

Agilent ICP-MS

Interactive Troubleshooting tool for High background

Rev. A

2017,Mar,16

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Preconditions

- 7900, 7800, 7700, or 8800 ICP-MS is used.
- Sample introduction type is “PeriPump”. If you are using a special configuration such as LC/GC integration or ISIS, setup the instrument with standard configuration.
- You have the “Hardware Maintenance Manual” for your instrument. Some details of the operations are not in this tool. You should refer to the manual.

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Legends

Note

Notes or tips that help troubleshoot.

Reference

You need to refer to another document for detail of the steps.

Good

Good example of situation.

Bad

Bad example of situation.

Did the ion lens test pass?

buttons such as

Yes

or

No

← Questions are displayed in blue you need to click

Based on your answer the tool will navigate you to next step.

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1.1.1 On-mass / Off-mass discrimination

(1) Which case is similar to your problem?

High background in tune reports

High BEC with Calibration curves

1.2.1 Check dependency for elements / tune modes

(1) With which mass do you find the high BEC ?

With specific element(s)

With specific tune mode(s)

Generally found among multiple elements /tune modes

Random

1.3.1 Check contamination from recent samples

(1) Recently did you measure samples containing concentrated (>100ppb) elements with high BEC?

Yes

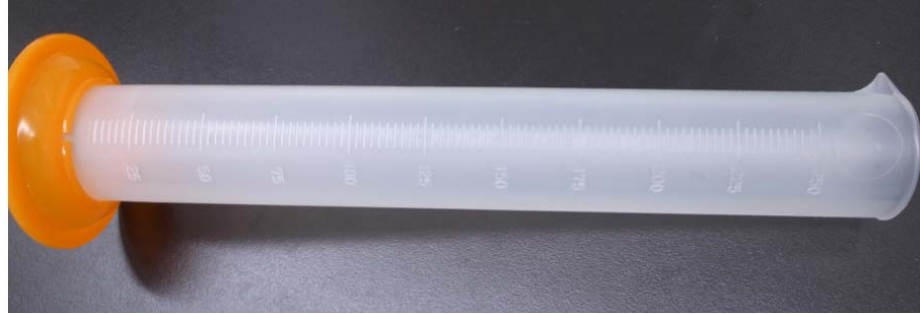
No

1.4.1 Check usage of glassware

(1) Did you use any glassware for sample preparation or handling of calibration standards ?



Bad



Good

Yes

No

1.5.1 Do not use glassware

(1) Prepare standards without using glassware.



1.6.1 Re-prepare standards

(1) Prepare new calibration standards with:

- Different container (new one).
- Different tips for pipette (new one).
- Other source of pure water (if available).
- Other bottle of acid (if available) or without acid.

(2) Is the problem solved?

Yes

No

2.1.1 Check background in a tune report

(1) Generate a tune report

(2) In tune report, is there any element for which background CPS is more than 50?

Yes

No

2.2.1 Check background in a tune report

(1) In tune reports, compare bkg CPS of mass 205 with Mass 89.

(2) Is the 205 CPS 5 times higher, or more, than that of 89?

Note The higher background with the higher mass indicates discharge in the Q-pole. You need an engineer from Agilent to fix it.

Yes

No

2.3.1 Continue using instrument

(1) Bkg is a little bit high, but no special care is required. Just continue using instrument with current conditions.



2.4.1 Adjust/Check EM voltage

(1) Put instrument in Analysis mode

(2) In the same manner, check “On” for “EM”. Uncheck the others. Click “Add to Queue” to Execute startup. Wait until optimization finishes.

Startup

Add to Queue Select Custom Settings Auto Sampler Nebulizer Pump Speed

<input type="checkbox"/>	Hardware Settings	On
<input type="checkbox"/>	Torch Axis	<input type="checkbox"/>
<input checked="" type="checkbox"/>	EM	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Plasma Correction	<input type="checkbox"/>
<input type="checkbox"/>	Standard Lenses Tune	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Resolution/Axis	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Performance Report	<input type="checkbox"/>
<input type="checkbox"/>	Full Spectrum	<input type="checkbox"/>
<input type="checkbox"/>	P/A Factor	<input type="checkbox"/>

