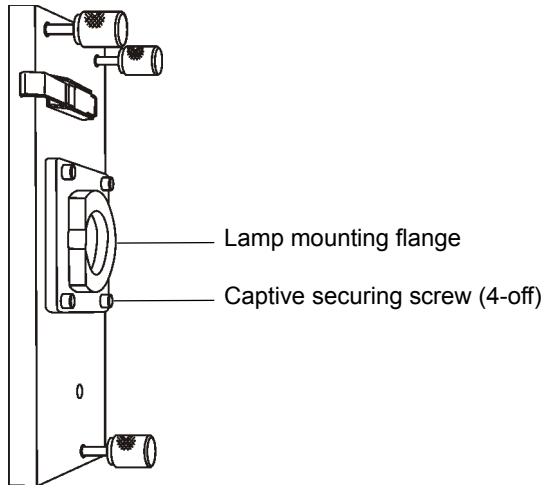


5. Extract the mounting shaft from the APPI source enclosure side plate.
6. Use the O-ring removal kit to carefully remove the mounting shaft O-rings from inside the lamp mounting flange aperture.

See also: [“Removing O-rings and seals” on page 4-3.](#)

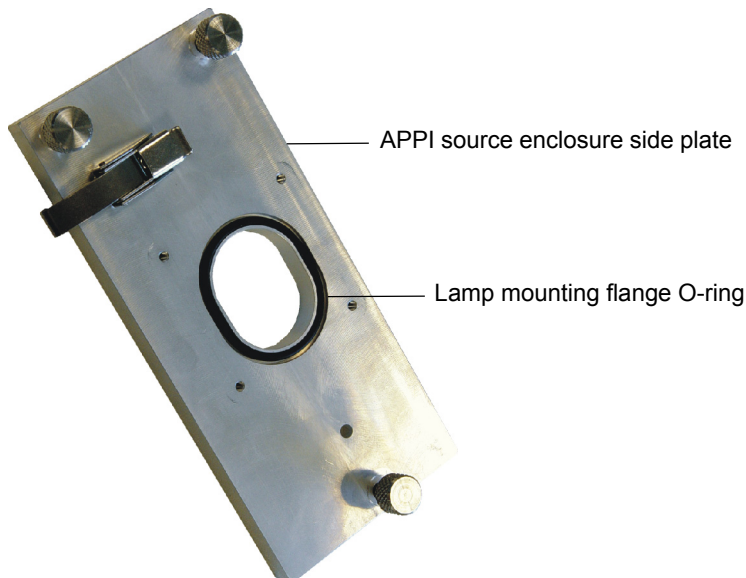


7. Use the 2.5-mm Allen wrench to unscrew the four captive lamp mounting flange securing screws.



8. Remove the lamp mounting flange from the APPI source enclosure side plate.
9. Use the O-ring removal kit to carefully remove the lamp mounting flange O-ring from the APPI source enclosure side plate.

See also: [“Removing O-rings and seals” on page 4-3.](#)





Warning: The O-rings may be contaminated with biohazardous and/or toxic materials. Ensure that they are correctly disposed of according to local environmental regulations.

10. Dispose of the O-rings in accordance with local environmental regulations.

Fitting the new APPI lamp drive assembly O-rings

Required materials

- Chemical-resistant, powder-free gloves
- 2.5-mm Allen wrench
- 1:1 methanol/water
- Lint-free cloth
- Mounting shaft insertion tool

To fit the new APPI lamp drive assembly O-rings



Warning: To avoid self contamination with toxic and biohazardous materials, always wear chemical-resistant, powder-free gloves at all times while handling the components. The probe and source may be contaminated with biologically hazardous materials.

1. Ensure that all the grooves for the O-rings are free from dirt and hairs.
Tip: If contamination is present, use 1:1 methanol/water, applied to the lint-free cloth, to carefully clean the grooves.
2. Fit the new lamp mounting flange O-ring to the APPI source enclosure side plate.

