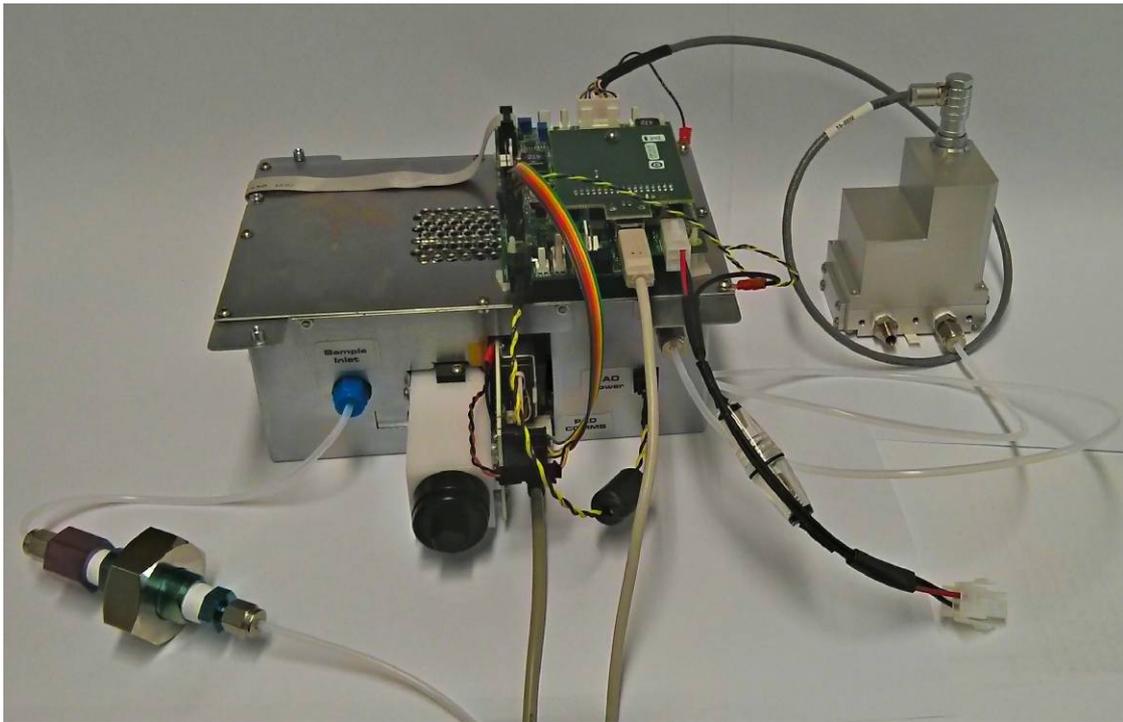




## UV-FAIMS PAD Development Kit User Manual

Issue/Version	Date	Author	Details
AAA	30/7/2010	Martin Holden	First Release
AAB	31/10/2013	Andrew Pauza	Renamed doc for consistency. Aligned with Lonestar Safety Notice documentation. Reformatted.
AAC	18/11/2013	Andrew Pauza	Further nomenclature changes and title change.
001	26/11/2013	Graham Newell	Placed under engineering change control



The UV-FAIMS ((Ultra Violet Field Asymmetric Ion Mobility Spectrometry) PAD Development Kit is an engineering prototype produced to meet the developmental needs of OEM suppliers. The unit is based around the UV-FAIMS functional block used in the Lonestar® system. The majority of the ancillary functional blocks present in the Lonestar® have been removed

## About this Manual

This supplemental manual contains all the information needed to set up to run the UV-FAIMS PAD Development Kit. Additional information can be found in various Lonestar® manuals, although not all aspects will be relevant to this unit.



It is essential that this user manual be read and understood before commencing any work with the system. Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device. Using the UV-FAIMS PAD Development Kit in a way that is not specified in this manual could be harmful to health of the operator and co-workers.

This symbol is used to highlight a section explaining particularly important safety considerations

## Contents

UV-FAIMS PAD Development Kit User Manual.....	1	Warning Labels.....	4
About this Manual.....	2	Safety Notice.....	5
Contents.....	2	Harmful substances.....	5
Notices.....	2	Chemical compatibility.....	5
Copyright.....	2	Setup Guide.....	6
Disclaimer.....	3	System Contents.....	6
Proper Use of Owlstone Instruments.....	3	Pre Installation.....	7
Contacting Owlstone.....	3	Before Starting.....	7
Owlstone Support.....	3	System Setup.....	8
Warranty.....	3	System Functionality.....	12
Returns.....	4	Service and Maintenance.....	13
Chemical Safety.....	4	Changing and cleaning the UV Bulb.....	13
Packaging.....	4	About Owlstone.....	15
Recycling and Disposal.....	4		

## Notices

### Copyright

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## Disclaimer

Owlstone Ltd makes no representations or warranties, either expressed or implied, with respect to the contents hereof and specifically disclaims any warranties, merchantability or fitness for any particular purpose. Furthermore, Owlstone Ltd reserves the right to revise this publication and to make changes from time to time in the contents hereof without obligation of Owlstone Ltd to notify any person of such revision or changes.