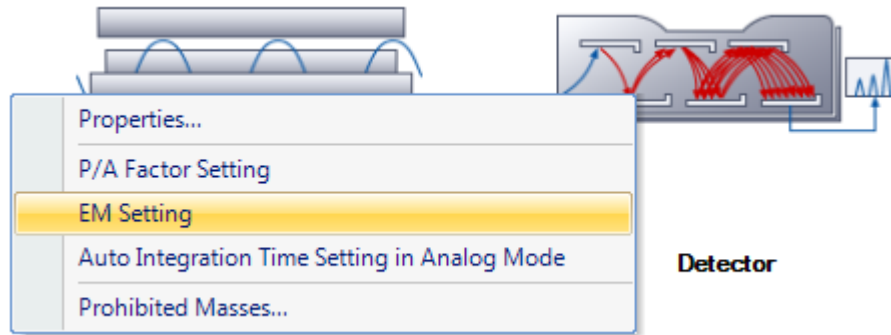
Standard Setting

Vial# Monitored Masses:

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2.4.2 Check EM voltage

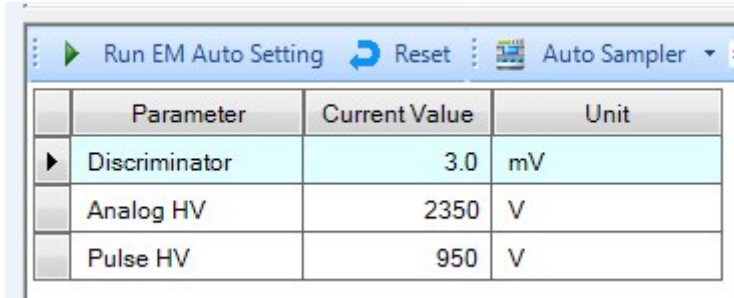
(2) Go to "Hardware" Pane. Right click on "Detector" and select "EM Setting" from the menu.



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2.4.3 Check EM voltage

(3) Confirm optimized value of Analog HV, Pulse HV



The screenshot shows a software window with a table of parameters. The window title bar includes 'Run EM Auto Setting', 'Reset', and 'Auto Sampler'. The table has four columns: a selection column, 'Parameter', 'Current Value', and 'Unit'. The 'Discriminator' row is highlighted in light blue.

	Parameter	Current Value	Unit
▶	Discriminator	3.0	mV
	Analog HV	2350	V
	Pulse HV	950	V

(4) Do any exceed the values below?

Analog HV: 2700 V

Pulse HV: 1500 V

If exceeded, your EM has come to the end of its life. You need to replace it.

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Yes

No

2.5.1 Maintain Ion lens

(1) Put the instrument in Standby mode.

(2) Remove ion lens.

Reference Hardware Maintenance manual → “Maintenance” → ”Extraction Lens-Omega Lens Assembly” → “Removal”

(3) Polish ion lenses

Reference Hardware Maintenance manual → ”Maintenance” → ”Extraction Lens-Omega Lens Assembly” → ”Disassembly” and “Cleaning”

(4) Assemble ion lenses and set in the instrument.

Reference Hardware Maintenance manual → “Maintenance” → ”Extraction Lens-Omega Lens Assembly” → “Assembly”

(5) Set skimmer cone and sampling cone to instrument.

(6) Ignite plasma.

(7) Is the problem solved?

Yes

No

3.1.1 Check if the tune mode uses cell gas

(1) Does the tune mode with the problem use cell gas?

