Owlstone ultraFAIMS-T1 Hardware Installation User Manual

Contents

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Notice of Proper Use of Owlstone Medical Ltd Instruments

The supplied system is in compliance with international regulations. If this system is used in a manner not specified by Owlstone Medical Ltd, the protection provided by the system could be impaired

Safety notice

Always observe the following safety precautions

- Use only the mains adaptor and leads supplied.
- This equipment is for use in moderate climates only (see Appendix). Do not use the equipment in damp or wet conditions.
- Avoid excessive heat, humidity, dust & vibration.
- Do not use where the equipment may be subjected to dripping or splashing liquids.
- Do not block the cooling duct whilst system is in operation.

Ensure the system is properly installed on the mass spectrometer according to the enclosed instructions before attempting to power on. Never operate the system unless properly installed on the mass spectrometer

Do not operate the ultraFAIMS system without an ultraFAIMS chip or test load attached.

Caution: risk of electric shock. Remove power from system before disconnecting from the mass spectrometer. Do not remove covers.

The ultraFAIMS control unit is rated 24VDC, 60W max. It is fitted with a fuse of type F3.15AH 250VAC fast-acting. Replace only with a fuse of the same type and rating.

PLEASE READ THIS DOCUMENT <u>BEFORE</u> SETTING UP AND POWERING THE SYSTEM

Contacting Owlstone Medical Ltd

Visit the OWLSTONE support website (http://support.owlstonenanotech.com) for up to date contact details and service support.

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System Description

The Owlstone ultraFAIMS products are field-asymmetric waveform ion mobility (FAIMS) pre-separators for use on Mass Spectrometers. They are used to separate or filter ions before they enter the mass spectrometer. This may provide a reduction in chemical noise or allow observation of ions that would otherwise be difficult to resolve in the mass spectrum.

The ultraFAIMS-T1 system the version intended for use on **Thermo Exactive** or **Orbitrap Mass Spectrometers**. These notes are provided to assist with understanding how to set up and use the system safely.

See the *Owlstone ultraFAIMS user interface software manual (OW-003401-TM)* for further information on FAIMS separation.

System Familiarisation

The system consists of the following items:

1. UltraFAIMS Control Unit (01-0480)

The control unit generates the FAIMS waveforms needed to drive the FAIMS chip.

It is controlled by the PC software supplied.

2. UltraFAIMS Chip Sealer Assembly (or Module)

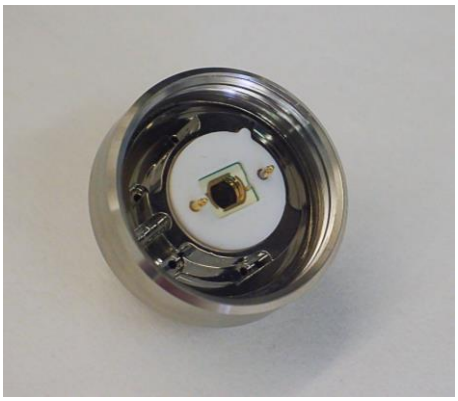
The chip sealer assembly (shown here inside the packaging) is the core of the ultraFAIMS system – this is the FAIMS device that produces the separation of ions as they pass through the fields applied across the channel.

3. ***Modified Back Cone (01-0532)***

The modified back cone provides the interface between the FAIMS chip sealer assembly and the MS inlet and routes the FAIMS waveforms to the chip.

The chip cone (cap) – below - holds the chip sealer assembly in place on the back cone interface.

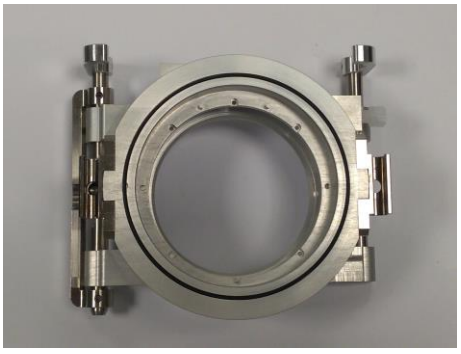
4. ***Chip Cone (Cap) (01-0401)***



The chip cone (cap) holds the chip sealer assembly in place on the back cone interface.

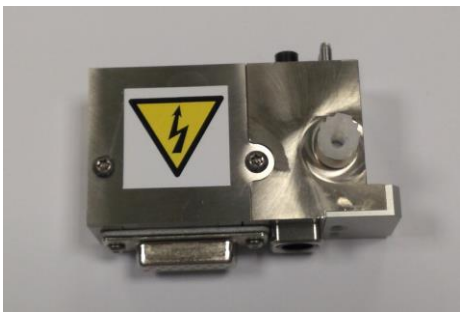
A chip sealer assembly is shown fitted in the center.

5. Adaptor Plate (01-0400)



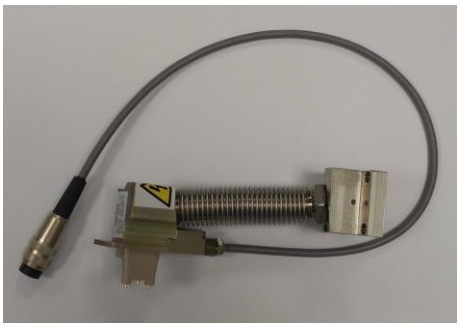
The adaptor plate (ring) is the interface between the mass spectrometer, the FAIMS module and the ionisation source.

6. Connection Extender (01-0355)



The connection extender is the interface between the mass spectrometer, and the ionisation source extending the gas and electrical connections to create the extra space needed for the FAIMS system to be fitted.

7. *Waveform (RF) feeder (01-0399)*



The RF waveform feeder connects the chip to the control unit so that the FAIMS waveforms can be applied. (Interlock sensor assembly is attached).

8. *Support extender pin (01-0479)*

The support extender pin fits over one of the ionisation source support pins to allow the source to be supported when the adaptor plate is in place.

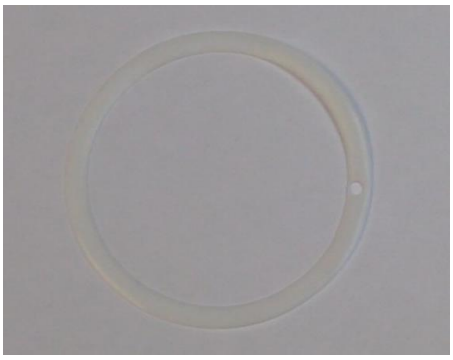
9. Power supply (01-0320)

The power supply consists of a 24V power supply “brick” with a custom connector.

