



BWB
FLAME PHOTOMETER RANGE
SERVICE MANUAL



Why have we made this guide horizontal?
Protecting the environment is a key concern for us here at BWB. This manual was created with the intention of being read on modern PC monitors to prevent the need to print onto paper. Paper copies are available on request for a small charge.



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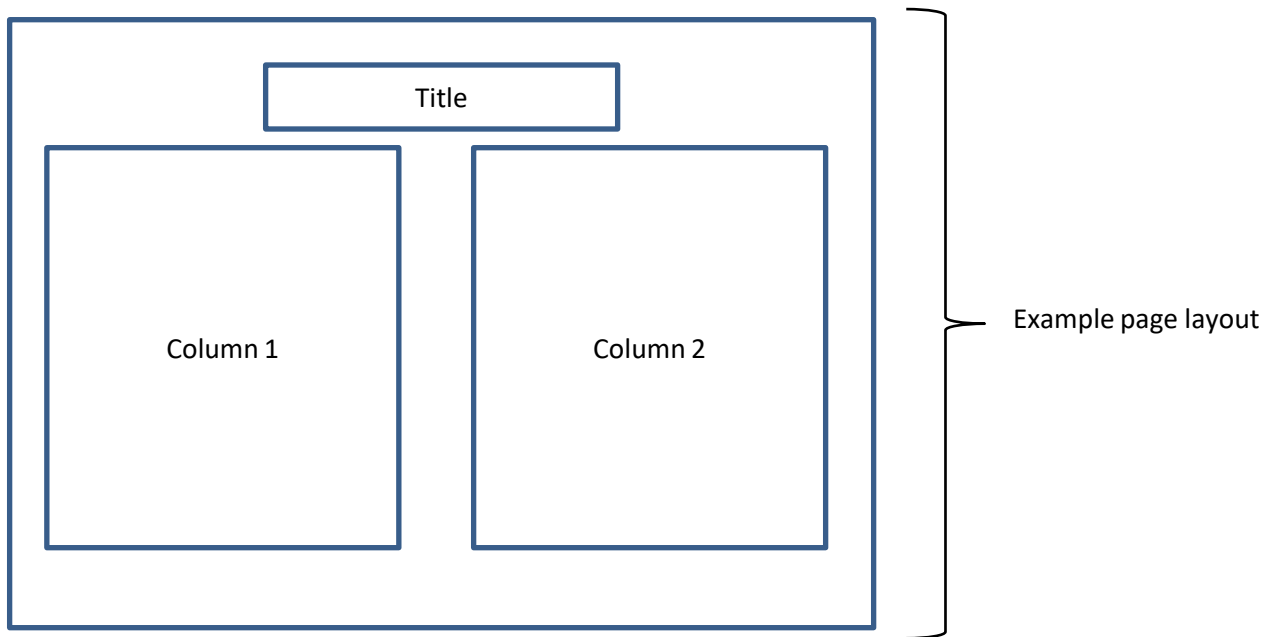
* Due to launch mid 2021

Ensure you read this manual cover to cover before attempting to use the instrument. Analytical instrumentation is very sensitive and BWB Technologies Ltd will not be held responsible for operators failing to follow correct processes.

This manual has been written in English, any translations have been conducted at the discretion of the distributor or importer. The English version will always take precedence where required.

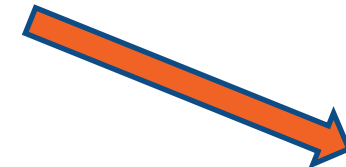
How to use this manual

This manual has been constructed in a similar manner to a newspaper with up to 2 columns per page.



Where required a hyperlink is indicated by [blue underlined](#) text. The link can be clicked to take you to an appropriate section within the manual.

Page numbers are found in the bottom corners.