## Proper Use of Owlstone Instruments

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

## Contacting Owlstone

Visit the Owlstone® website ([www.owlstonenanotech.com](http://www.owlstonenanotech.com)) for up-to-date contact details.

For general inquires please email [info@owlstonenanotech.com](mailto:info@owlstonenanotech.com)

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CT 06851  
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## Owlstone Support

The Lonestar® User Manual, as well as other information and resources for Owlstone customers, are available at our support website:

<http://owlstone.zendesk.com/home>

For help with any further questions or problems, please contact Owlstone directly on our support address:

[support@owlstone.zendesk.com](mailto:support@owlstone.zendesk.com)

## Warranty

Owlstone Ltd warrants that equipment supplied will perform to the advertised specifications for a period of 12 months. Should any material failure of the product occur within 12 calendar months of delivery Owlstone Ltd will repair or replace the equipment free of charge given our satisfaction that sub-standard performance is genuinely the result of defective material or workmanship and not caused by fair wear and tear.

If required, please contact Owlstone Ltd for further detail regarding exact terms of the warranty.

## Returns

### Chemical Safety

Owlstone takes chemical safety seriously. Customers are **NOT** permitted to return hardware to Owlstone without prior authorisation. Please consult your Owlstone representative regarding the returns procedure.

Before equipment can be returned, customers are required to fill out a Decontamination Certificate and submit to Owlstone for review. After H&S review, Owlstone will issue a returns number (RMA#).

The Decontamination Certificate, p/n 90-0027, is provided in your document pack (supplied with the Lonestar®) and can also be downloaded from our support website.

Under no circumstances should equipment be returned to Owlstone without an RMA#.

### Packaging

Customers are encouraged to retain the original equipment packaging in case a future need arises for equipment return. Owlstone cannot take responsibility for transit damage due to poorly packed equipment.

For further advice regarding correct packaging of Owlstone equipment please contact Owlstone.

## Recycling and Disposal



This Product has been designed and manufactured with high quality materials and components, which can be recycled and reused.

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC so should not be disposed of in normal waste. In some locations the radioactive source has additional disposal requirements; please consult Owlstone Ltd for details of our recycling and disposal program for this product.

For users outside the European Union consult local authorities for correct disposal or contact Owlstone Ltd.

## Warning Labels



This warning label indicates parts of the product that will become hot during use. Please take care.



This warning label indicates danger of electrical shock hazard

## Safety Notice



Caution: Read these operating instructions fully before use and pay particular attention to sections containing this symbol

Always observe the following safety precautions:

- Only connect to an earthed supply socket. **THE MAINS ADAPTOR IS CLASS 1 CONSTRUCTION AND MUST BE EARTHED (GROUNDED)!**
- Ensure the mains outlet is easily reached to disconnect the unit
- Use only the supplied mains adaptor and leads supplied
- Always disconnect the equipment from the mains supply before moving
- This equipment is for use in moderate climates only. **NEVER** 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

## Harmful substances



The UV-FAIMS PAD Development Kit can be used with a wide range of samples some of which could be toxic or harmful. The UV-FAIMS PAD Development Kit is not a fully sealed unit, therefore for this reason it is essential that the user conduct a risk assessment for the substances to be used and establish safety protocols to cope with the release of such materials under the normal operation of the unit. These protocols must include suitable installation (e.g. in a fume cupboard, provision of extraction, etc.) and operational procedures to protect the operator.

## Chemical compatibility

Materials in the flow path include

- PTFE
- stainless steel
- aluminium
- silicon
- graphite
- gold
- glass coated stainless steel
- FR4 circuit board
- Viton®
- MgF (face of UV bulb)

Ensure test atmospheres are neither corrosive nor reactive with materials in the flow path and can be safely operated at 60°C. If in doubt please contact an Owlstone representative using the contact details provided.

Note that the relative humidity sensors are for indication only. Typically the humidity sensors are accurate to +/-5%, but they can be affected by the exact makeup of the process sample and can be easily altered or damaged by certain chemicals.