Yes

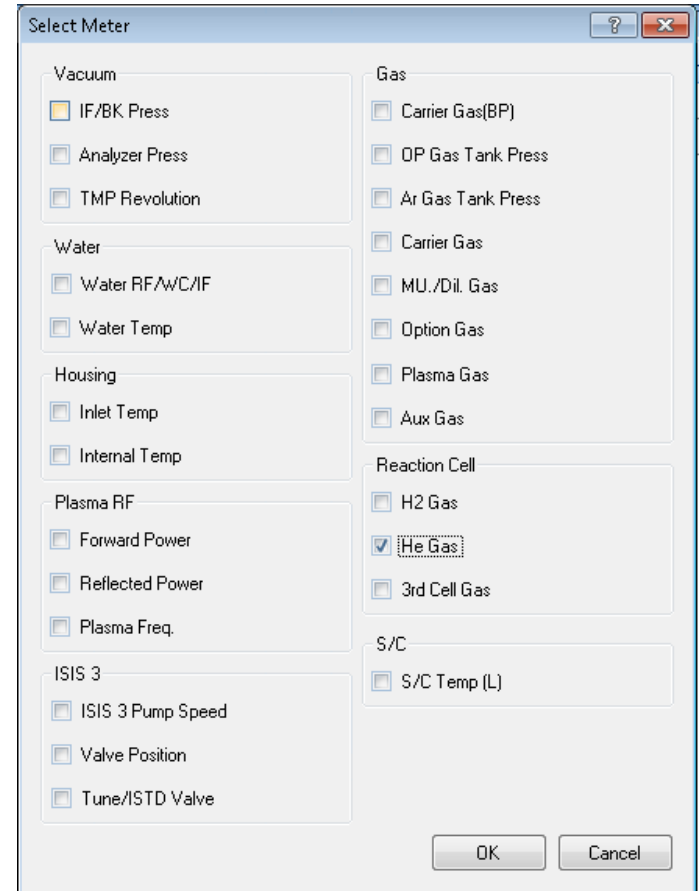
No

3.2.1 Check cell gas flow rate

- (1) Select “View” → ”Meters” in main menu of ICP-MS Instrument Control.
- (2) Check the cell gas for the tune mode with the problem.
- (3) Put instrument in Analysis mode.
- (4) Open the batch with the problem.
- (5) In tune screen, select the tune mode with the problem
- (6) In tune screen, click “Send to ICP-MS”

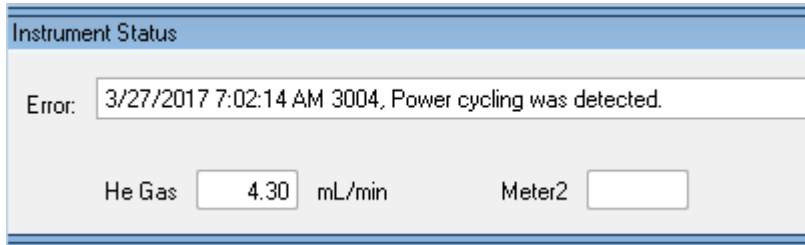
Note In case main menu is not displayed, press F10.

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3.2.2 Check cell gas flow rate

(7) Display “Instrument Status” using “View” → ”Instrument Status”.



The screenshot shows a window titled "Instrument Status". Inside the window, there is an "Error:" label followed by a text box containing the message: "3/27/2017 7:02:14 AM 3004, Power cycling was detected." Below the error message, there are two input fields. The first is labeled "He Gas" and contains the value "4.30" followed by the unit "mL/min". The second is labeled "Meter2" and is currently empty.

(8) Does the cell gas flow rate satisfy the criteria below?

He, H₂: ± 0.1 ml/min of the setting value

3rd, 4th cell gas: ± 2 % of the setting value

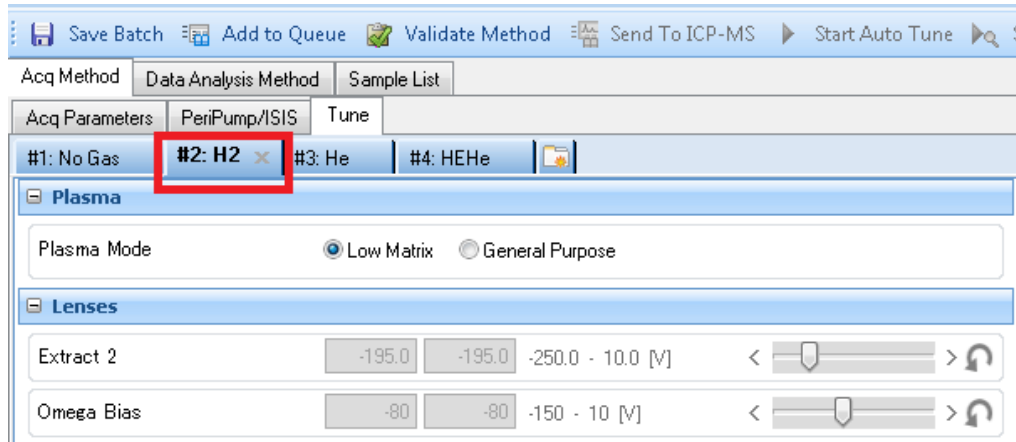
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Yes

No

3.3.1 Check tune parameters

- (1) Open the batch with the problem.
- (2) Go to tune screen and select the tune mode with the problem.



- (3) Are the values of the tune parameters the intended ones?



3.4.1 Fix the tune parameter

(1) Fix the tune parameters.

(2) Is the problem solved?

Yes

No

3.5.1 Check cell gas line

- (1) Check if all valves are open between the cylinder of the cell gas and the instrument.
- (2) Check if the residual pressure of the cylinder is enough (> 0.5 MP).

(3) Are they OK?