3. Fit the lamp mounting flange to the APPI source enclosure side plate.



Caution: The securing screws must each be sequentially tightened a small amount until they are all fully tight; this ensures that the lamp mounting flange is uniformly seated on the APPI source enclosure side plate.

4. Use the 2.5-mm Allen wrench to tighten the four captive lamp mounting flange securing screws.

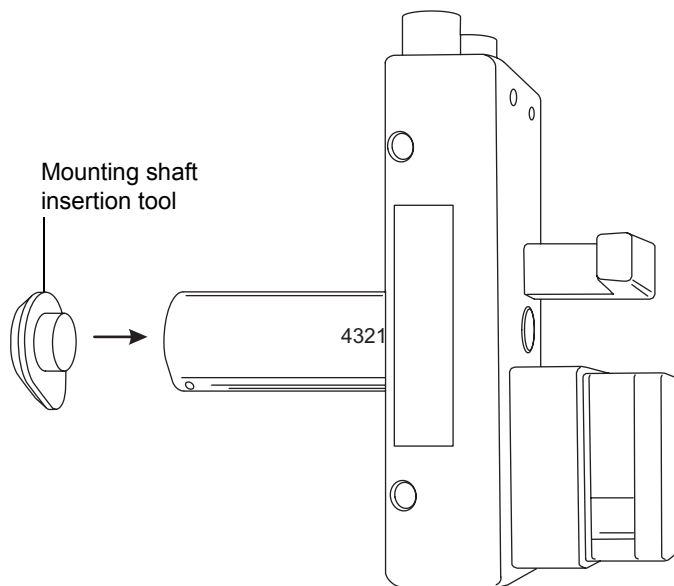


Caution: Take care not to damage the APPI lamp drive assembly mounting shaft O-rings when fitting them to the lamp mounting flange.

5. Fit the APPI lamp drive assembly mounting shaft O-rings to the lamp mounting flange.

Tip: First seat the O-ring in the small radius at the bottom of the groove in the source enclosure side plate, then use a suitable tool, having a circular cross-section, to “roll” the remainder of the O-ring into the groove.

6. Fit the mounting shaft insertion tool to the mounting shaft.





Caution: To prevent damage to the mounting shaft O-rings, the mounting shaft insertion tool must be fitted to the mounting shaft before fitting the shaft to the lamp mounting flange.

7. Insert the mounting shaft into the lamp mounting flange.
8. Remove the mounting shaft insertion tool from the mounting shaft.
9. Fit the lamp bulb sealing O-ring to the mounting shaft.
10. Fit the PEEK insulator to the mounting shaft.
11. Use the 2.5-mm Allen wrench to fit and tighten the two insulator retaining screws.
12. Insert the new bulb into the lamp drive assembly.
13. Refit the cover cap to the lamp drive assembly.
14. Fit the repeller electrode to the PEEK insulator.
15. Fit and tighten the repeller electrode retaining screw.
16. Fully retract the lamp's mounting shaft in the APPI lamp drive assembly.
17. Fit the APPI lamp drive assembly onto the right side of the source enclosure.



Caution: The securing thumbscrews must each be sequentially tightened a small amount until they are all fully tight; this ensures that the APPI lamp drive assembly is uniformly seated on the source enclosure.

18. Fit and tighten the three securing thumbscrews.

See also: [Figure “APPI lamp drive assembly and side plate” on page 2-3.](#)

19. Close the source enclosure door and fasten the door securing clips.
20. Connect the APPI drive cable (part number 4170075CC1), between the APPI lamp drive assembly APPI electrical connection and the APPI connector on the instrument front panel.

21. Connect the HT cable (part number M955286BC1), between the APPI lamp drive assembly's HV electrical connection and the HV connector on the instrument front panel.
22. Close the instrument's front access door.



Warning: To confirm the integrity of the source exhaust system, you must perform a pressure test on the source, as described in the *Waters Source Pressure Test Unit Operator's Guide*.