## Setup Guide

### System Contents

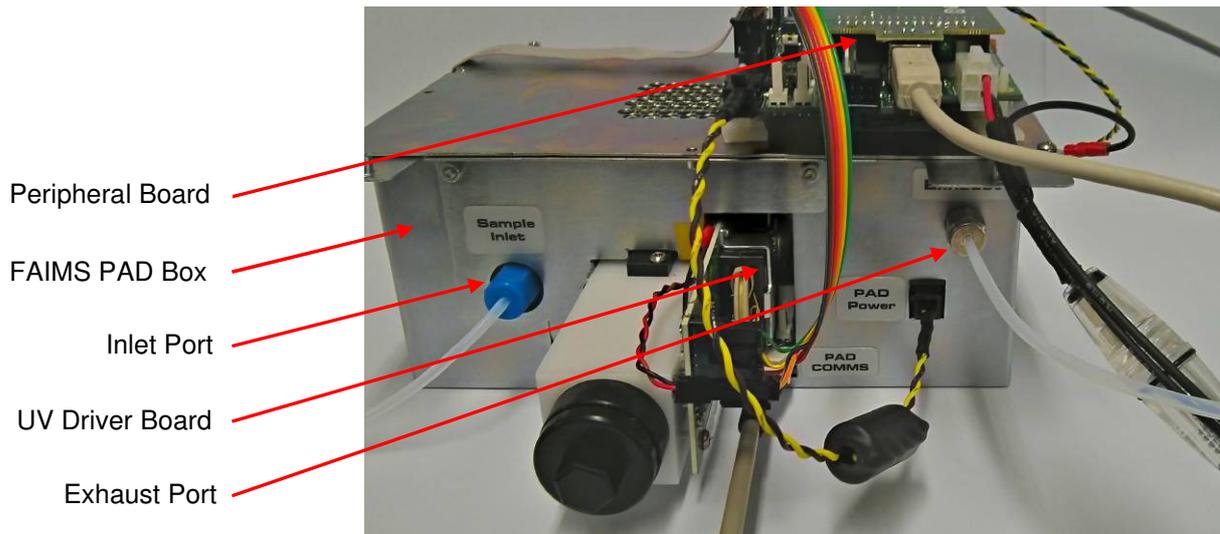
The UV-FAIMS PAD Development Kit will typically be shipped with the following:

- 01-0224 1 UV FAIMS Box Assembly
- 01-0042 1 Lonestar Peripheral Interface Assembly
- 01-0359 1 Staged Scrubber - 1/4" Swagelok fitting
- 01-0195 1 Inlet Filter Assembly
- 01-0080 1 Brushless Pump Assembly, External, Lemo connector
- 01-0431 Cables, UV FAIMS Box Development Kit
  - 13-0009 1 FAIMS Sensor Cable
  - 13-0159 1 USB, Laptop-FAIMS, Type A-5 way KK
  - 13-0073 1 PAD to Peripheral PCB Power Lead
  - 13-0074 1 FAIMS PAD Main Power Lead
  - 13-0080 1 PAD Power Supply Assembly (FSP 150W)
  - 13-0237 1 UV PAD Flow Sensor and UV Drive Cable Loom
  - 14-0384 1 USB 2.0, Male B to USB Male A Lead, 1.8m
- 13-0232 1 Lonestar External Brushless Pump, Peripheral PCB-Lemo Cable
- 50-1022 1 Laptop, Windows 7 Professional (+power supply)
- 50-0372 1 Mains lead, IEC C13 socket to EU 3-pin plug
- 50-xxxx 1 Power lead, XXX-plug to IEC C5 socket (*as required for region*)
- 50-0507 1 Swagelok Fitting, 1/8 in. Tube OD x 1/4 in. Female NPT (Glass coated)
- 90-0027 1 Owlstone Decontamination Certificate
- 90-0081 1 MSDS, Activated Carbon
- 90-0308 1 UV PAD Development Kit Instruction Manual (this manual)

A detailed packing list will be provided with your instrument.

If any of these items are missing or damaged then contact Owlstone Ltd immediately.

Please retain all items and packaging for return to Owlstone for annual service. No responsibility for damage arising from shipping using non-approved packaging will be accepted.



**Figure 1.** UV-FAIMS PAD Development Kit with inlet and exhaust ports, and the main PCB's indicated.

## Pre Installation

- Please see the Lonestar Documentation in the Pre-Installation Guide section in the Support area on the Owlstone [website](#).
- This gives guidance on air compressors, driers, zero air generators and other equipment that may be needed to generate air of sufficient quality to be used with the UV-FAIMS PAD Development Kit.

## Before Starting

- Ensure that the system is placed on a solid, level surface, which is able to support its weight
- Only use the Owlstone supplied power supply
- Ensure cabling is routed behind the system, at bench level, posing no risk of tripping. Ensure that all cables are detached before attempting to move the unit.
- Ensure that the ventilation holes are not blocked
- Do not place in space that is poorly ventilated or confined. Allow at least 50cm clearance from walls and free flow of air around the system
- Do not place near flammable materials
- Ensure that all power cables are intact with no damaged insulation or frays.
- Ensure the exhaust end cap is removed before applying flows otherwise the system may be damaged.



The pressure in any gas line connected to the system must not exceed 20psi

- Take care in removing and attaching Swagelok fittings to ensure fingers are not trapped or the instrument isn't damaged by over tightening.
- Do not open the unit – there is a risk of electric shock if covers are removed



A separate exhaust line should be made ready to connect to the exhaust outlet of the unit. This line should be checked for chemical compatibility and it is recommended that it is exhausted to a hydrocarbon trap or to a fume hood, depending on the findings of the risk assessment.

## System Setup

The following steps describe how to connect up the UV-FAIMS PAD Development Kit, with reference to Figure 2 and Figure 3 the cable connection schematic in Figure 5.