Yes

No

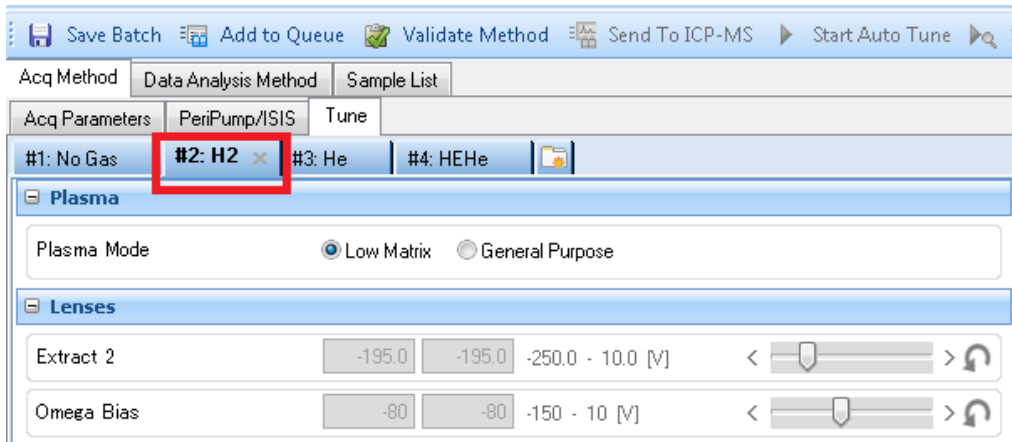
3.6.1 Check cell gas line

(1) Open the valves or exchange the cylinder with a full one.

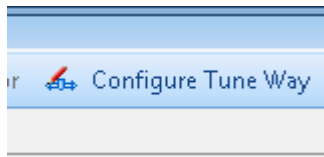


4.1.1 Check background without aerosol

- (1) Put the instrument in Analysis mode.
- (2) Open the batch with the problem.
- (3) Go to the tune screen and select the tune mode with the problem.

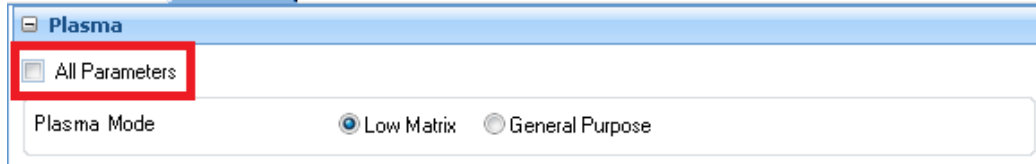


- (4) Click “Configure Tune Way” and set tune way “Signal Monitor”.

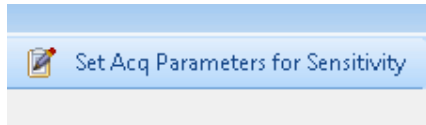


4.1.2 Check background without aerosol

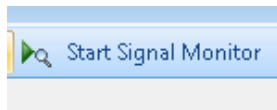
(4) Check “All parameters” in “Plasma” group.



(5) Click “Set Acq Parameter for Sensitivity” and set parameter so as to monitor the mass with high background.






(6) Start signal monitor with the “Start Signal Monitor” button .



4.1.3 Check background without aerosol

- (7) Set tune parameter “Nebulizer Pump” zero (in case of quartz glass nebulizer).
Set tune parameter “Carrier Gas” zero (in case of PFA nebulizer).

Carrier Gas		<input type="text" value="1.05"/>	<input type="text" value="1.05"/>	0.00 - 2.00 [L/min]
Option Gas		<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	0.0 - 100.0 [%]
Nebulizer Pump		<input type="text" value="0.10"/>	<input type="text" value="0.10"/>	0.00 - 0.50 [rps]

- (8) Does signal of the mass with the high background become more than 50% lower than before step (7)?
- (9) Set “Nebulizer Pump” or “Carrier Gas” to original value.
- (10) Click “Configure Tune Way” and select original tune way.

4.2.1 Rinse sample line

(1) Introduce 5% HNO₃ as sample to wash sample line.

(2) Keep 5% HNO₃ introduced for 30 minutes.

(3) Is the problem solved?

Yes

No

4.3.1 Disassemble and wash sample line

(1) Disassemble sample line and nebulizer.