10. External trigger cable (13-0165)

Information on how to use the external trigger cable is available on the Owlstone support website.

11. THE PTFE Gasket (02-1490)



The PTFE Gasket is used to provide a gas seal for the sweep gas, but may not be required.

12. USB cable (50-0974)

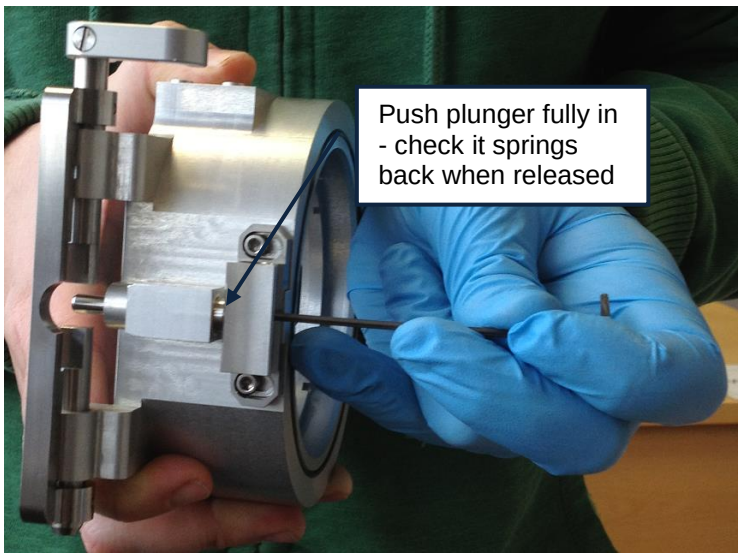
A standard USB A-to-B cable is used to connect the control unit to a PC.

Safety Information

Although FAIMS voltages can be hazardous, the ultraFAIMS-T1 system has protection in place to prevent users being exposed to any hazardous voltages during normal operation. Users should take note of the following:

- When a FAIMS sweep is underway, the RF voltages applied to the chip via the RF waveform feeder are considered hazardous live.
- An interlock on the RF waveform feeder ensures that these voltages are disabled when the RF waveform feeder is not connected to the adaptor ring. **Do not override this interlock.** This would result in hazardous voltages being accessible on the pins of the DF feeder.
- **The ultraFAIMS system is not designed to operate without a chip sealer assembly installed.**
- Do not try to run the system without
    - the chip sealer assembly (chip module) present in the modified back cone interface
    - the chip cone (cap) in place on the modified cone or
    - the cone interface mounted on the mass spectrometer.

  as this could potentially expose the user to hazardous voltages or cause damage to the ultraFAIMS system.
- Before installing the adaptor plate check that the high voltage interlock plunger moves freely on the mass spec (see below)



Installing the T1 System

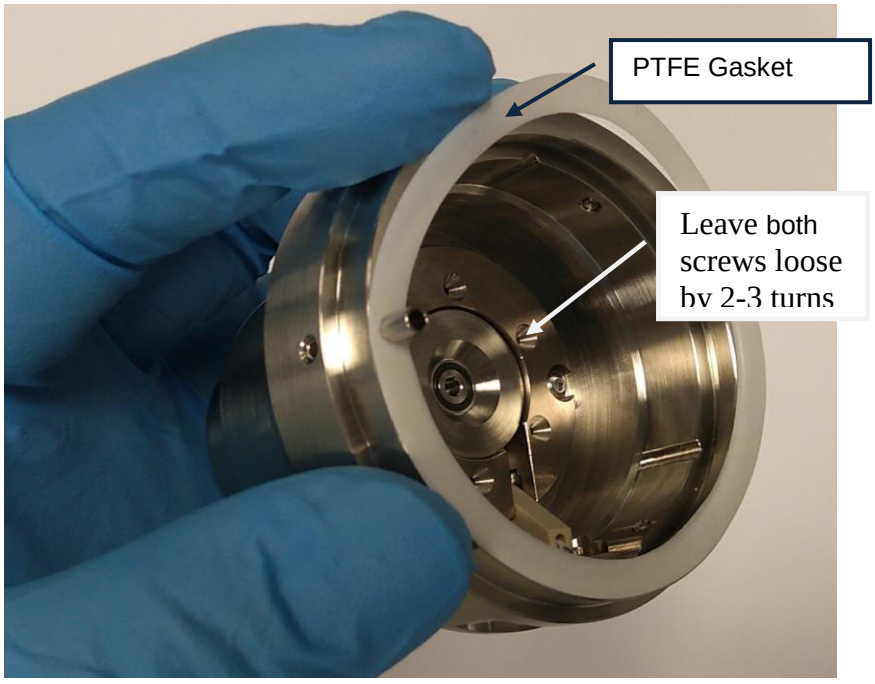
1. Remove any **ionisation sources** from the mass spectrometer and remove the **ion sweep cone** from the MS inlet.

   Check the MS user manual to discover how to do this.

2. As supplied, **the chip cone (cap)** is screwed onto the **T1 back cone**. Unscrew this.

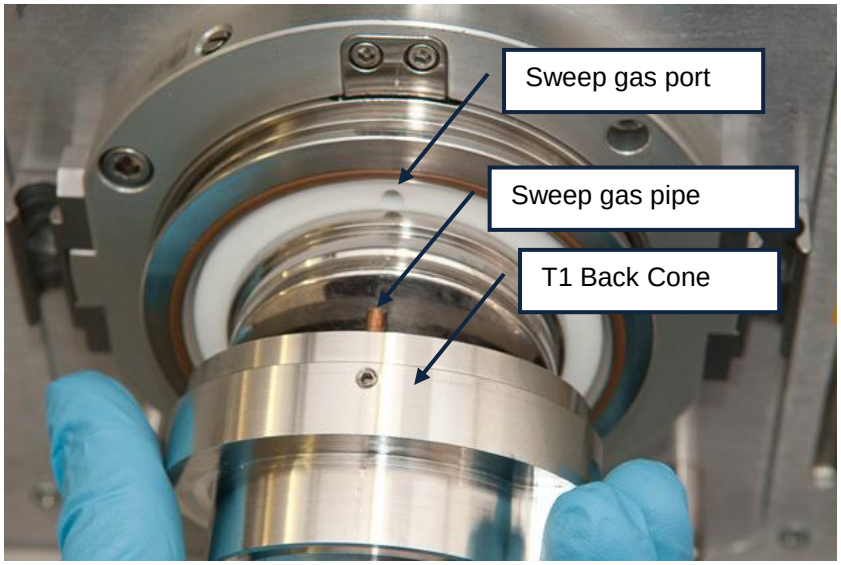
   Do NOT fit the PTFE gasket at first as it may not be needed. The image shows how it should be fitted IF REQUIRED

   Do NOT tighten the screws holding the internal insert in place – this must be slightly loose when fitted to the mass spectrometer).



