Chapter 8
Troubleshooting

This chapter describes how to troubleshoot the Quattro Premier XE Mass Spectrometer with the help of recommended troubleshooting procedures. This chapter covers:

- Safety and handling
- General troubleshooting
- Component hardware troubleshooting

8.1 Spare Parts

Waters recommends that the customer only replace parts mentioned in this document.

8.2 Safety and Handling

When troubleshooting the Quattro Premier XE, keep the following safety considerations in mind.

Warning: *To avoid electric shock, do not remove the instrument's panels. There are no user-serviceable items inside the instrument.*

Warning: *To prevent injury, always observe good laboratory practices when handling solvents, changing tubing, or operating the Quattro Premier XE. Know the physical and chemical properties of the solvents used (see the Material Safety Data Sheets for the solvents in use).*

8.3 System Troubleshooting

Examine the system, checking the simple things first. Is something obvious causing the problem, for example, are the instrument and its cables improperly connected, or is there any leakage of fluid, vacuum, or gas?

Compare current system operation with the way the system operated before the problem appeared. To help identify normal operating conditions:

- Make a note of the LC system (tubing and electrical connections).
- Keep a daily log.
- Run test samples regularly. Check the instrument performance with known samples, preferably the ones used for instrument qualification.

  This illustrates the importance of keeping track of system parameters and performance during normal operation. Troubleshooting is easier when typical operating conditions are known. For example, are the system tuning parameters values similar to those when a test sample was run previously? Are the lens settings required for optimum sensitivity higher than those obtained previously? If extreme values have to be used to achieve good results, some part of the system is likely to require attention.

Methodically check and eliminate possible causes to identify the system parameter that is atypical.

See the troubleshooting information in the following sections to identify possible causes of symptoms and suggest corrective actions.

If you determine that a problem relates to another system component (for example, HPLC, autosampler, UV detector), see the appropriate operator's guide.

8.4 Component Hardware Troubleshooting

The following sections provide suggestions for resolving hardware problems.

8.4.1 Power Switch Fails to Power-up the Instrument

Warning: *Parts of the instrument may be electrically live even when a mains power fuse has failed. To avoid electric shock, isolate the instrument from the mains supply before replacing the mains power fuses.*

Possible Cause	Corrective Action
Mains power fuse failure.	Replace both mains power fuses (see Section 1.6.14).

8.4.2 No Peaks in the Tune Window (No Ion Beam)

Possible Cause	Corrective Action
The Tune window parameters are improperly set.	Optimize the parameters (see Sections 2.2.1 and 3.2.1). Once a beam has been obtained, ensure that all lenses affect the beam as expected.
Cables are not properly connected.	Ensure that all the cables have been correctly attached to the source and probe.
The instrument is not in Operate.	Put the instrument into Operate by clicking Press for Operate in the Tune window. (When in Operate, the adjacent icon and the Operate LED on the instrument's front panel are both green.)
Communication failure.	Reinitialize the instrument by selecting Options > Reinitialize in the Tune window. Reboot the embedded PC using the embedded PC reset switch (see Section 1.5.2).
No sample is present.	Ensure that sample is loaded correctly in the autosampler or syringe pump syringe.

Possible Cause	Corrective Action
The isolation valve is closed.	Open the isolation valve (see Figure 2-4).
The source components are dirty.	Clean the source components (see Section 7.9).
Insufficient nitrogen flow.	Ensure that the nitrogen pressure is 6 to 7 bar (90 to 105 psi) and the gas flow rate in the Tune window is >100 L/h.
No LC flow.	Look for solvent flow from the autosampler or syringe pump.
Fluid leak in the HPLC system.	Replace the APCI capillary (see Section 7.15).
The source components have been incorrectly assembled.	Ensure that the source and probe voltage readbacks vary with the Tune window settings. If any voltage is absent, disassemble and correctly reassemble the source and T-Wave assemblies (see Section 7.9).
The ESI or APCI sample capillary is blocked.	Replace the capillary (see Section 7.14 or Section 7.15).

8.4.3 Unsteady or Low Intensity Peaks (Ion Beam)

Possible Cause	Corrective Action
Poor nebulization.	In the Tune window, ensure that the source and desolvation temperature, and gas flow settings are suitable for the flow rate.
	Liquid inside the source enclosure indicates that the source temperature is too low; in the Tune window Source page, increase the Source Temp (°C) parameter value.
	Ensure that the nitrogen pressure is 6 to 7 bar (90 to 100 psi).
	Check the stability of the nitrogen flow (use a good-quality two-stage regulator).
	In the Tune window Source page, ensure that the Desolvation Gas Flow (L/h) parameter is greater than 100.
Problem with the sample delivery (autosampler, syringe pump, or HPLC system).	Troubleshoot the autosampler.
	Inspect the syringe in the syringe pump for leaks and ensure that it is correctly grounded (earthed).
	Ensure that there is sufficient sample in the vials.
	Look for pressure variation on injecting the sample.
Fluid leak in the HPLC system.	Look for leaks in the HPLC system, and rectify them.
The source components require cleaning.	Clean the source components (see Section 7.9).
The lens settings are wrong or atypical.	Ensure that all the settings are correct.
	Ensure that the Tune window readbacks have reasonable values.
	Ensure that all the lens parameters affect the beam.