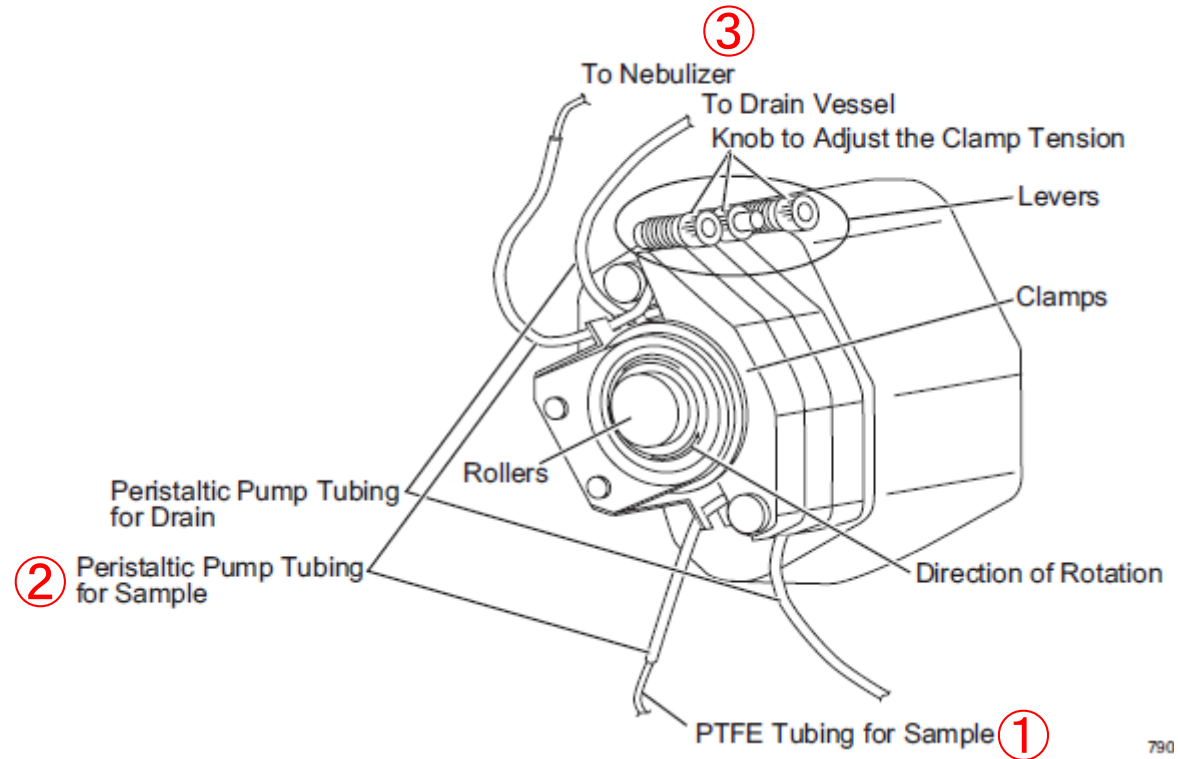
Reference Hardware Maintenance manual → “Maintenance” →” Peristaltic Pump Area”
→ “Internal Standard Tubing Kit”

Reference Hardware Maintenance manual → “Maintenance” →” Peristaltic Pump Area”
→ “Nebulizer and Spray Chamber” → “Nebulizer” → “Removal”

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4.3.2 Disassemble and wash sample line

(2) Maintain each part and re-assemble.



Note

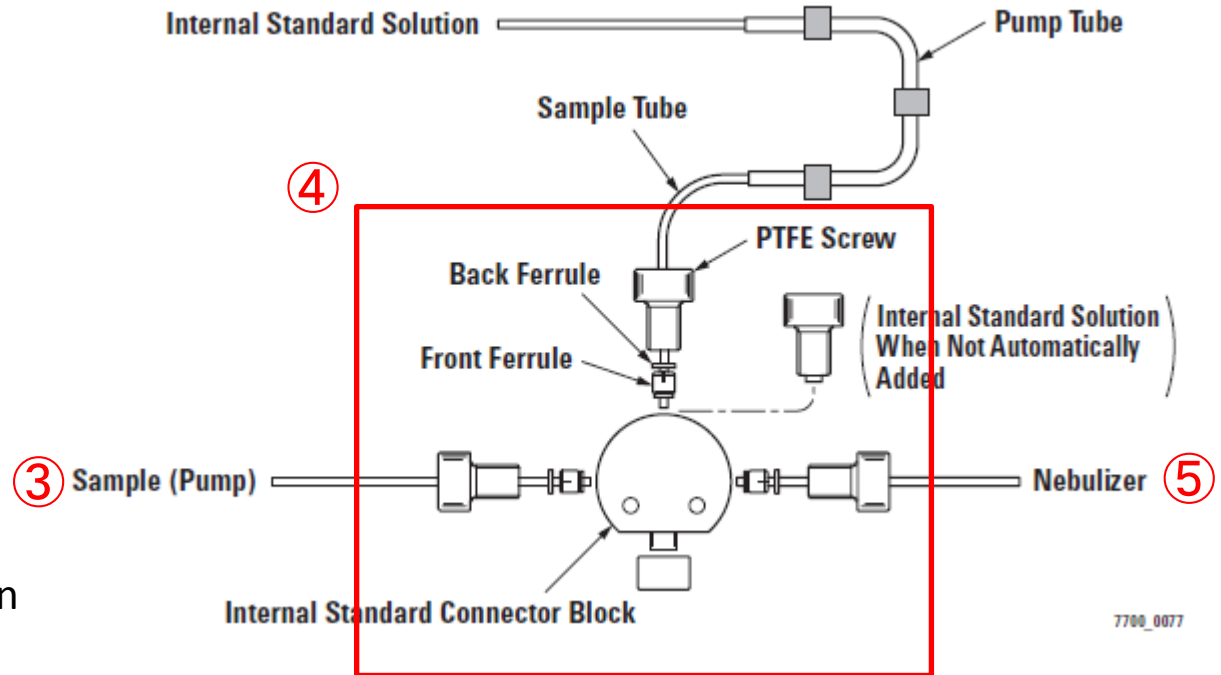
Instructions regarding maintenance of each numbered part are shown in later pages