- Unpack the laptop and connect to the laptop power supply
- Unpack the UV-FAIMS PAD Development Kit and connect it to its power supply
- Unpack the USB cables and plug the two USB ends into the corresponding ports on the PAD box and Peripheral Interface Assembly and the other (Type A) ends into the laptop.
- Check that all other cables are seated correctly, as shown in Figure 6.
- Connect the gas flow cables (inlet and outlet) and pump as required to be able to get the desired gas flow rate and pressure inside the instrument. A basic schematic for the ideal gas supply setup for the UV-FAIMS Core unit is given in Figure 7.
  - The UV PAD unit will accept a 1/8" (0.125 inch, 3.175 mm) Swagelok fitting on both the inlet and exhaust.
- Power up the laptop.
- Start the Lonestar software from the windows start bar or the desktop shortcut.
- Follow the software instructions in the Lonestar manual. The UV systems have one main extra piece of functionality: the UV on-off button (see Figure 4)

Pump  
(optional)

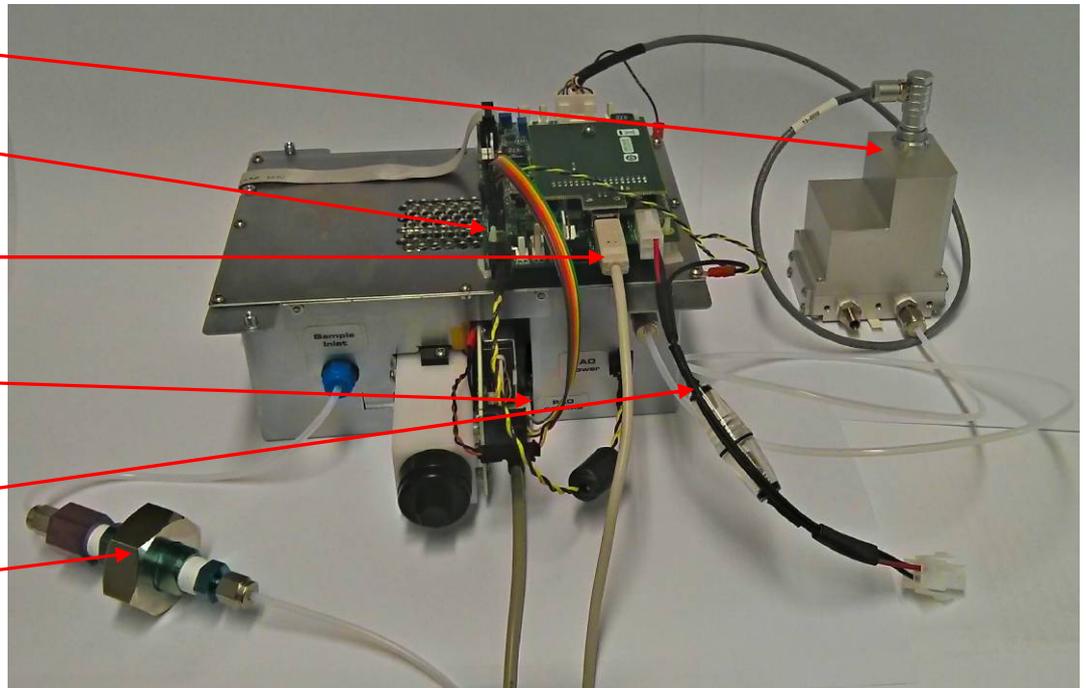
Peripheral  
board power  
connector

USB Cable  
(Male B  
connector)

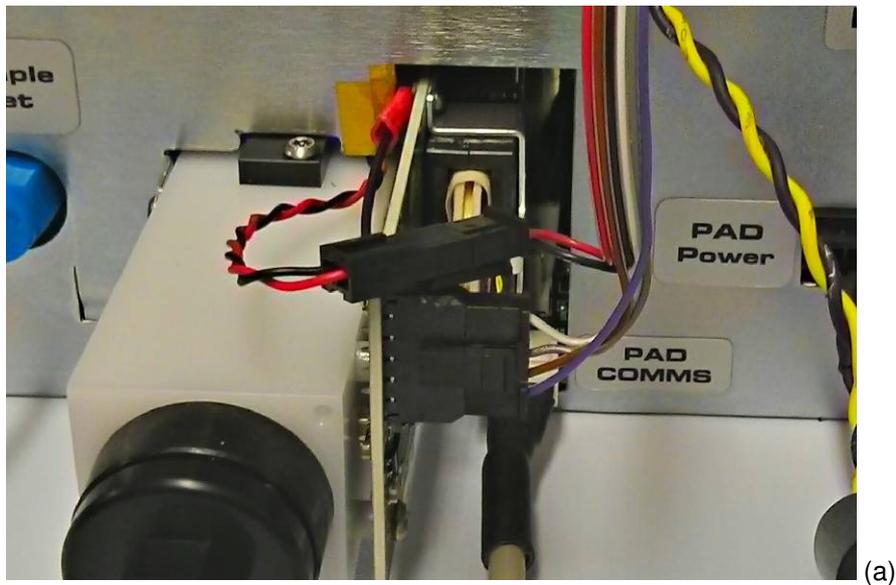
USB Cable  
(Molex C-Grid  
Connector)