CONTENTS

Safety	7	Gas flow schematic.	44
Hazards	8	Gaining access to the instrument enclosure.	45
Operational recommendations	9	Component overview.	47
Introduction	11	Instrument main chassis.	47
Unboxing	12	Instrument front panel.	48
Front panel controls	13	Replacing components.	49
Rear panel controls and connections	14	The OTA.	49
Sample area and chimney	15	The chassis fan.	50
Installation	16	The gas Solenoid.	51
The set up and service menu.	18	The air compressor.	52
The interface menu	19	The air filter.	53
The test hardware menu.	20	The air inlet filter.	55
The maintenance menu.	23	The gas filter.	56
Flame Optimisation.	25	The gas fuel adjustment valve.	57
Chart recorder configuration	26	The gas regulator.	58
Firmware updates (reflashing).	27	The keypad.	59
Recommended tool kit.	30	The marshalling board (PCB).	60
Maintenance.	31	The motherboard (PCB).	61
Electrical schematic.	39	The LCD/LCD ribbon	62
Wiring schematic.	40	The ignition module	63
Motherboard schematic.	41	The chimney fan	65
Marshalling board schematic.	42	The ignitor	66
Air flow schematic.	43	The inner chimney windows.	68
		The optic windows.	70
		The burner.	71
		The mixing chamber.	72
		The o-rings.	73
		The motherboard battery.	74
		The printer.	75

CONTENTS

Upgrading to 'AFHS' enabled.	<u>76</u>
Upgrading (installing) the printer module.	<u>77</u>
Upgrading to mA output functionality.	<u>78</u>
Annex A.	<u>81</u>
Annex B.	<u>85</u>
Annex C.	<u>86</u>
Annex D.	<u>87</u>



Safety statements



For full risk assessment information please refer to the separate Risk Assessment Document in Annex A.

Please ensure you read this information carefully prior to installing or using a BWB Flame Photometer



The instrument is designed to be operated only by trained laboratory competent operators over the age of 18. For educational purposes, where operators are under 18 years old, you should conduct an independent risk assessment and ensure suitable measures are implemented to prevent accidental burns from the top of the chimney.

Any adjustments, maintenance and repair must be carried out as defined in the operator manual by a person who is aware of the hazards involved



Operating and service personnel should always employ a safe system of work in addition to the detailed instructions provided in this manual.



MSDS Sheets have been supplied for the Calibration Standards, Diluent & Cleaning Solutions supplied in the Starter Pack. If any other chemicals are used the appropriate MSDS should be obtained from the supplier. All Health and Safety data should be adhered to with these and any other chemicals used with the instrument.



It is the operators responsibility to ensure spills are wiped away in a safe and efficient manner carrying out appropriate decontamination if hazardous material is spilt on or inside the instrument.



In the event of a problem where the possibility of safety protection has been impaired, the instrument must be made inoperative, disconnected from service supplies and the fault must be reported immediately. (*Serial number and the Hour Meter reading will be required*).



Under no circumstances should the instrument covers be removed. This can only be performed by a trained engineer and could result in a void of warranty.



Laboratory procedures for safe handling of chemicals should be employed at all times



The instrument is intended for use in laboratory environments and tested to Class B electromechanical compatibility.

















The instrument should not be operated with a live flame unless the chimney fan is operational.



Before using any cleaning or decontamination methods except those specified by the BWB you should confirm with us that the proposed method will not damage the equipment

Safety statements

-  All electrical equipment is potentially hazardous. **Never remove covers** from the instrument unless specific maintenance procedures are being followed by trained personnel.
- Propane, Butane, and mixtures thereof are highly flammable and potentially explosive.
-  Test all gas hose connections for leakage with a soap solution or proprietary leak detection spray prior to initial start-up. **Never use a naked flame.** Check for bubbles or any signs of leakage when the gas source is opened. *Leakage can result in a dangerous situation! If any odour of gas is detected or leakage discovered, STOP IMMEDIATELY and correct the situation.*
- As with all gas fuelled equipment, combustion products are released into the atmosphere when the flame is alight. The instrument must therefore be installed in an area of sufficient volume and with ventilation adequate to ensure these combustion products do not build-up to hazardous levels. The application and type of sample should also be considered during the evaluation of a fume extraction system to ensure that hazardous fumes are not created from the sample composition. Specialist advice should be sought if any doubt exists regarding the suitability of the proposed location.
-  Under no circumstances leave the instrument unattended when the flame is alight.
-  Cylinders of fuel gas should be stored and used in accordance with the supplier's recommendations and local regulations.
-  The gas hose supplied with the instrument conforms to current UK legislation. If using an alternative gas hose ensure it conforms to your local and national regulations.
-  Ensure that the connections used within the gas supply pipework from the gas bottle or other source conform to applicable national requirements.