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4.3.3 Disassemble and wash sample line

(2) Maintain each part and re-assemble.



Note

Instructions regarding maintenance of each numbered part are shown in later pages

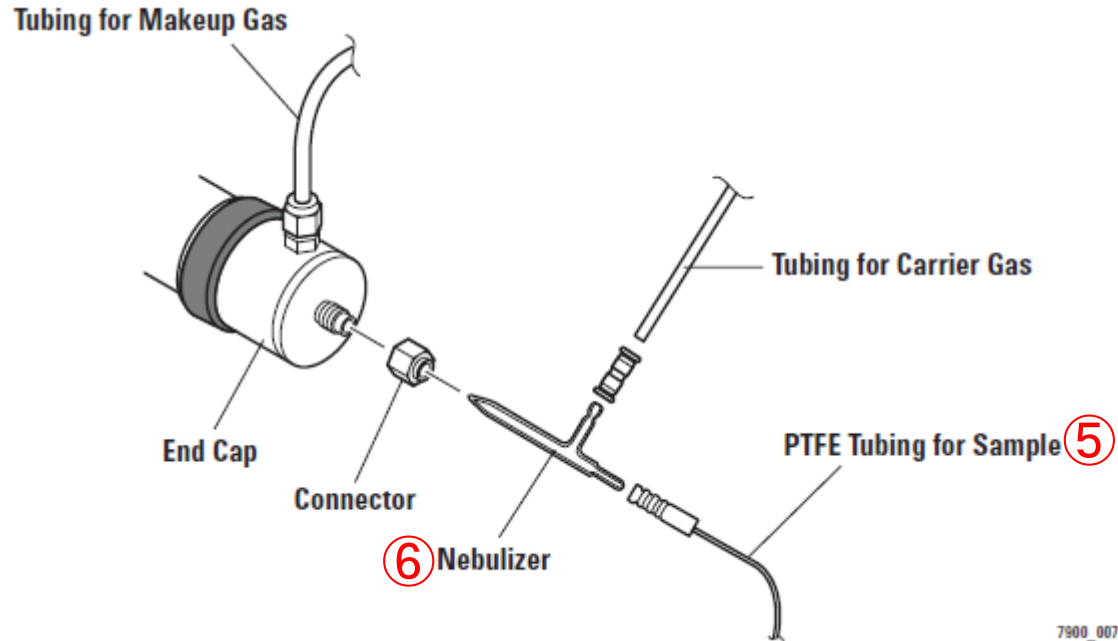
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4.3.4 Disassemble and wash sample line

(2) Maintain each part and re-assemble.



Note Instructions regarding maintenance of each numbered part are shown in later pages

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4.3.5 Disassemble and wash sample line

(2) Maintain each parts and re-assemble.

Parts	Way of maintenance
① ALS Probe (In case ALS is in use)	If there is a spare part, Replace with new one.
①' Sample tube [Sample – Peri Pump] (In case ALS is not in use)	Replace with new one.
② Peri Pump Tube	Replace with new one.
③ Sample tube [Peri Pump – 3 way connector]	Replace with new one.
④ 3 way connector/ PTFE Screw / Front Ferrule	30 minutes sonication in 5% NHO_3 .

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4.3.6 Disassemble and wash sample line

(2) Maintain each parts and re-assemble.

Parts	Way of maintenance
⑤ Sample tube [3 way connector - Nebulizer]	30 minutes sonication in 5% NHO_3 . If it does not solve the problem and there is a spare part, replace with new one.
⑥ Nebulizer	Reference Hardware Maintenance manual → “Maintenance” → “Peristaltic Pump Area” → “Nebulizer and Spray Chamber” → “Nebulizer” → “Cleaning”

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4.3.7 Disassemble and wash sample line

(3) Is the problem solved?