Mains power  
connector

Inlet Filter



**Figure 2.** Power Supply and USB cable connections



(a)

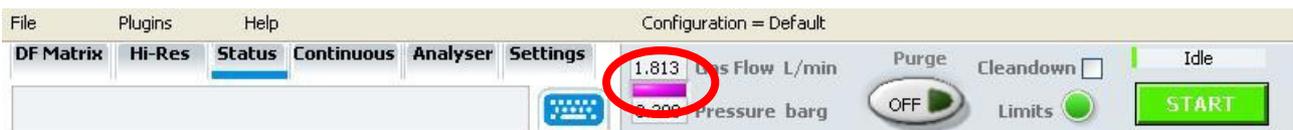


(b)

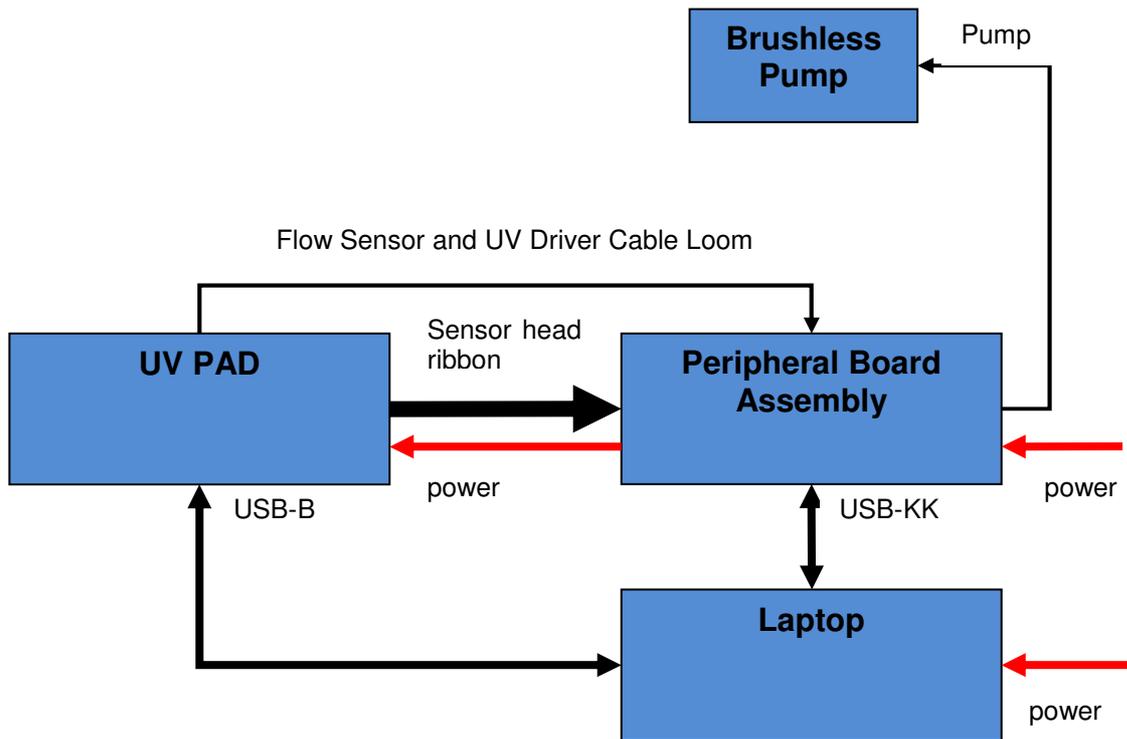


(c)

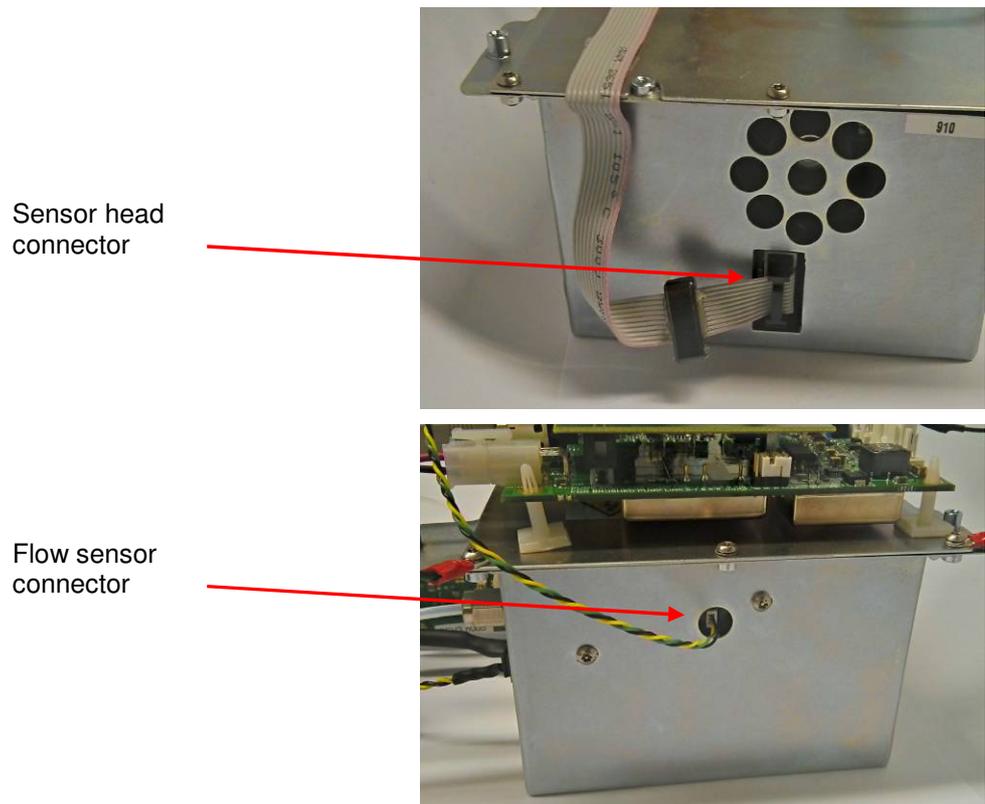
**Figure 3.** (a) Close up of the UV Driver PCB and blue LED connections (b) Close up of the USB-B and main power connections to the NI board (c) The pump connection to the interface PCB.