3. Fit the**T1 back cone** on the MS inlet as shown.

   The sweep gas intake pipe fits into the sweep gas port above the spray cone



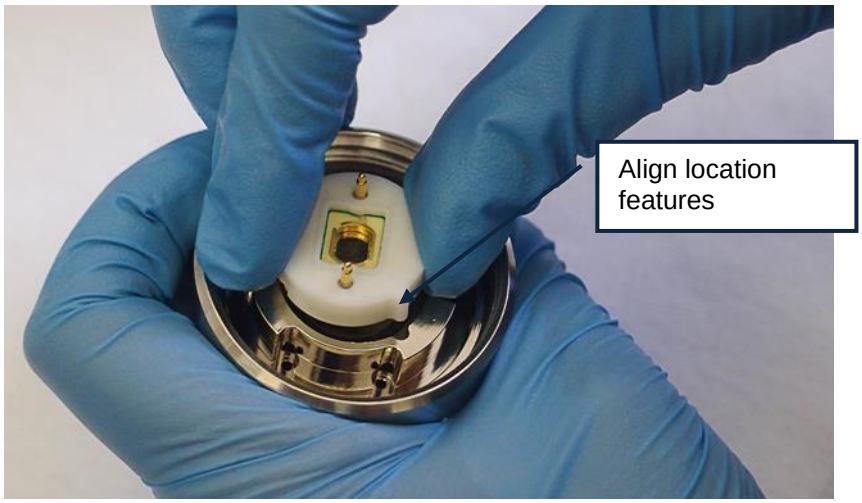
4. Tighten the 3 grub screws on the T1 back cone to secure it in place using the supplied 1.5mm hex key.

   To ensure a good seal around the rear face of the T1 back cone, push the cone towards the MS inlet while tightening the grub screws.

   Tighten (finger tight) all 3 grub screws and work around the T1 back cone to retighten and check them.

5. Choose the chip type to be used (NC or ND) and insert the chip sealer assembly into the **chip cone (cap),** aligning the notch feature as shown

   Check the chip for any visible particles on the (gold coloured) chip – remove if possible.



6. Fit the **chip cone**, aligning the location features on the **chip cone** with those on the **T1 back cone**

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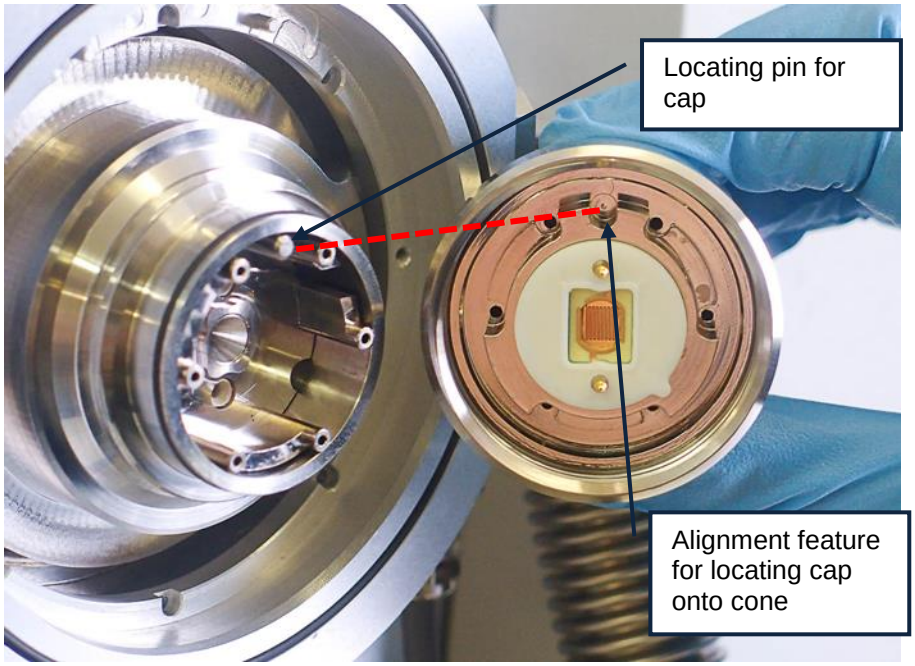
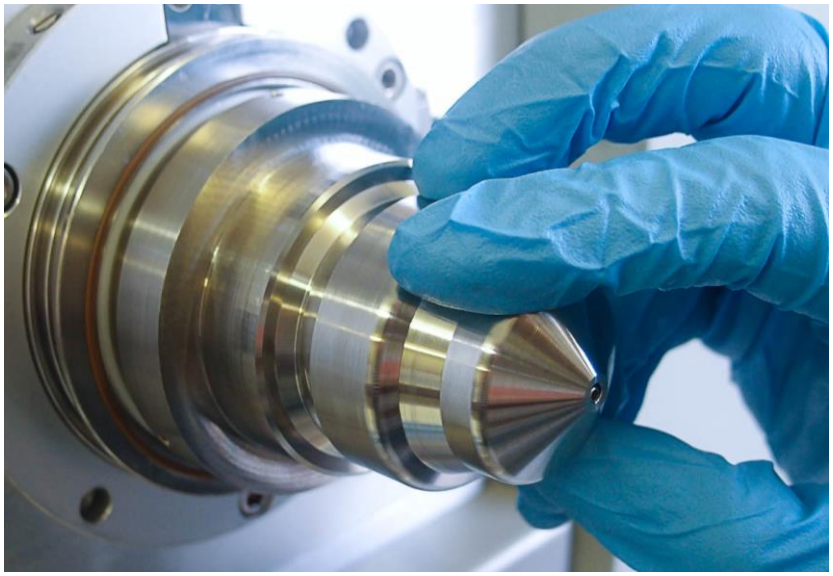


7. Push the **chip cone *inner***into position over the o-ring.

It should stay in position on the **T1 back cone**.

8. Screw in the chip cone (cap) outer part and tighten.

Tightening this sufficiently is essential as this pushes the small o-ring inside the **T1 back cone** onto the capillary on the mass spectrometer to form a seal.



9. Fit the **adaptor plate** (ring) onto the inlet – this connects in the same way as an ionisation source, with the connector block connecting to the sockets above the inlet and the mounting rods fitted to the side catches.