Yes

No

4.4.1 Disassemble and wash sample introduction system

- (1) Put instrument in Standby mode.
- (2) Disassemble sample line and sample introduction system.

Reference Hardware Maintenance manual → “Maintenance” →” Nebulizer and Spray Chamber”
→ “Spray Chamber” → “Removal”

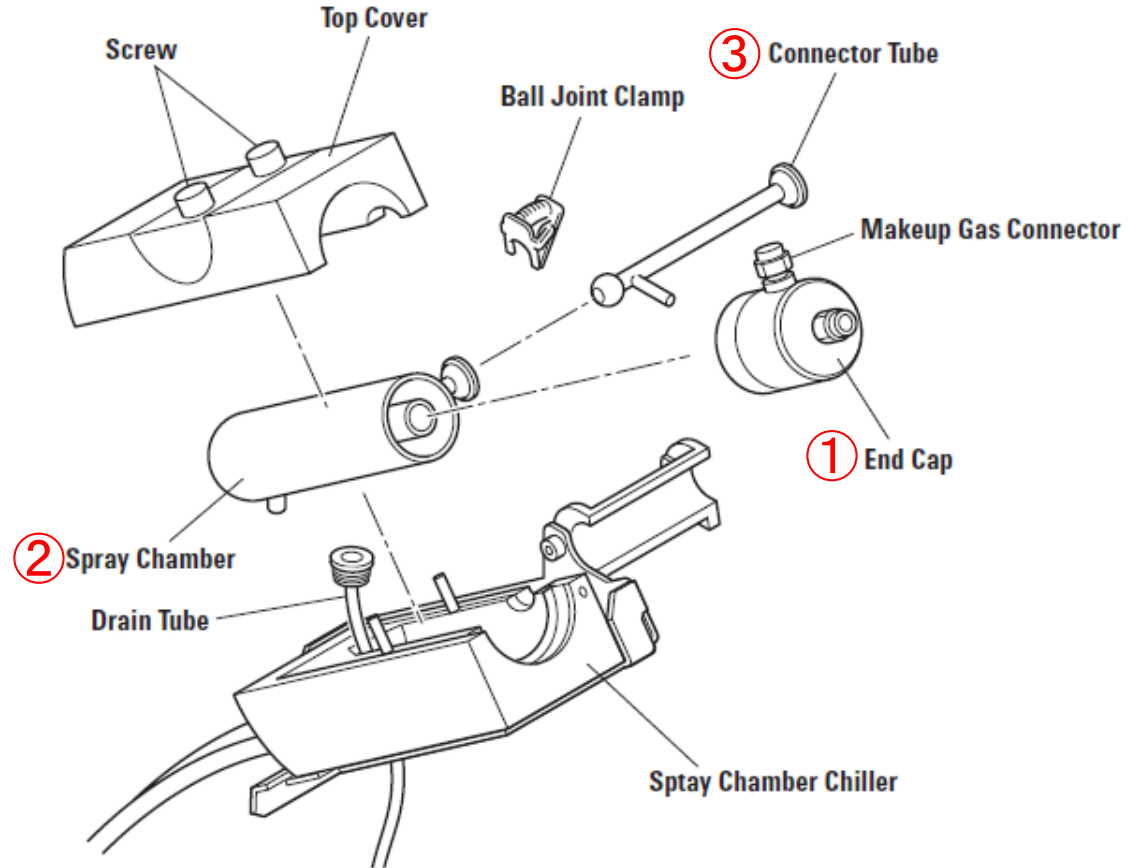
Reference Hardware Maintenance manual → “Maintenance” →” Torch Area” → “Torch”
→ “Removal”

Reference Hardware Maintenance manual → “Maintenance” →” Interface” → “Sampling Cone
and Skimmer Cone” → “Removal”

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4.4.2 Disassemble and wash sample introduction system

(3) Maintain each part and re-assemble.