23. Perform a pressure test on the source.

A Safety Advisories

Waters instruments display hazard symbols designed to alert you to the hidden dangers of operating and maintaining the instruments. Their corresponding user guides also include the hazard symbols, with accompanying text statements describing the hazards and telling you how to avoid them. This appendix presents all the safety symbols and statements that apply to the entire line of Waters products.

Contents

Topic	Page
Warning symbols	A-2
Caution symbol	A-5
Warnings that apply to all Waters instruments	A-5
Electrical and handling symbols	A-13

Warning symbols

Warning symbols alert you to the risk of death, injury, or seriously adverse physiological reactions associated with an instrument's use or misuse. Heed all warnings when you install, repair, and operate Waters instruments. Waters assumes no liability for the failure of those who install, repair, or operate its instruments to comply with any safety precaution.

Task-specific hazard warnings

The following warning symbols alert you to risks that can arise when you operate or maintain an instrument or instrument component. Such risks include burn injuries, electric shocks, ultraviolet radiation exposures, and others.

When the following symbols appear in a manual's narratives or procedures, their accompanying text identifies the specific risk and explains how to avoid it.



Warning: (General risk of danger. When this symbol appears on an instrument, consult the instrument's user documentation for important safety-related information before you use the instrument.)



Warning: (Risk of burn injury from contacting hot surfaces.)



Warning: (Risk of electric shock.)



Warning: (Risk of fire.)



Warning: (Risk of needle puncture.)



Warning: (Risk of injury caused by moving machinery.)



Warning: (Risk of exposure to ultraviolet radiation.)



Warning: (Risk of contacting corrosive substances.)



Warning: (Risk of exposure to a toxic substance.)



Warning: (Risk of personal exposure to laser radiation.)



Warning: (Risk of exposure to biological agents that can pose a serious health threat.)

Warnings that apply to particular instruments, instrument components, and sample types

The following warnings can appear in the user manuals of particular instruments and on labels affixed to them or their component parts.

Burst warning

This warning applies to Waters instruments fitted with nonmetallic tubing.



Warning: Pressurized nonmetallic, or polymer, tubing can burst. Observe these precautions when working around such tubing:

- Wear eye protection.
- Extinguish all nearby flames.
- Do not use tubing that is, or has been, stressed or kinked.
- Do not expose nonmetallic tubing to incompatible compounds like tetrahydrofuran (THF) and nitric or sulfuric acids.
- Be aware that some compounds, like methylene chloride and dimethyl sulfoxide, can cause nonmetallic tubing to swell, which significantly reduces the pressure at which the tubing can rupture.

Mass spectrometer flammable solvents warning

This warning applies to instruments operated with flammable solvents.



Warning: Where significant quantities of flammable solvents are involved, a continuous flow of nitrogen into the ion source is required to prevent possible ignition in that enclosed space.

Ensure that the nitrogen supply pressure never falls below 400 kPa (4 bar, 58 psi) during an analysis in which flammable solvents are used. Also ensure a gas-fail connection is connected to the LC system so that the LC solvent flow stops if the nitrogen supply fails.

Mass spectrometer shock hazard

This warning applies to all Waters mass spectrometers.



Warning: To avoid electric shock, do not remove the mass spectrometer's protective panels. The components they cover are not user-serviceable.

This warning applies to certain instruments when they are in Operate mode.



Warning: High voltages can be present at certain external surfaces of the mass spectrometer when the instrument is in Operate mode. To avoid non-lethal electric shock, make sure the instrument is in Standby mode before touching areas marked with this high voltage warning symbol.

Biohazard warning

This warning applies to Waters instruments that can be used to process material that might contain biohazards: substances that contain biological agents capable of producing harmful effects in humans.