10. Rotate the rods to hold the **adaptor plate (ring)** in place.

    The rods can be stiff to turn and the left hand one may require some force to rotate. Adjusting the latch blocks forward and using metal shims behind them may help.

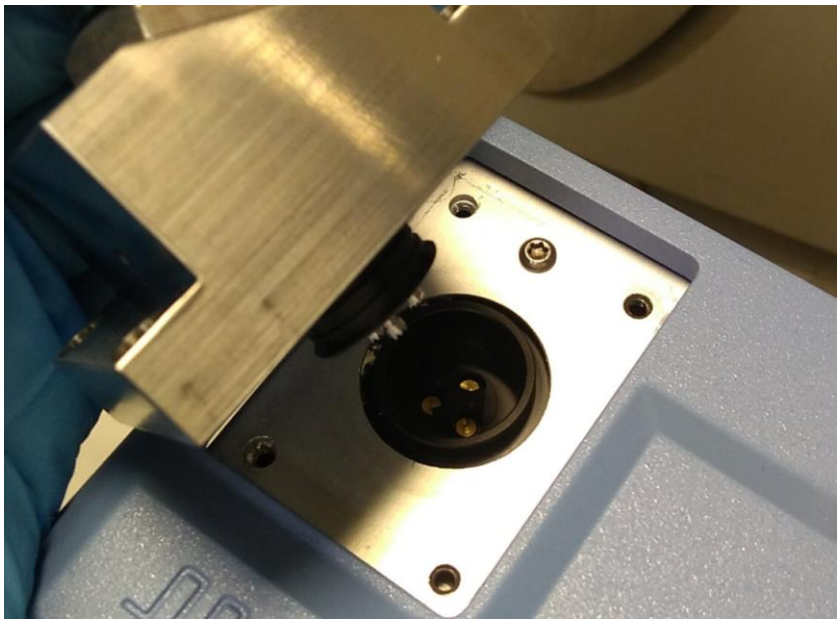
    Ensure the large o-ring is in place in the groove on the outer face.

11. Fit the **connection extender** above the **adaptor plate (ring)**

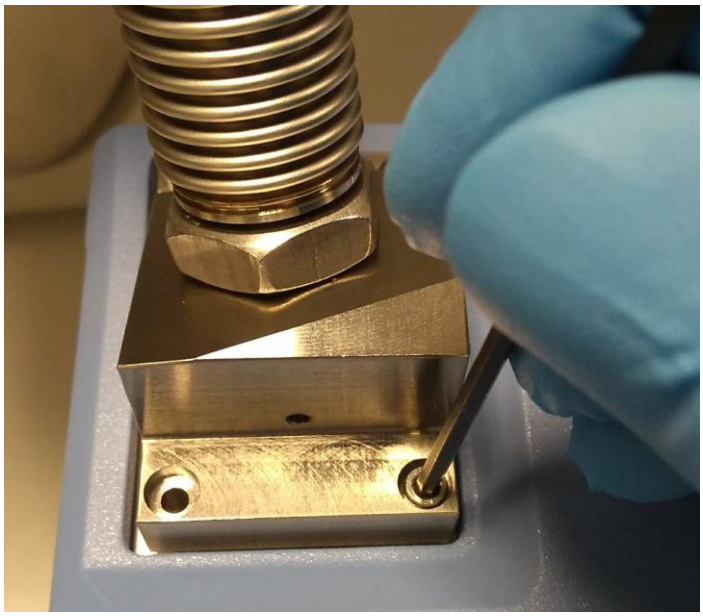
12. Fit the **support extender pin** over the bottom left source support pin on the mass spectrometer.

13. If not already done, fit the **waveform (RF) feeder** to the control module using the **M3x12** screws supplied.

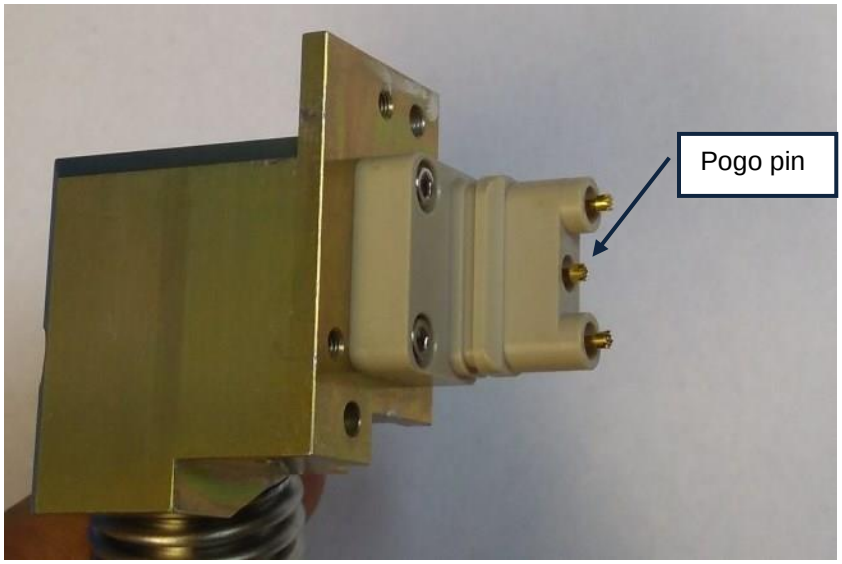
    Note the orientation of this part - with the slope of the metal to the outside of the box to get the correct alignment of the pins on the bottom of the **waveform (RF) feeder**



14. Use the supplied 2.5mm hex key to tighten all 4 screws.



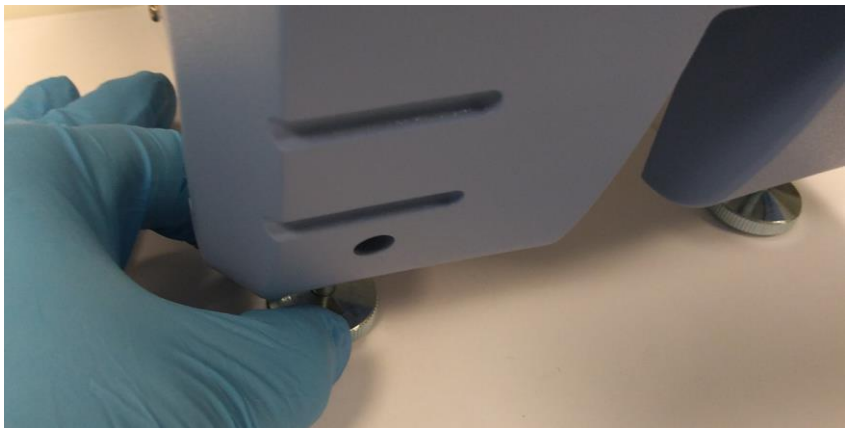
15. Check that all **three** of the replaceable pogo pins are fitted in the feeder.