**Figure 4.** The violet rectangle which works as both a button and an indicator to show if the UV bulb is on or off (v4.9 software)

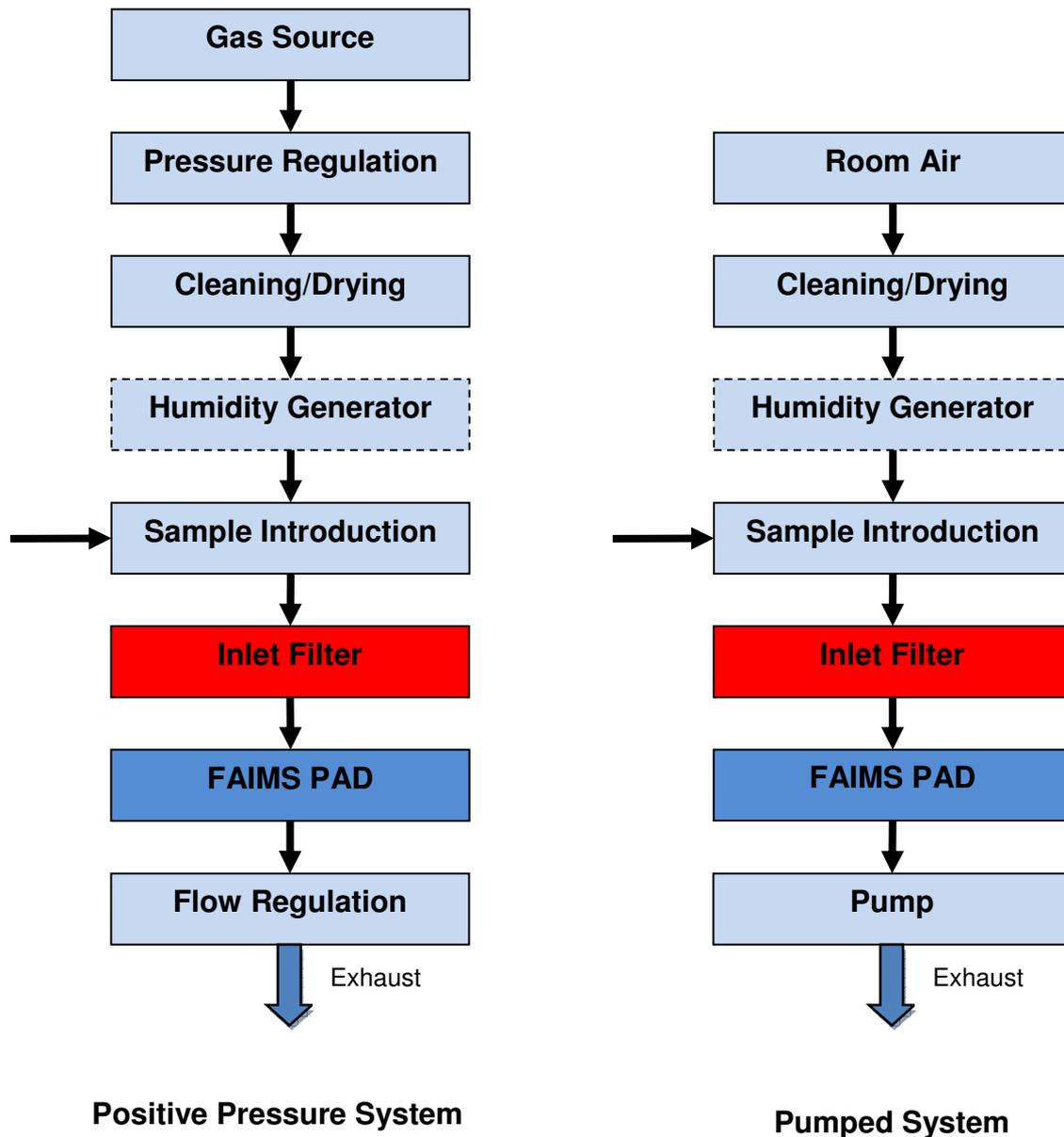


**Figure 5.** Schematic of the electrical connections on a UV-FAIMS PAD system.



**Figure 6.** Detail of sensor head and flow sensor connectors

It is important to note that the optimal total flow through the UV-FAIMS Core unit is 1 - 2.5 SLPM and that the maximum flow is 5 SLPM. **Please Note: Applying a total flow greater than 5 SLPM may cause damage to the unit.**