-  Under no circumstances should the instrument be installed beneath overhanging cabinets. There must be at least 50cm of clear space above the chimney.
-  Consideration should be undertaken for the appropriate filtering or other systems which may be necessary to trap hazardous sample residues present in the exhaust gas stream.
-  Use of fuel gases other than Propane, Butane or Natural Gas can result in a dangerous situation and cause severe damage to the instrument, which will void the warranty.
-  If legislated in your region, connecting the unit to a gas supply should only be carried out by a suitably qualified and certificated installer.
-  **Do not attempt to look down into the Chimney when the flame photometer is in use.** Always use the Inspection Port to view the flame
-  Necessary provisions for collection of waste from the mixing chamber U-Tube/ Waste cup should be considered when supplying a suitable waste receptacle to ensure that hazardous waste material does not pose a risk to other people or the environment. Hazardous waste fluid should be disposed of in accordance to local or national regulations.
-  When using the Alternate Air Port make sure that the air is flowing **before** initiating the Start Up sequence and that the Shut Down sequence has finished before turning off the air. **DO NOT** use oxygen or oxygen-enriched air.
-  The instrument must be located such that it does not impede access around the work area, taking care that both the instrument and service connections cannot be accidentally disturbed or damaged by personnel undertaking other tasks.

Operational recommendations

The Flame Photometer must be installed in a clean, draught-free environment, where a stable temperature can be maintained.

✓ The instrument should also be sited away from bright sunlight and other intense light sources, (away from doors, windows, fans A/C units, etc.). The atmosphere must be free of airborne contaminants such as cigarette smoke, vapour, dust and solvents. Failure to observe these precautions may lead to inaccurate and/or unstable results.

✓ Ensure there is a clear drain to waste. Check that the drain tubing is free from kinks and that the end is kept above the level in the waste container (if used). The T-piece supplied should be fitted to avoid any possibility of a partial syphon being formed.

NOTE: An air lock preventing drainage will occur if the waste tube falls below the water level in a waste bucket or waste receptacle.

✓ Always use the same batch of diluent. It is recommended that diluent concentrate (019-015) is added to all standards and samples at a ratio of 1:100.

✓ Users should ensure they have access to adequate quantities of deionised (019-051) or distilled water. It is important to ensure the quality and purity of the water is consistent and appropriate to the types of samples being analysed.

✓ For optimum performance and accuracy always use the same techniques and apparatus when performing calibrations and taking readings.

✓ The samples should not be highly viscous or non-homogeneous. If possible, samples likely to contain sediment should first be filtered.

✓ Avoid handling samples, or touching any item in contact with samples, with unprotected fingers. Doing so could lead to serious contamination and significantly impair the accuracy of results.

Solutions should always be stored away from direct sunlight, and preferably at temperatures below 25°C. Glass containers should not be used for storage as these may lead to contamination through sodium leaching into the solution.

✓ Standards should be prepared and stored in plastic vessels, in high concentrations (i.e. 1000ppm or greater). Dilutions should be prepared as required and discarded at the end of each working day.

✓ The flame photometer must be allowed to fully warm-up prior to calibration and sample analysis. After the flame has been lit, aspirate diluent or deionised water for a minimum of 45 minutes prior to use. A warm-up period of more than an hour will ensure the accuracy and consistency of results are maximised.

After 'ignition slow start', open the inspection flap to visually check, and if necessary, optimise flame height. The inner cone should be 10-12mm above the top of the burner.