16. Insert the connector of the waveform feeder into the socket on the right side of the **adaptor plate (ring)**

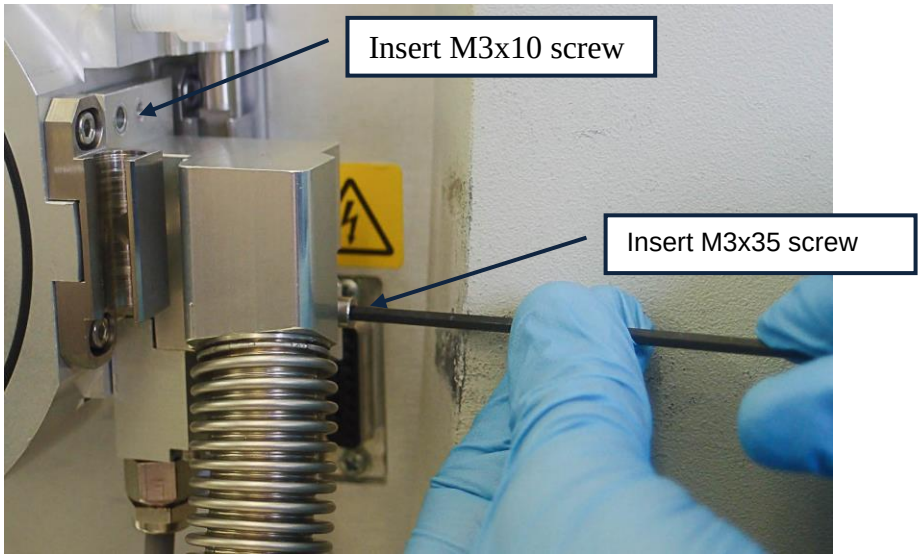
17. Adjust the extendable feet on the bottom of the control module so that it sits on the bench.

    If extra height is needed, a stand can be provided.



18. Use the screws supplied to secure the **waveform (DF) feeder** connector onto the **adaptor plate (ring)**.

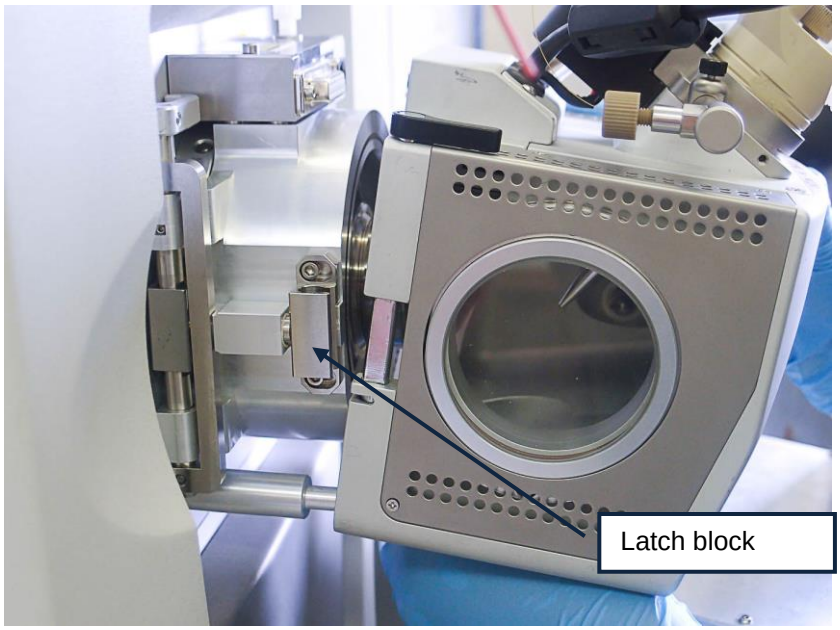
    Ensure there is no visible gap (> 0.2mm) between the **waveform (DF) feeder** and the **adaptor plate (ring)**



19. The ionisation source can now be mounted onto the **adaptor plate (ring)**, in the same way it is normally attached to the mass spectrometer

    The latch blocks are set to be 1.7mm from the face, but may need adjusting if the ionisation source doesn't fit.

    A Vernier calliper could be used to check that it they are parallel to the front face.



20. Connect the **USB cable** from the PC to the control module.

21. Connect the external **power supply** to the control module and plug in the power supply to the mains supply. Check the orientation of this plug as it can be forced on the wrong way around.

22. Connect the **interlock cable** attached to the waveform (DF) feeder to the *Interlock* socket on the control module.