Warning: Waters's instruments and software can be used to analyze or process potentially infectious human-sourced products, inactivated microorganisms, and other biological materials. To avoid infection with these agents, assume that all biological fluids are infectious, observe good laboratory practices and, consult your organization's biohazard safety representative regarding their proper use and handling. Specific precautions appear in the latest edition of the US National Institutes of Health (NIH) publication, *Biosafety in Microbiological and Biomedical Laboratories* (BMBL).

Chemical hazard warning

This warning applies to Waters instruments that can process corrosive, toxic, flammable, or other types of hazardous material.



Warning: Waters instruments can be used to analyze or process potentially hazardous substances. To avoid injury with any of these materials, familiarize yourself with the materials and their hazards, observe Good Laboratory Practices (GLP), and consult your organization's safety representative regarding proper use and handling. Guidelines are provided in the latest edition of the National Research Council's publication, *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals*.

Caution symbol

The caution symbol signifies that an instrument's use or misuse can damage the instrument or compromise a sample's integrity. The following symbol and its associated statement are typical of the kind that alert you to the risk of damaging the instrument or sample.



Caution: To avoid damage, do not use abrasives or solvents to clean the instrument's case.

Warnings that apply to all Waters instruments

When operating this device, follow standard quality control procedures and the equipment guidelines in this section.



Attention: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Important: Toute modification sur cette unité n'ayant pas été expressément approuvée par l'autorité responsable de la conformité à la réglementation peut annuler le droit de l'utilisateur à exploiter l'équipement.

Achtung: Jedwede Änderungen oder Modifikationen an dem Gerät ohne die ausdrückliche Genehmigung der für die ordnungsgemäße Funktionstüchtigkeit verantwortlichen Personen kann zum Entzug der Bedienungsbefugnis des Systems führen.

Avvertenza: eventuali modifiche o alterazioni apportate a questa unità e non espressamente approvate da un ente responsabile per la conformità annulleranno l'autorità dell'utente ad operare l'apparecchiatura.

Atencion: cualquier cambio o modificación efectuado en esta unidad que no haya sido expresamente aprobado por la parte responsable del cumplimiento puede anular la autorización del usuario para utilizar el equipo.

注意：未經有關法規認證部門允許對本設備進行的改變或修改，可能會使使用者喪失操作該設備的權利。

注意：未经有关法规认证部门明确允许对本设备进行的改变或改装，可能会使使用者丧失操作该设备的合法性。

주의 : 기기 검교정 담당자의 승인 없이 무단으로 기기를 변경 또는 수정하는 경우에는, 그 기기 운영에 대한 허가가 취소될 수 있습니다.

注意：規制機関から明確な承認を受けずに本装置の変更や改造を行うと、本装置のユーザとしての承認が無効になる可能性があります。



Warning: Use caution when working with any polymer tubing under pressure:

- Always wear eye protection when near pressurized polymer tubing.
- Extinguish all nearby flames.
- Do not use tubing that has been severely stressed or kinked.
- Do not use nonmetallic tubing with tetrahydrofuran (THF) or concentrated nitric or sulfuric acids.
- Be aware that methylene chloride and dimethyl sulfoxide cause nonmetallic tubing to swell, which greatly reduces the rupture pressure of the tubing.

Attention: Manipulez les tubes en polymère sous pression avec précaution:

- Portez systématiquement des lunettes de protection lorsque vous vous trouvez à proximité de tubes en polymère pressurisés.
- Éteignez toute flamme se trouvant à proximité de l'instrument.
- Évitez d'utiliser des tubes sévèrement déformés ou endommagés.
- Évitez d'utiliser des tubes non métalliques avec du tétrahydrofurane (THF) ou de l'acide sulfurique ou nitrique concentré.
- Sachez que le chlorure de méthylène et le diméthylesulfoxyde entraînent le gonflement des tuyaux non métalliques, ce qui réduit considérablement leur pression de rupture.