**Figure 7.** The gas flow path setup required for a positive pressure and pumped systems.

**Gas Source** – This should be air or an air equivalent (pure nitrogen) capable of producing sufficient flow with a pressure of 40 psi. This can be from a compressed air generator, nitrogen generator or a bottled gas supply. If a pressurised supply is not available then a pump must be used on the output of the system.

**Pressure Regulation** – To set the pressures in the system, a regulator must be fitted. This should be set to no more than 30 psi. The regulator used should be oil free if possible. The pressure regulator is not needed on a pumped system.

**Cleaning/Drying** – The scrubber is used to ensure the gas supplied to the unit is very dry and free of hydrocarbons. The detailed specifications for these are given in the Lonestar Technical Specifications document, available on the Owlstone website in the Support section.

We strongly recommend the use of a molecular sieve and activated charcoal in the gas supply line, or the use of the Owlstone scrubber cartridge. **Please note that molecular sieves may need replacement or regeneration to maintain their absorbent properties.**

**Humidity Generator** – This is not necessary, but can increase the scope of experimentation by introducing different humidity levels above the baseline concentration. There are many types available but they must be

fit in accordance with the rest of the gas line with respect to pressure and flow rates, Owlstone personnel can advise further on this matter.

**Sample Introduction** – This is the analyte to be studied and could be introduced directly as a gas or for non-gaseous analytes via an Owlstone Vapour Generator (OVG), Duran bottle etc. Owlstone personnel can advise on further this matter.

**Inlet Filter** – The system comes supplied with a 1 micron Inlet Filter. **THIS MUST BE USED IN ALL CIRCUMSTANCES.** The filter ensures that the FAIMS chip is not exposed to particulates that may damage it.

**(UV) FAIMS PAD** – The gas detection system.

**Flow Regulation/Pump** – The flow rate through the unit should be regulated with a flow meter or valve constriction down-stream of the UV-FAIMS PAD to avoid any potential areas of contamination. The UV-FAIMS PAD will report the gas flow rate which can be used to control the flow rate. A calibrated external flow meter can also be used. The flow regulation will also affect the pressure and may need to be balanced against the incoming pressure setting. The flow may also be regulated by the use of a pump, where the flow rate is controlled by the pump speed.

**Exhaust** –We advise the use of a wide-bore tube (PTFE, Tygon or silicone based) to avoid any effects on the pressure and flow regulation. This material must be compatible with any hazardous chemicals used in the analysis; refer to your COSHH assessment for further advice.

**Note:** the exhaust end-cap **MUST** be removed before any gas or gas mixture is passed through the unit. It is also very important to **replace the end caps** at the inlet and outlet of the UV-FAIMS PAD unit when the gas lines are disconnected to avoid contamination of the unit.

## System Functionality

The parts in the UV-FAIMS PAD Development Kit are the basic functional blocks of a Lonestar unit, however a number of functional blocks are not *always* included which may limit the system functionality. The following items are referred to in the main Lonestar user manual but are not always present on the UV-FAIMS PAD system:

**Scrubber Cartridge** – This produces a clean dry gas stream for the system. Without this, careful external conditioning of the gas flow is needed.

**Changeable Filter** – User changeable filter membrane contained within the inlet filter assembly.

**Inlet Filter Heater** – Reduces chemical “hang up” in the filter unit. The unheated filter supplied with the UV-FAIMS PAD may be a source of chemical “hang up”. It is recommended that this section is heated if possible

**Bypass Valve** – The Lonestar has the option of bypassing the sample inlet; this option is not available with the UV-FAIMS PAD Development Kit. The Lonestar software control of this valve will have no effect.

The UV-FAIMS PAD Development Kit has additional connectors on the Control Board to allow control over certain 3<sup>rd</sup> party electronic. For details contact your Owlstone Representative.