23. If using the **external trigger cable**, connect this to the socket labelled *MS Interface*.

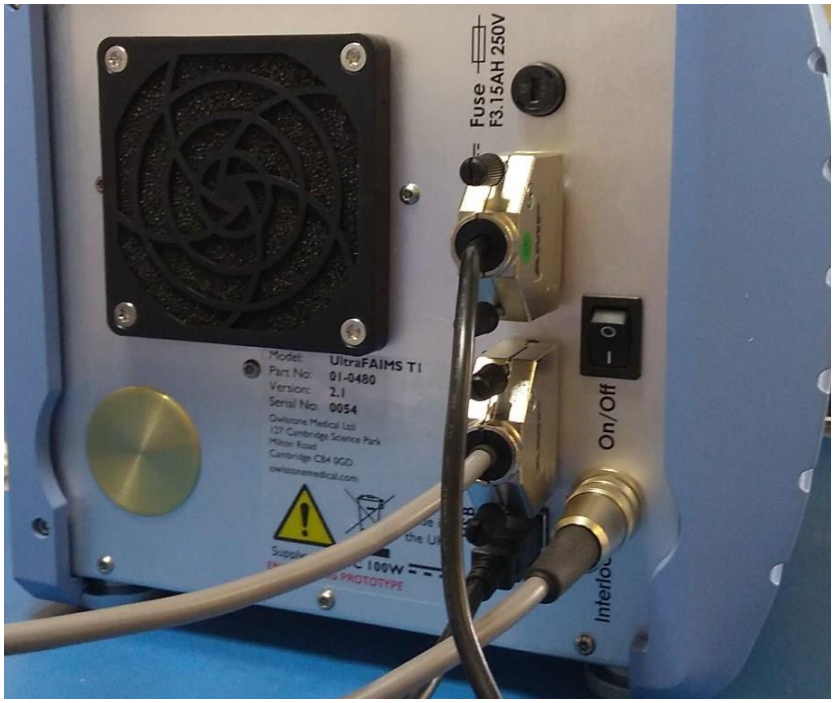
24. Install the PC interface software

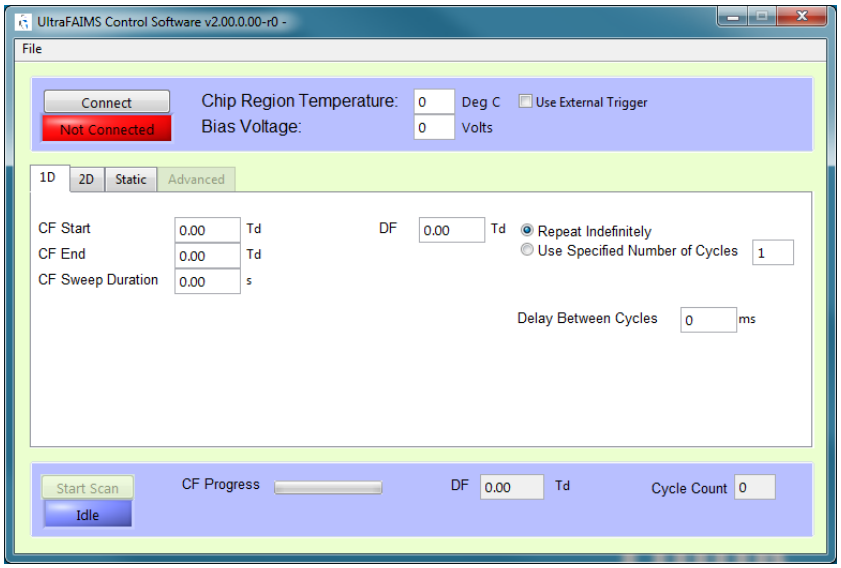
    See

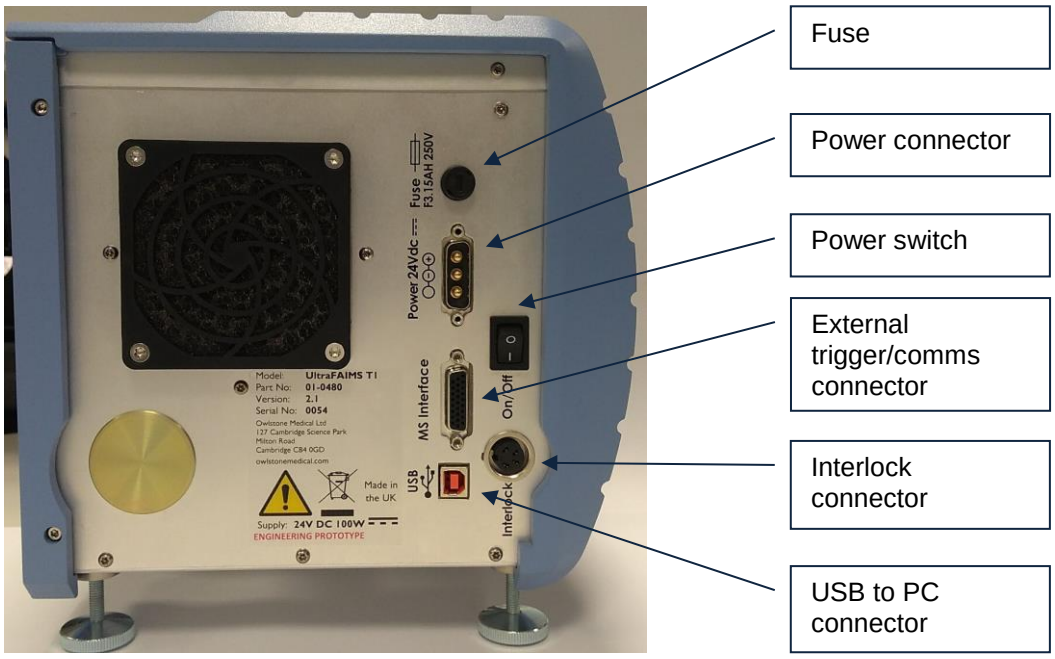
    OW-003401-TM Owlstone UltraFAIMS control software manual

    for details of how to do this.

    This software is available by request from the Owlstone support website.







Getting Started using UltraFAIMS

For general information on the use of UltraFAIMS please see the UltraFAIMS Training Material on the support website

https://support.owlstonenanotech.com/hc/en-us/sections/202712206

Removing the UltraFAIMS unit

To remove the UltraFAIMS unit from the mass spectrometer, please follow the above steps in reverse.

In particular, note that the adaptor plate (ring) and T1 back cone cannot be removed until the waveform (RF) feeder connector has been pulled out of the adaptor plate (ring).

Changing a Chip Sealer Assembly

To remove a chip sealer assembly from the system, for cleaning or to replace it with another chip:

1. Unscrew the **chip cone (cap)** from the **T1 back cone**

2. The PTFE **chip sealer assembly** is held in place in the cap by a single catch. To remove the **chip sealer assembly**, depress the catch (which can be accessed via the hole in the inner ring of the cap) using tweezers or other suitable tool, and lever the PTFE mount out. **IMPORTANT: do not try to remove by pulling on the gold connector pins as this may damage the chip.**