Possible Cause	Corrective Action
The cone or collision cell voltage ramp is on.	Turn off the voltage ramp (see Section C.7).
The ESI or APCI sample capillary is not properly installed.	Ensure that the probe position is correct. Ensure that the ESI or APCI probe sample capillary protrudes 0.5 mm (see Sections 7.14 and 7.15).
The ESI probe tip subassembly O-ring is damaged.	Replace the O-ring (see Section 7.10).
The corona discharge pin is not correctly aligned.	Ensure that the corona discharge pin is correctly aligned (see Section 7.11).
The CID gas pressure is incorrect.	Infuse sample and optimize the gas pressure. Check that the CID gas regulator is set to 0.5 bar, and is not leaking.
The collision cell parameter values are incorrect.	In the Tune window, confirm that the Entrance, Exit, and Collision parameters are optimized, and have reasonable readbacks.
The analyzer and multiplier are parameters incorrect.	In the Tune window, ensure that Multiplier is set to 550. Ensure that the Ion Energy and Resolution parameters are set correctly for the acquisition.

8.4.4 Unusually High LC Backpressure

Warning: *To avoid high-pressure liquid jet spray, wear safety goggles when inspecting the sample capillary, injection loop, or LC system tubing.*

Possible Cause	Corrective Action
There is a blockage in the sample capillary or injection loop due to particulate matter from the sample.	Remove the probe from the source and increase the solvent flow to 500 µL/min to clear the blockage.

Possible Cause	Corrective Action
The tubing from LC system is blocked.	Remove the finger-tight nut and tubing from the back of the probe. If the backpressure remains high, replace the tubing.
The ESI probe sample capillary is blocked.	Replace the sample capillary (see Section 7.14).
The ESI or APCI probe sample capillary is not fully seated in the LC union.	Remove and disassemble the probe, and reseat the sample capillary correctly in the union (see Section 7.14 or Section 7.15).

8.4.5 Unusually Low LC Backpressure

Possible Cause	Corrective Action
Leaking connector.	Inspect all the fittings and tighten them if necessary.
Problem with the LC solvent delivery.	Troubleshoot the LC system.

8.4.6 Insufficient Vacuum

There is insufficient vacuum when the Pirani gauge is reading greater than 5×10^{-4} mbar, when the CID gas is off.

Possible Cause	Corrective Action
The ion block O-rings are leaking.	Disassemble the source and check the condition of the ion block O-rings (see Section 7.9).

Possible Cause	Corrective Action
The backing pump is not operating correctly.	If using a rotary pump, gas ballast the pump to return accumulated oil from the oil mist filter (see Section 7.5). Check the rotary pump oil (see Section 7.6). If the oil is dirty, change the oil (see Section 7.7). Repeat if necessary. If using a scroll pump, replace the scroll pump seals (see the Edwards document *XDS 35i Instruction Manual A730-01-880*, supplied with the instrument).
Leak in the vacuum backing line.	Inspect the vacuum hose for cracks or vacuum leaks.
Restriction in the vacuum pump exhaust tubing.	Inspect the exhaust line for restrictions.
Turbo pump not operating properly.	Contact Waters for advice (see Section 8.6).

8.4.7 Leaking Nitrogen

A hissing sound or solvent smell can indicate a nitrogen leak.

Possible Cause	Corrective Action
Poor seal around the source enclosure.	Visually inspect the source enclosure sealing surfaces for imperfections or nicks. Examine the condition of the encapsulated O-rings.

8.4.8 Rotary Pump Oil Accumulated in the Exhaust Tubing

Possible Cause	Corrective Action
The oil mist filter needs replacement.	Replace the oil mist and odor filter elements (see Section 7.8).

8.4.9 Ion Source Heater and Desolvation Heater are Not Working

Possible Cause	Corrective Action
The ion source heater has failed.	Check the Source Temp (°C) readback on the Tune window Source page. Replace the heater if necessary (see Section 7.13).
The main system printed circuit board fuse has failed.	Check the Desolvation Temp (°C) readback on the Tune window Source page. Contact Waters if the readback is incorrect (see Section 8.6).

8.4.10 APCI Probe Heater Not Working

Possible Cause	Corrective Action
If the desolvation heater is working in ESI mode, the APCI probe heater may need replacing.	Replace the APCI probe heater (see Section 7.16).

8.4.11 Failure of the Fuse Supplying the Rotary Pump

Note: *This fuse is not supplied by Waters – it is in the user's power supply.*

Possible Cause	Corrective Action
The oil mist filter element is saturated. Vacuum oil may also be accumulating in the exhaust tubing.	Replace the oil mist and odor filter elements (see Section 7.8).
The system needs to be ballasted.	Ballast the pump for 20 to 30 minutes (see Section 7.5).
The mains supply voltage is less than 208 V a.c.	The mains supply voltage to the instrument must be measured by a qualified electrician.
The rotary pump oil is very dirty.	Change the rotary pump oil (see Section 7.7).