Vorsicht: Bei der Arbeit mit Polymerschläuchen unter Druck ist besondere Vorsicht angebracht:

- In der Nähe von unter Druck stehenden Polymerschläuchen stets Schutzbrille tragen.
- Alle offenen Flammen in der Nähe löschen.
- Keine Schläuche verwenden, die stark geknickt oder überbeansprucht sind.
- Nichtmetallische Schläuche nicht für Tetrahydrofuran (THF) oder konzentrierte Salpeter- oder Schwefelsäure verwenden.
- Durch Methylenchlorid und Dimethylsulfoxid können nichtmetallische Schläuche quellen; dadurch wird der Berstdruck des Schlauches erheblich reduziert.



Attenzione: prestare attenzione durante l'utilizzo dei tubi di polimero pressurizzati:

- Indossare sempre occhiali da lavoro protettivi nei pressi di tubi di polimero pressurizzati.
- Estinguere ogni fonte di ignizione circostante.
- Non utilizzare tubi soggetti che hanno subito sollecitazioni eccessive o sono stati incurvati.
- Non utilizzare tubi non metallici con tetraidrofurano (THF) o acido solforico o nitrico concentrato.
- Tenere presente che il cloruro di metilene e il dimetilsolfossido provocano rigonfiamento nei tubi non metallici, riducendo notevolmente la resistenza alla rottura dei tubi stessi.

Advertencia: se recomienda precaución cuando se trabaje con tubos de polímero sometidos a presión:

- El usuario deberá protegerse siempre los ojos cuando trabaje cerca de tubos de polímero sometidos a presión.
- Si hubiera alguna llama las proximidades.
- No se debe trabajar con tubos que se hayan doblado o sometido a altas presiones.
- Es necesario utilizar tubos de metal cuando se trabaje con tetrahidrofurano (THF) o ácidos nítrico o sulfúrico concentrados.
- Hay que tener en cuenta que el cloruro de metileno y el sulfóxido de dimetilo dilatan los tubos no metálicos, lo que reduce la presión de ruptura de los tubos.

警告：當在有壓力的情況下使用聚合物管線時，小心注意以下幾點：

- 當接近有壓力的聚合物管線時一定要戴防護眼鏡。
- 熄滅附近所有的火焰。
- 不要使用已經被壓癟或嚴重彎曲管線。
- 不要在非金屬管線中使用四氫呋喃或濃硝酸或濃硫酸。
- 要了解使用二氯甲烷及二甲基亞楓會導致非金屬管線膨脹，大大降低管線的耐壓能力。



警告：当在有压力的情况下使用管线时，小心注意以下几点：

- 当接近有压力的聚合物管线时一定要戴防护眼镜。
- 熄灭附近所有的火焰。
- 不要使用已经被压瘪或严重弯曲的管线。
- 不要在非金属管线中使用四氢呋喃或浓硝酸或浓硫酸。
- 要了解使用二氯甲烷及二甲基亚砆会导致非金属管线膨胀，大大降低管线的耐压能力。

경고: 폴리머재질의 튜빙을 압력하에서 사용할 때는 다음 사항에 유의하십시오.

- 압력을 받은 폴리머 튜빙 부근에서는 반드시 보호안경을 착용할 것
- 모든 화기의 접근을 금함
- 늘리거나 뒤틀린 튜빙은 사용하지 말 것
- 비금속 튜빙을 테트라히드로퓨란(THF)이나 염산 및 황산과 함께 사용하지 말 것
- 디글로로메탄(methylene chloride)와 디메틸설폭사이드(dimethyl sulfoxide)는 비금속 튜빙을 팽창시켜 쉽게 파열되므로 주의할 것

警告: ポリマーチューブに圧力をかけて取り扱う場合は、次のように注意してください。

- 加圧したポリマーチューブの付近では、常に保護めがねを着用してください。
- 付近の火はすべて消してください。
- 激しい応力やねじれを受けたチューブは使用しないでください。
- テトラヒドロフラン(THF)、濃硝酸、あるいは濃硫酸には、非金属製のチューブを使用しないでください。
- ジクロロメタンやジメチルスルホキシドは非金属製のチューブを膨張させ、チューブの破断圧力を大幅に低下させますので、注意してください。



Warning: The user shall be made aware that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Attention: L'utilisateur doit être informé que si le matériel est utilisé d'une façon non spécifiée par le fabricant, la protection assurée par le matériel risque d'être défectueuses.