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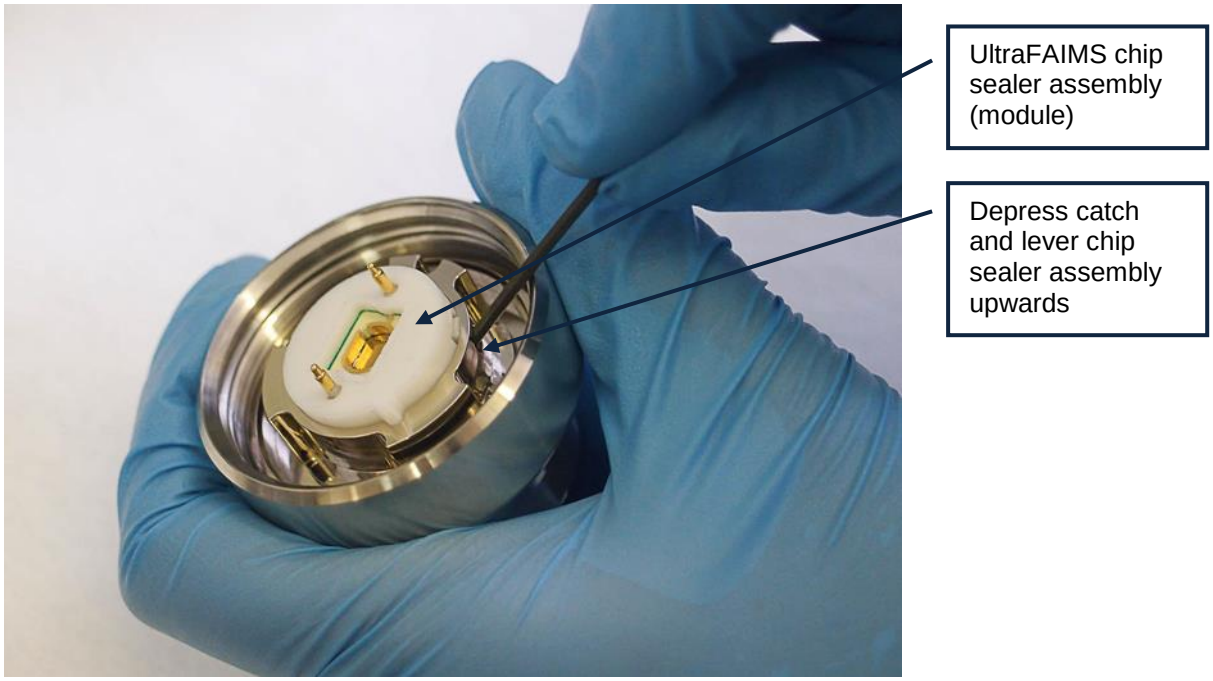
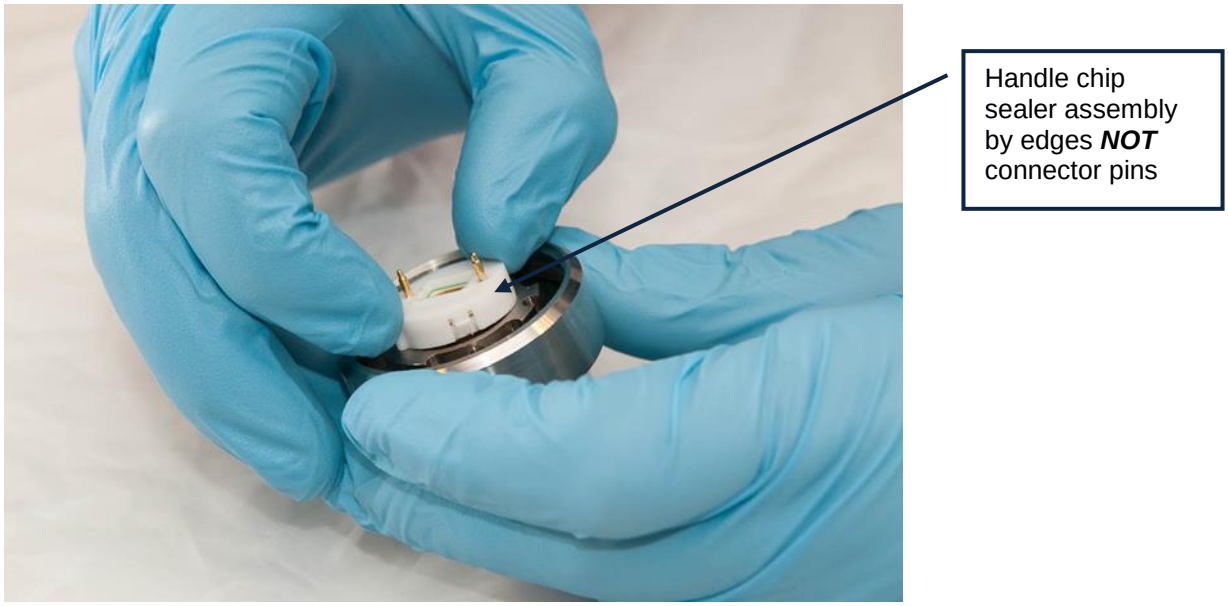




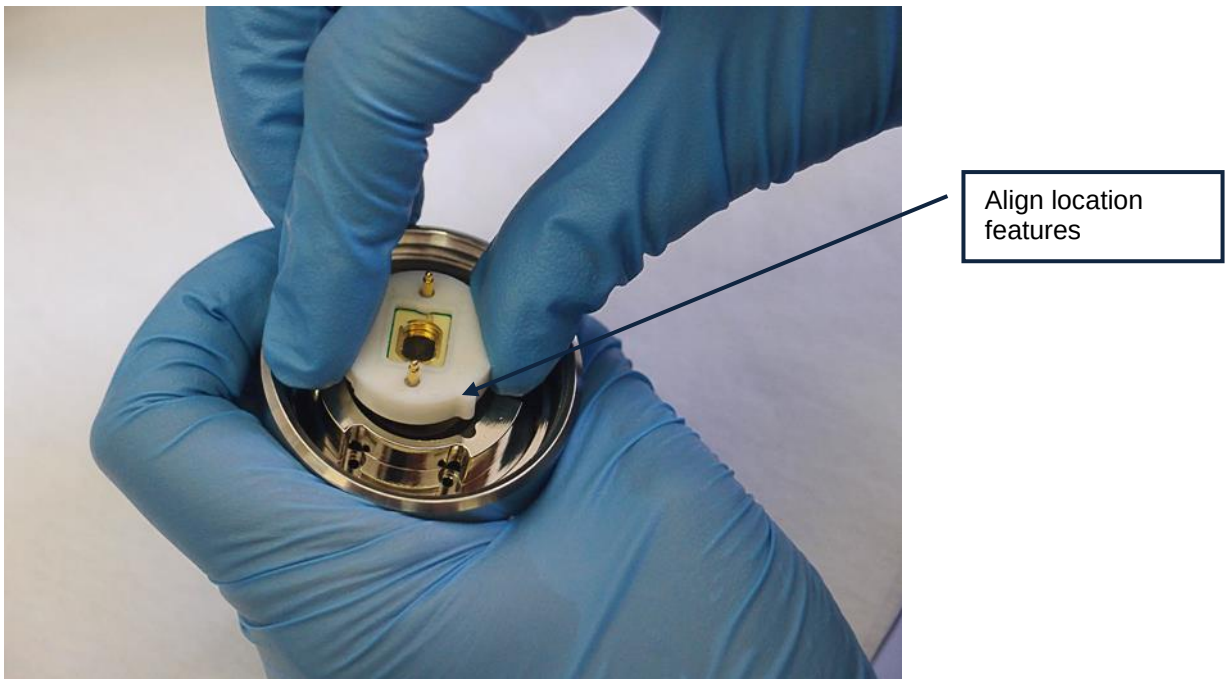
3. The **chip sealer assembly** can be cleaned by immersing in suitable solvents and sonicated, or by heating (up to 150°C).