## Service and Maintenance

This interior of the equipment contains no user serviceable parts. Disassembly by users is NOT permitted. If your equipment requires maintenance or service other than a UV bulb change, please contact your Owlstone® representative. Return and repair details are provided below

### Changing and cleaning the UV Bulb

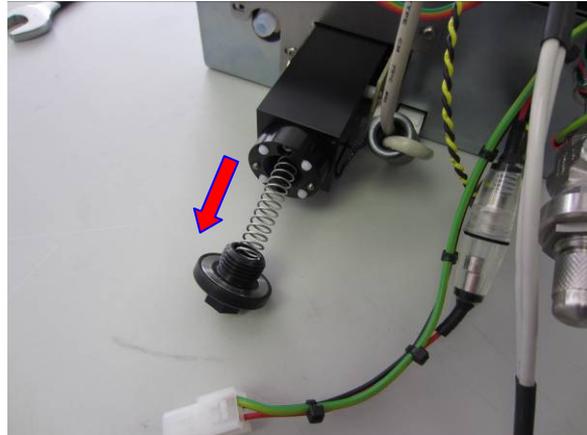
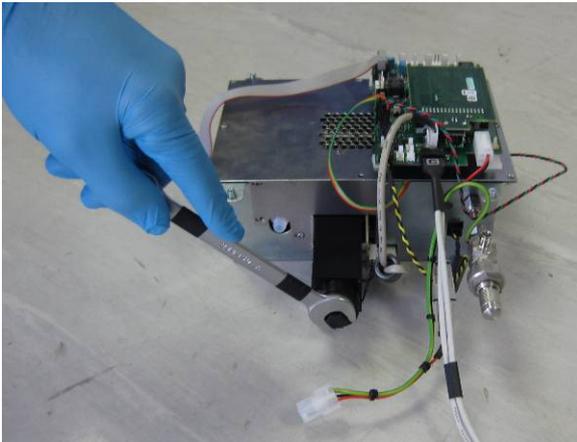
After an extended period of continuous running, a drop-off in sensitivity may indicate that the bulb needs cleaning or, if performance is not improved by cleaning, then it may need to be replaced.

Spare bulbs can be purchased from Owlstone. PN: 01-0378 “UV Bulb assembly, 10.6eV, Krypton”

1. Switch off the unit and unplug it from its power source and the USB connection to the computer
2. If practical leave a low flow of clean, dry air (100-200ml/min) going through the system to prevent ingress of dust whilst removing the UV bulb
3. Loosen the cap with a ½ inch spanner as shown in Figure 8 then unscrew using fingers. Be careful to catch the strong spring after about 5 turns.



Always wear protective eyewear when changing a bulb



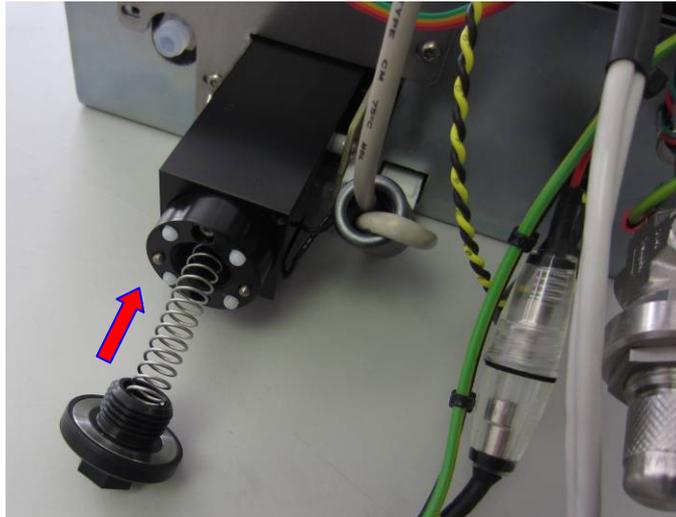
**Figure 8.** Unscrewing the cap holding the bulb in place

4. Pull out the bulb, it is attached to the rod shown in Figure 9



**Figure 9.** Bulb attached to holder.

5. To clean the bulb, wipe the window end with methanol using a clean, lint free cloth. **Never touch the window (MgF) end of the bulb with bare hands as this will damage it and reduce performance.** IPA can be used if methanol is not available
6. If replacing the bulb, clean the window before inserting it.
7. Push in the new/cleaned bulb gently, until it touches the castellated metal plate.
8. Re insert the spring and screw on the end cap as shown in Figure 10
9. Tighten **gently** with a ½ inch spanner **only if necessary** after tightening by hand.
10. Turn on the unit and check that there is a RIP peak in the negative mode with a flow of clean air > 1 L/min.
11. If the flow and pressure are less than expected, then tighten the end cap very slightly more until a seal is obtained.



**Figure 10.** Re-insertion of the UV bulb.

## About Owlstone

Owlstone develops and commercializes innovative new technologies to address the critical need for compact, dependable and cost-effective chemical and biological detection solutions for a wide range of markets.

Owlstone was formed through the recognition of the opportunities created by the application of micro- and nano- technology to develop improved sensing solutions.

Owlstone is focused on the innovation of detection technologies to address unmet needs, developing solutions that are flexible enough to target a range of markets with the potential for growth by enabling new application opportunities.

From homeland security to home safety, Owlstone is working with leading manufacturers and integrators across a range of markets to develop products incorporating our microchip chemical sensing solution.

Owlstone is headquartered in the United States and has laboratory facilities in the United Kingdom. Owlstone Ltd was founded in 2003 with a seed investment of two million dollars from Advance Nanotech, Inc., a New York based company specializing in the investment in and commercialization of nanotechnologies.