✓ Adjust by SLOWLY turning the Fuel control as required. Do not re-adjust the flame height after calibration. Once completed, close the inspection flap to avoid stray light entering the optical system.

✓ Samples should always be drawn from the top half of the sample cup to avoid sediment or particulate matter being drawn into the aspiration tube. Do not allow the sample cup to become fully drained and never allow the aspiration tube to draw dust or debris from the surface of the sample tray.

✓ It is essential that the Nebuliser, Mixing Chamber and Burner are maintained in a clean condition to avoid contamination and analysis inaccuracies in the future. Always aspirate deionised water for at least ten minutes after all samples have been analysed, prior to shut down. If high salt content samples have been analysed or contamination is suspected, extend the period over which deionised water is aspirated.

Operational recommendations

✓ Any slight blockage in the Nebuliser will cause readings to show a downward trend. Aspirating deionised water at all times that standards and samples are not being analysed, and for at least ten minutes after use, will minimise this risk. However, the syringe provided may be used to force diluent through the aspiration tube and nebuliser while the instrument is aspirating if problems with blockage are experienced.

✓ Ensure there is no evidence of grease or other deposits on the outside of the Aspiration Tube, since this can pick up small droplets of diluent/sample and cause cross contamination. If this occurs, clean the outside of the tube with IPA or a similar de-greasing agent.

✓ Always use genuine BWB Technologies Ltd replacement parts and qualified personnel to carry out any work on the instrument.

✓ Always carry out maintenance when indicated or in line with your organisations standard operating procedures (SOPs)

✓ The front panel is impervious to many chemicals. However, some chemicals may attack it. Immediately wipe up all spills. Clean with a mild soap or detergent and wipe with a soft cloth.

✓ A plastic based paint is used to protect the enclosure from harsh environments, however, some chemicals will still cause damage, immediately wipe up all spills on the drip tray. Clean with a mild soap or detergent and wipe with a soft cloth.

✓ To maintain a consistent sample head, it is recommended that samples and standards are taken from low volume, larger diameter beakers. If tall, narrow sample cups are used, the sample head will vary considerably and this will affect the rate of aspiration and thus the stability of results.

✓ Information on decontaminants their use, dilution and potential application is contained in the laboratory biosafety manual published by the world health organisation and the biosafety in microbiological and biomedical laboratories, published by centres for disease control and prevention and national institutes of health Washington. There are also national guidelines that cover these areas.

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*due for launch mid/late 2021

Introduction

This Service Manual contains detailed instructions for the repair and maintenance of the BWB Flame Photometers which must only be carried out by qualified personnel.

This Manual is intended to support all of the products in the BWB Flame Photometer range, these are:

BWB XP

BWB XP Plus

BWB BIO

BWB BIO-AV

BWB BIO-943 (available on the US market only)

BWB Sugar

BWB Syn Fuels

BWB Nuclear

BWB Lithium

BWB Soil

These products are closely related, with a large proportion of the hardware and electronic systems common to all. However, each product has specific firmware to provide particular features and tailor performance and operating systems to individual needs and applications.



All electrical equipment is potentially hazardous. **Never remove covers** from the instrument unless specific maintenance procedures are being followed by trained personnel.



Prior to attempting any repair or service procedure the instrument must be disconnected from the mains supply. All drawings and procedures should be consulted prior to removing/ replacing any components or sub-assemblies.



The flame photometer has components which carry pressurised Propane, Butane or LPG. These can result in a fire hazard if the instrument is incorrectly repaired or serviced. Ensure the gas supply is turned off at source and the gas supply is disconnected.



After servicing test all gas hose connections for leakage with a soap solution or BWB leak detection spray prior to initial start-up. **Never use a naked flame.** Check for bubbles or any signs of leakage when the gas source is opened. Leakage can result in a dangerous situation! *If any odour of gas is detected or leakage discovered, STOP IMMEDIATELY and correct the situation.*



The Chimney Top, Inner Chimney & Burner, as well as the area above the Chimney, are extremely hot and will cause severe burns. Ensure the instrument has fully cooled down prior to attempting repair/service.