Vorsicht: Der Benutzer wird darauf aufmerksam gemacht, dass bei unsachgemäßer Verwendung des Gerätes unter Umständen nicht ordnungsgemäß funktionieren.

Attenzione: l'utente deve essere al corrente del fatto che, se l'apparecchiatura viene usata in un modo specificato dal produttore, la protezione fornita dall'apparecchiatura potrà essere invalidata.

Advertencia: el usuario deberá saber que si el equipo se utiliza de forma distinta a la especificada por el fabricante, las medidas de protección del equipo podrían ser insuficientes.

警告：使用者必須非常清楚如果設備不是按照製造廠商指定的方式使用，那麼該設備所提供的保護將被削弱。

警告：使用者必須非常清楚如果設備不是按照製造廠商指定的方式使用，那麼該設備所提供的保護將被削弱。

경고：제조사가 지정한 것 이외의 방법으로 기기를 사용하는 경우에는, 사용자가 위험으로부터 보호될 수 없는 경우가 발생할 수 있음에 유념하십시오.

警告：ユーザは製造業者が指定していない方法で装置を使用した場合は装置が提供する保護が損なわれることがあるということを承知しているものとします。



Warning: To protect against fire hazard, replace fuses with those of the same type and rating.

Attention: Remplacez toujours les fusibles par d'autres du même type et de la même puissance afin d'éviter tout risque d'incendie.

Vorsicht: Zum Schutz gegen Feuergefahr die Sicherungen nur mit Sicherungen des gleichen Typs und Nennwertes ersetzen.

Attenzione: per una buona protezione contro i rischi di incendio, sostituire i fusibili con altri dello stesso tipo e amperaggio.

Advertencia: sustituya los fusibles por otros del mismo tipo y características para evitar el riesgo de incendio.

警告：為了避免火災的危險，應更換同種類型及規格的保險絲。

警告：为了避免火灾的危险，应更换同种类型及规格的保险丝。

경고： 화재를 방지하기 위해서는 퓨즈 교체 시 같은 종류, 같은 등급의 것을 사용하십시오.

警告：火災の危険防止のために、ヒューズの交換は同一タイプおよび定格のもので行なってください。



Warning: To avoid possible electrical shock, disconnect the power cord before servicing the instrument.

Attention: Afin d'éviter toute possibilité de commotion électrique, débranchez le cordon d'alimentation de la prise avant d'effectuer la maintenance de l'instrument.

Vorsicht: Zur Vermeidung von Stromschlägen sollte das Gerät vor der Wartung vom Netz getrennt werden.

Attenzione: per evitare il rischio di scossa elettrica, scollegare il cavo di alimentazione prima di svolgere la manutenzione dello strumento.

Precaución: para evitar descargas eléctricas, desenchufe el cable de alimentación del instrumento antes de realizar cualquier reparación.

警告：要避免觸電，請在修理或保養器材前把電源線拔出。

警告：为避免可能引起得触电危险，在修理前请切断电源连接。










경고: 전기 충격의 가능성을 피하기 위해서는, 기기를 수리하기 이전에 전원 코드를 차단하십시오.

警告：感電の危険性を避けるために、装置の保守を行う前には装置の電源コードを引き抜いてください。

Electrical and handling symbols





Electrical symbols

These can appear in instrument user manuals and on the instrument's front or rear panels.

	Electrical power on
	Electrical power off
	Standby
	Direct current
	Alternating current
	Protective conductor terminal
	Frame, or chassis, terminal
	Fuse
	Recycle symbol: Do not dispose in municipal waste.

Handling symbols

These handling symbols and their associated text can appear on labels affixed to the outer packaging of Waters instrument and component shipments.