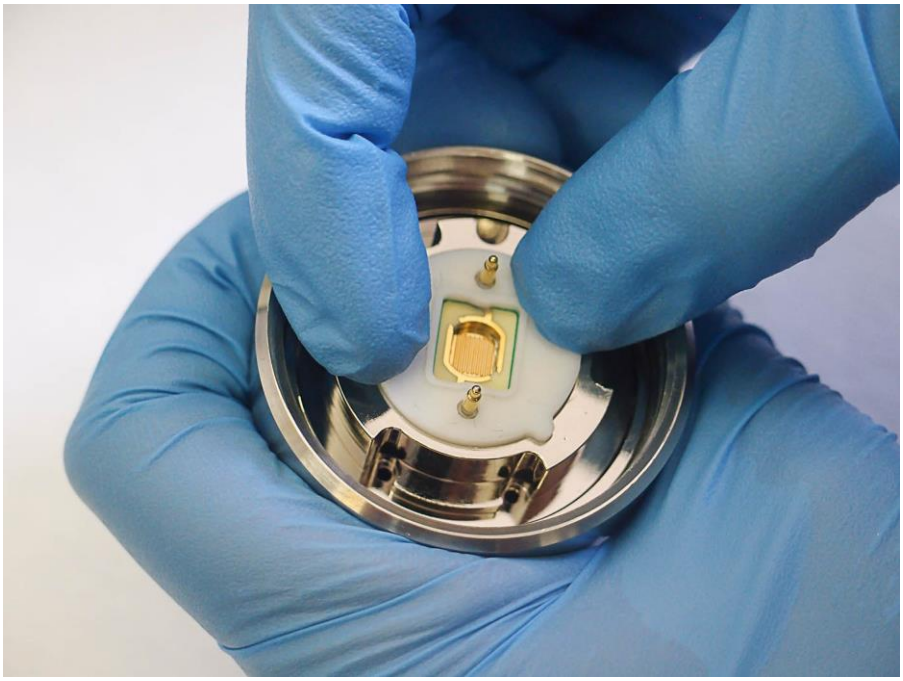
   Exposure to vacuum (e.g. in vacuum oven) is **not** recommended and may distort the chip mount.

   Ensure the **chip sealer assembly** is completely dry before applying FAIMS waveforms to the cleaned chip.

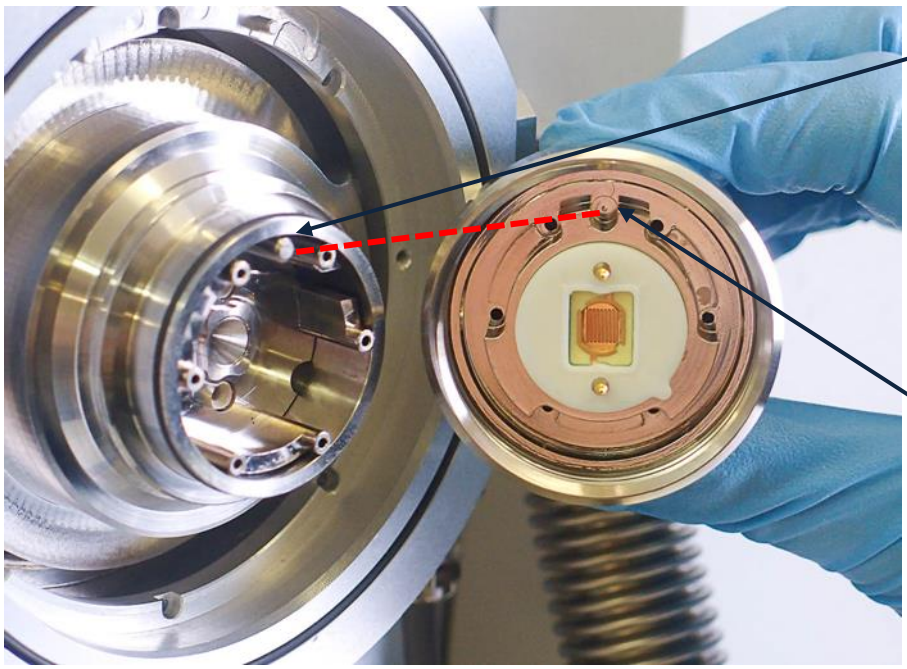
   Further advice on cleaning can be found on the Owlstone support website https://support.owlstonenanotech.com/hc/en-us/categories/201660986

4. To replace the **chip sealer assembly** in the cap, align the alignment feature (bump) in the PTFE mount with the corresponding recess in the inner ring of the cap and push it into place.





5. Align the gold connector pins with the holes in the **T1 back cone** and the alignment feature on the inner ring of the cap with the locating pin in the **T1 back cone**.



6. Screw the **chip cone (cap)** back tightly onto the **T1 back cone**.

Reminder: Do not operate the system without a chip attached.

Troubleshooting

Status LED Indications

Amber

An amber indication on the LED is a recoverable error. There are four conditions which could lead to an amber LED

1. Chamber door/interlock open –Check the interlock on the RF Waveform feeder is correctly fitted and screwed into the control module. Check that the sprung loaded pin on the left hand side of the **adaptor plate (ring)** is free to move.
2. RF temperature over limit - this means the air/and or the heater sink is too hot or the temperature difference between them is too large. Allow the system to cool, or operate it in a cooler location.
3. RF fan failure. Check that the fan can still be heard and that it is blowing air.
4. RF PSU overvoltage. This means the RF 135 power supply went above a safety level of 140V and caused the RF sub-system to be reset. This may mean that this power supply has failed.

Red

This indicates an unrecoverable error however if the cause of the fault (e.g a short of the connection pins) is removed, then a power cycle may recover the error.

Technical Support

Please contact Owlstone via the support website

https://support.owlstonenanotech.com/hc/en-us

or by emailing

support@owlstone.zendesk.com

for technical support and troubleshooting information.

Appendix – Operating Conditions

Type	Specification
Ambient operating temperature	15-35°C
Ambient storage temperature	5-50°C
Humidity	20-85% relative humidity at 35°C
Operating altitude	Up to 2000m