The LCD, Motherboard, Optical (OTA) boards and the RS232/USB board contains sensitive electrostatic devices. Suitable precautions must be taken when handling.



The Nebuliser, Mixing Chamber and Burner Assemblies may have been exposed, or contain chemical residue from customer use. Suitable safety wear should be worn when handling these parts.



All biological samples should be treated with the care accorded to those known to contain pathogenic organisms.



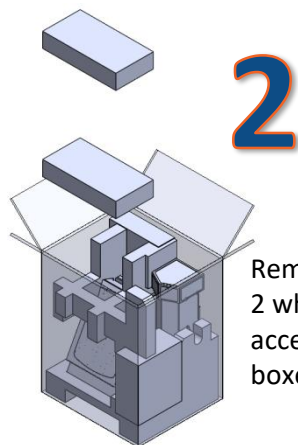
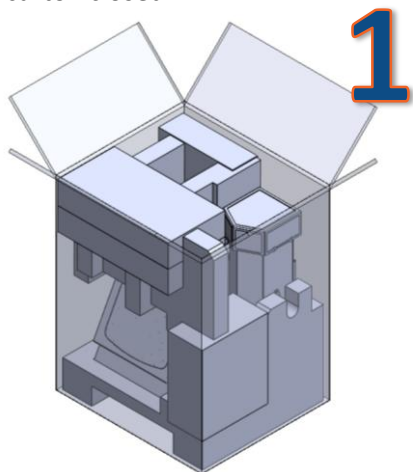
All removed components and sub-assemblies must be disposed of in the correct manner, or returned to BWB UK for disposal or recycling.

Any product or instrument returned to BWB must be accompanied by a Customer Returns Notification Form, available to download from the website and listed in Annex B

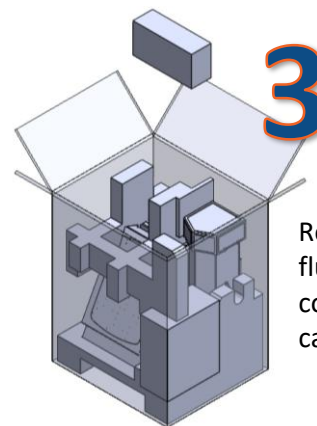
Unboxing

Please note, for clarity the outer cardboard box is shown in a transparent state.

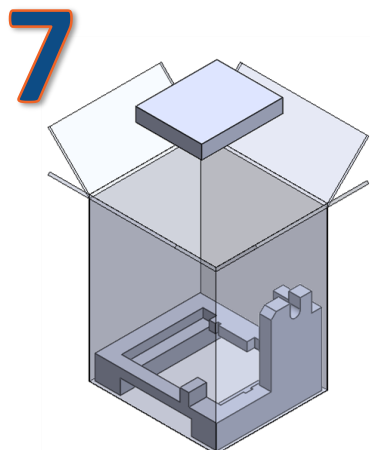
Use a safe box knife to open the tape holding the carton closed.



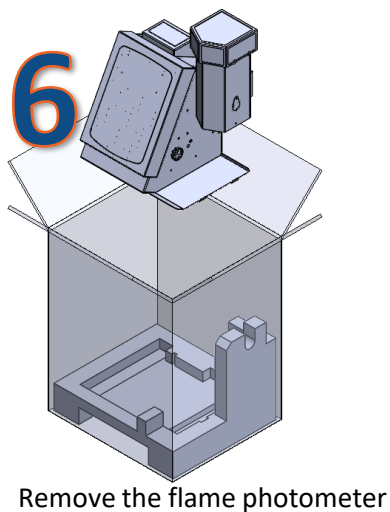
Remove the 2 white accessory boxes



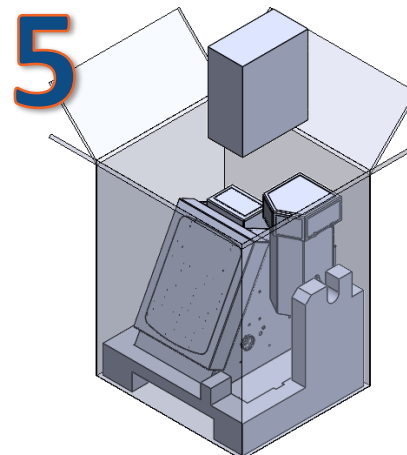
Remove the white fluid box – this contains your calibration fluids*.