	Keep upright!
	Keep dry!
	Fragile!
	Use no hooks!

B Materials of Construction and Compliant Solvents



Warning: To confirm the integrity of the source exhaust system, you must address any safety issues raised by the contents of this Appendix.

Topic	Page
Preventing contamination	B-2
Items exposed to solvent	B-2
Solvents used to prepare mobile phases	B-3

Preventing contamination

For information on preventing contamination, refer to *Controlling Contamination in LC/MS Systems* (part number 715001307). You can find this document on <http://www.waters.com>; click Services and Support and then Support Center.

Items exposed to solvent

The items that appear in the following table can be exposed to solvent. You must evaluate the safety issues if the solvents used in your application differ from the solvents normally used with these items. See “[Solvents used to prepare mobile phases](#)” on page B-3 for details about the most common ingredients used to prepare mobile phases.

Items exposed to solvent

Item	Material
APPI lamp drive assembly:	
Mounting shaft	Stainless steel
Repeller electrode	Stainless steel
Insulator	PEEK
Lamp window	Magnesium fluoride
Autotune vials	High density polyethylene (HDPE)
Corona discharge pin mounting contact	PEEK
Gas exhaust port	Aluminium
Gas tubes	Fluorinated ethylene propylene (FEP)
Ion block	Stainless steel
Ion block support	PEEK™
Isolation valve	Gold-plated aluminium/bronze
O-rings	Viton® or PTFE-encapsulated Viton
Probe adjuster bellows	PTFE/Viton

Items exposed to solvent

Item	Material
Probe adjuster assembly	Anodized aluminium, glass filled acetal, and stainless steel
Probe shaft	PEEK
Push-in gas fittings	Nickel/brass
Solvent waste/leak management	Tygon tubing
Source enclosure	Alochromed aluminium
Source enclosure view port	Toughened plate glass
Waste bottle	Polypropylene
Waste bottle push-in fittings	Nitrile butadiene rubber (NBR), stainless steel, polybutylene terephthalate (PBT), and polyoxymethylene (POM)

Solvents used to prepare mobile phases

The following lists the most common ingredients used to prepare mobile phases for reverse-phase LC/MS (API):

- Water
- Methanol
- Acetonitrile
- Formic acid (<0.1%)
- Acetic acid (<0.1%)
- Trifluoroacetic acid (<0.1%)
- Ammonium acetate (<10 mM)
- Ammonium formate (<10 mM)

These solvents are not expected to cause any problems with the materials identified in [“Items exposed to solvent” on page B-2](#).

Index

A

- Analyser tab [3-8](#)
- APCI corona pin [1-3](#), [3-14](#)
- APCI mode [1-3](#), [3-10](#)
 - obtaining an ion beam [3-12](#)
 - preparing for operation in [3-10](#)
- APCI probe [1-2](#), [1-3](#), [2-2](#), [2-7](#), [3-5](#), [3-6](#)
- APPI
 - connector [2-7](#), [4-14](#)
 - drive cable [2-7](#), [4-14](#)
- APPI lamp
 - drive assembly [2-2](#)
 - drive assembly mounting shaft
 - numbered indexing indents [2-3](#)
 - replacing bulb [4-5](#)
- APPI mode [1-2](#), [3-2](#)
 - obtaining an ion beam [3-6](#)
 - preparing for operation in [3-2](#)
- APPI source enclosure side plate [2-2](#)
- APPI Source tab [3-4](#)
- APPI/APCI source tab [3-17](#)

B

- biohazard warning [A-4](#)
- bulb, replacing [4-5](#)
- burst warning [A-3](#)

C

- cables
 - drive [2-7](#), [4-14](#)
 - HT [2-7](#), [4-15](#)
- caution symbol [A-5](#)
- chemical hazard warning [A-5](#)
- cleaning the UV lamp window [4-7](#)
- combined APPI/APCI source
 - installing [2-5](#)