8.4.12 Ion Mode Fault

The Tune window drop-down menu options are unavailable, or the instrument spontaneously switches probe type.

Possible Cause	Corrective Action
One, or both, of the probe contact pins are jammed inside the probe and are not making contact with probe support plate.	Remove the probe cover, free the contact pin, and ensure that both the pins and their associated springs move freely within the bushing.

8.4.13 Failure to Recognize a Particular Probe Type

Possible Cause	Corrective Action
A problem with the probe.	Remove the probe, and try another probe of the same type. On the Tune window Diagnostics page, ensure that the Source ID (V) value is 1.5 to 2.5 V for ESI and 2.5 to 3.5 V for APCI.

8.4.14 Ripple

The peaks and baseline appear to vary cyclically in intensity.

Warning: *To avoid high-pressure liquid jet spray, wear safety goggles when inspecting the sample capillary, injection loop, or tubing from the LC system.*

Possible Cause	Corrective Action
Erratic LC solvent flow.	Troubleshoot the LC system.
Poor nebulization due to incorrect temperature and gas flow settings.	Adjust the temperature and gas flow settings. Liquid in the source enclosure indicates that the temperature is too low.
Vibration from the rotary pump or even other equipment in the same building.	Look for and eliminate excessive bench top and instrument vibration.

8.4.15 Loss of Communication with the Instrument

Possible Cause	Corrective Action
The instrument to MassLynx host communication has failed.	Reset the workstation and, when rebooted, reboot the embedded PC from the front panel using a short length of PEEK tubing to operate the reset switch (see Figure 1-3 on page 5). Wait 3 minutes for the audible signal indicating that the embedded PC has booted from the Quattro Premier XE before starting MassLynx.

8.4.16 IEEE Communication Errors

Possible Cause	Corrective Action
The instrument's components have powered up in the wrong sequence.	Power down the system components and start up the system components in the correct order: 1. Workstation 2. Quattro Premier XE 3. Inlet modules Wait 3 minutes for the audible signal indicating that the embedded PC has booted from the Quattro Premier XE before starting MassLynx.
There is a wrong or conflicting IEEE address.	Check the system's IEEE settings and enter the correct addresses.
There is a faulty IEEE cable in the IEEE chain.	Systematically replace the IEEE cables until the problem cable is located.
Network cables are confused with the site network.	Ensure that the network cable for the instrument is connected to the correct network card in the PC. Ensure that the network card with the BNC connector is configured to the site network.

8.5 High Noise Levels in MRM Analyses

The background noise in MRM analysis can be either electronic or chemical. To distinguish between the two:

1. Start an acquisition.
2. During the acquisition, set Ion Energy 1, and Ion Energy 2 fully negative in the Tune window Analyser page.

A significant decrease in signal when the ion energies are set negative implies that the major contribution to the overall noise is chemical.

Any residual noise is electronic.

8.5.1 Chemical Noise

Possible Cause	Corrective Action
High background noise due to carry-over after tuning with strong concentrations.	Repeat injections of 10% formic acid and/or isopropanol.
Contaminated injector. (The signal changes upon injection of mobile phase).	Repeat injections of 10% formic acid and/or isopropanol.
Contaminated tubing.	Replace the tubing.
Contaminated probe.	Flush with methanol at 0.5 mL/min until the background noise level falls.
	Replace the ESI or APCI sample capillary (see Sections 7.14 and 7.15).
Contaminated HPLC system.	Infuse mobile phase from the solvent reservoir using a syringe pump. Compare the MRM background levels. Confirm the purity of solvents and replace them if necessary. Ensure that all solvents are HPLC grade.
Contaminated glassware.	Ensure that glassware is not cleaned with commercial surfactants.

8.5.2 Electronic Noise

Corrective Action
Ensure that the valleys of peak-peak noise, when ion energies are fully negative, touch the baseline. Increase the Ion Counting Threshold to suit; ensure that this does not reduce the sensitivity on low level peaks too much (see Section 5.3.4).

8.6 Contacting Waters

You can easily correct many problems with the Quattro Premier XE. However, if this is not the case, you must contact Waters.

Customers in the USA and Canada should report maintenance problems they cannot resolve to Waters Technical Service (800 252-4752). All others should visit http://www.waters.com and click Offices, or phone their local Waters subsidiary or Waters corporate headquarters at 34 Maple Street, Milford, MA 01757, USA.

When contacting Waters, have the following information available:

- The nature of the symptom
- The Quattro Premier XE serial number

Depending on the nature of the fault, it may also be useful to have the following information available:

- Details of the flow rate, mobile phases, and sample concentrations
- Details of the gas cell operating pressure
- The Tune window settings
- The software version update reference