Finally remove the document box from the bottom

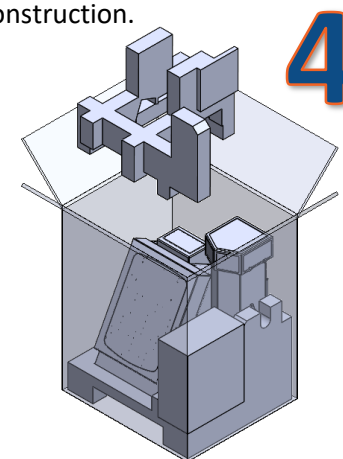


Remove the flame photometer



Remove the second fluid box – this contains DI water and Diluent Concentrate.

Remove the white foam holding the instrument in place, this is a single piece construction.

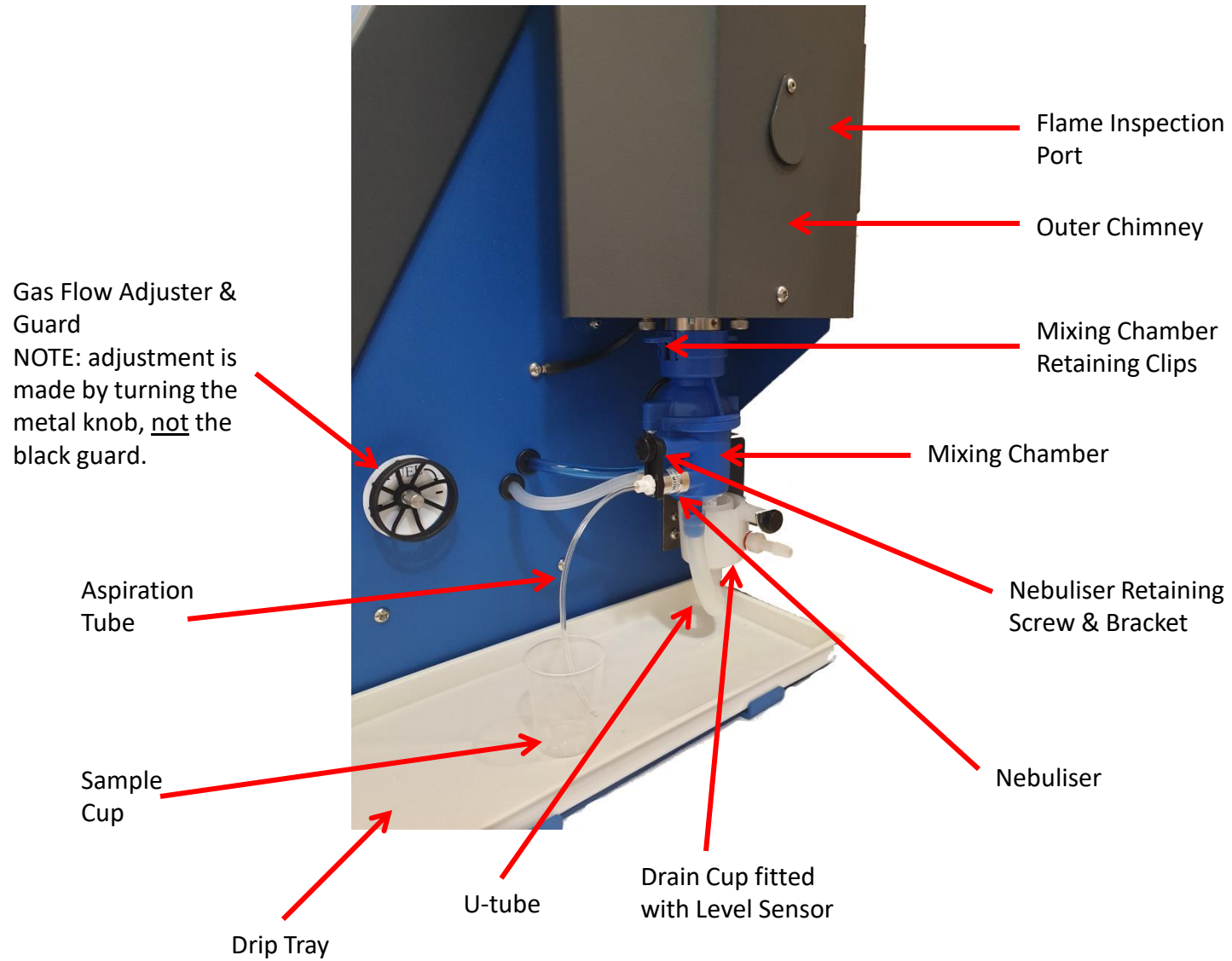


! We strongly recommended you retain the packaging. Damage caused from returning the instrument in non-BWB packaging is billed at the normal rate.

Front Panel Controls



Sample area & chimney



Installation



Please ensure you have familiarised yourself with the safety statements before installing this equipment.

For optimum performance, the instrument should be installed according to the following conditions:

The environment must be clean and free of dust and airborne contaminants.

- The instrument should not be stored beneath overhanging cupboards. Allow a minimum of 50cm of clear space above the chimney.
- The instrument must be placed on a sturdy worktop. The BWB model range requires approximately 50cm deep by 60cm wide by 100cm high of bench space.
- Avoid sites that expose the instrument to direct sunlight or draughts.
- To meet the specification, the ambient temperature must be within the range +10°C to +35°C and a maximum relative humidity of 85%, non-condensing.



An AC supply of 100V to 250V, at 50 or 60Hz, is required for the BWB model range. The power supply automatically detects the mains voltage and provides the correct power to the various components of the instrument. The maximum current drawn is 2 amps. Only the BWB supplied DC power adaptor should be used. Any other DC supplies may invalidate the warranty or void the CE testing and certification. The instrument can be run from a 12vDC battery (such as those found in a car) with a suitable adapter cable available from BWB. Please contact us should this be required.