- removing [2-8](#)
- compliant solvents [B-1](#)
- connector
 - APPI [2-7](#), [4-14](#)
 - HV [2-7](#), [4-15](#)
- construction materials [B-1](#)
- contamination, preventing [B-2](#)
- corona pin
 - APCI [1-3](#), [3-14](#)
 - dual APPI/APCI [1-4](#), [3-11](#), [3-15](#)

D

- dual APPI/APCI corona pin [1-4](#), [3-11](#), [3-15](#)
- dual APPI/APCI mode [1-4](#), [3-13](#)
 - creating an MS method file [3-19](#)
 - obtaining an ion beam [3-17](#)
 - preparing for operation in [3-13](#)

E

- electrical symbols [A-13](#)
- Equipment guidelines [viii](#)
- equipment guidelines [5](#)

F

- flammable solvents [A-3](#)

H

- handling symbols [A-14](#)
- HPLC pump [3-5](#)
- HPLC pump and column connections,
 - APCI mode [3-5](#)
- HT cable [2-7](#), [4-15](#)
- HV connector [2-7](#), [4-15](#)

I

in vitro diagnostic applications [viii](#)
installing combined APPI/APCI source
 [2-5](#)

instrument front panel connectors
 APPI [2-7](#), [4-14](#)
 HV [2-7](#), [4-15](#)

intended use [viii](#)

ion beam, obtaining
 APCI mode [3-12](#)
 APPI mode [3-6](#)
 dual APPI/APCI mode [3-17](#)

L

lamp
 cleaning window [4-7](#)
 replacing bulb [4-5](#)
 turning on [2-3](#)

M

mass spectrometer shock hazard [A-4](#)
MassLynx Tune window
 Analyser tab [3-8](#)
 APPI Source tab [3-4](#)
materials of construction [B-1](#)
mobile phases, solvents used in
 preparation of [B-3](#)
MS Function Editor [3-20](#)
MS method file, creating for dual
 APPI/APCI mode [3-19](#)

O

O-ring removal kit [4-3](#)
O-rings
 lamp bulb sealing [4-9](#)
 lamp mounting flange [4-9](#)
 mounting shaft [4-9](#)
 replacing the, [4-9](#)
O-rings, removing [4-3](#)

P

pin, corona
 APCI [1-3](#), [3-14](#)
 dual APPI/APCI [1-4](#), [3-11](#), [3-15](#)
pressure test, performing [2-5](#), [2-8](#), [4-4](#)
preventing contamination [B-2](#)
probe, APCI [1-2](#), [1-3](#), [2-2](#), [3-5](#), [3-6](#)
pump
 HPLC [3-5](#)
 syringe [3-5](#)

R

removing
 O-rings [4-3](#)
 seals [4-3](#)
removing combined APPI/APCI source
 [2-8](#)
repeller electrode [1-2](#), [2-2](#)

S

safety advisories [A-1](#)
safety and handling [4-3](#)
sample cone [3-6](#), [3-15](#)
seals, removing [4-3](#)
selecting the syringe type [3-9](#)
software upgrade CD-ROM [2-5](#)
solvents
 compliant [B-1](#)
 exposure of SQ detector
 components to [B-2](#)
 use in mobile phases [B-3](#)
source [2-5](#), [2-8](#)
source enclosure [2-2](#)
SQ detector
 compliant solvents [B-1](#)
 materials of construction [B-1](#)
symbols
 caution [A-5](#)
 electrical [A-13](#)
 handling [A-14](#)

- warning [A-2](#)
- syringe pump [3-5](#)
- syringe type, selecting [3-9](#)

T

- Tune window
 - Analyser tab [3-8](#)
 - APPI Source tab [3-4](#)

U

- UV lamp [2-2](#)
 - cleaning window [4-7](#)
 - replacing bulb [4-5](#)
 - turning on [2-3](#)

W

- warning symbols [A-2](#), [A-5](#)