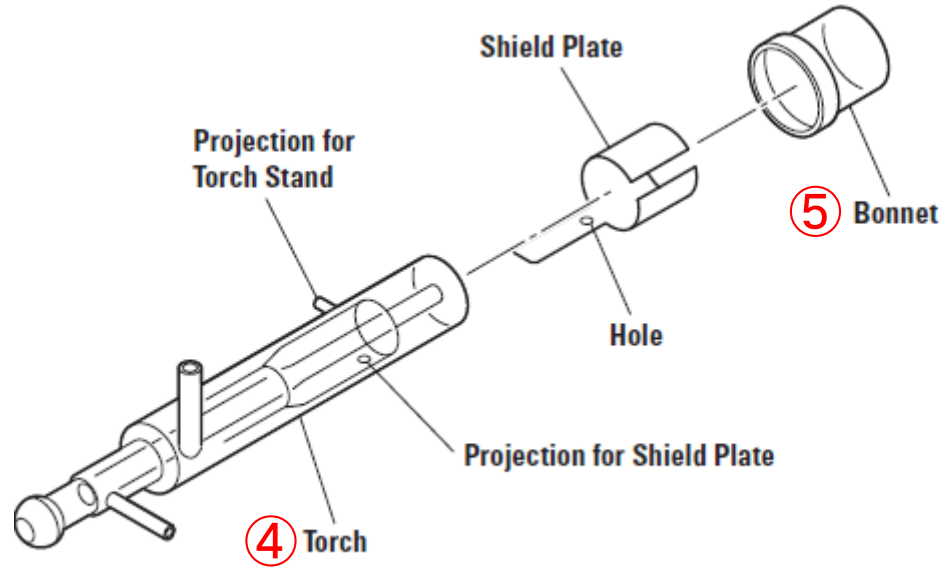
Note Instructions regarding maintenance of each numbered part are shown in later pages

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4.4.3 Disassemble and wash sample introduction system

(3) Maintain each part and re-assemble.



Note

Instructions regarding maintenance of each numbered part are shown in later pages

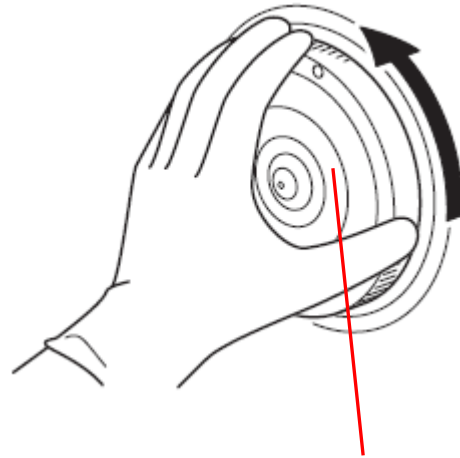
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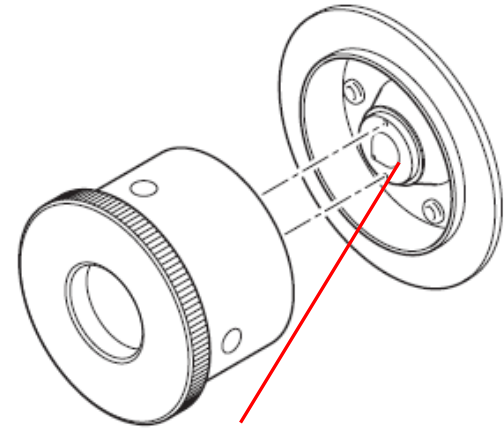
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4.4.4 Disassemble and wash sample introduction system

(3) Maintain each part and re-assemble.



⑥ Sampling Cone



⑦ Skimmer Cone

Note

Instructions regarding maintenance of each numbered part are shown in later pages

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4.4.5 Disassemble and wash sample introduction system

(3) Maintain each parts and re-assemble.

Parts	Way of maintenance
① End Cap	6 hours soaking in 5% NHO_3 .
② Splay Chamber ③ Connector tube ④ Torch ⑤ Bonnet	30 minutes sonication in 5% NHO_3 .
⑥ Sampling Cone ⑦ Skimmer Cone	Reference Hardware Maintenance manual → “Maintenance” → “Interface” → “Sampling Cone and Skimmer Cone” → “Cleaning the Cones”

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4.4.6 Disassemble and wash sample introduction system

(4) Is the problem solved?

Yes

No

4.5.1 Maintain Ion lens

(1) Put the instrument Standby mode.

(2) Remove ion lens.

Reference Hardware Maintenance manual → “Maintenance” → ”Extraction Lens-Omega Lens Assembly” → “Removal”

(3) Polish ion lenses

Reference Hardware Maintenance manual → ”Maintenance” → ”Extraction Lens-Omega Lens Assembly” → ”Disassembly” and “Cleaning”

(4) Assemble ion lenses and set in the instrument.

Reference Hardware Maintenance manual → “Maintenance” → ”Extraction Lens-Omega Lens Assembly” → “Assembly”

(5) Set skimmer cone and sampling cone to instrument.

(6) Ignite plasma.

(7) Is the problem solved?

Yes

No

5.1 End of procedure

Close this window.

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5.2 End of procedure

To solve the problem an engineer from Agilent is needed. Please contact Agilent using the link below.

<http://www.agilent.com/en-us/contact-us/page>

Close this window.

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