A gas fuel supply of Propane, Butane, or Propane/Butane mixture (as in LPG) is used on the BWB model range. It should be regulated at the source to no more than 20Bar with a minimum flow rate of 0.4 litres/minute. The use of industrial quality gas is not recommended as impurities can enter, leaving deposits of dirt and oil, which will render the instrument inoperable.



Attach the supplied high-pressure hose *between the gas source and the gas regulator on the rear panel using the clamp provided to ensure a good seal.

*Refer to the safety statements.

It is recommended that a leakage check be performed using a soap solution or a proprietary leak detection solution the first time the instrument gas supply is turned on to ensure the integrity of the connections.

Installation



Embedded in the instrument enclosure is a built-in air compressor. A unique electronic control system automatically regulates the air pressure/flow to the optimum levels. No user adjustments are necessary to achieve maximum performance. Adjustments, if required, can be carried out in *Service* mode. If an exterior alternate air source is desired, there is a hose barb on the rear panel. The air source must be regulated to 10 PSI, offering 4L/min (measured in operational series) and be free of oil, dust and airborne contaminates. The air supply must not be oxygen enriched.

A sink or suitable container should be sited near the instrument to dispose of the waste overflow from the Drain Cup. If a waste container is used it should be situated so that the sides are below the bottom of the Drain Cup. Attach the supplied silicone tubing to the side port of the Drain Cup and route the other end to the sink or waste container.



There should be a clear drain to waste without kinks or U-sections and the end of the waste tube should be kept above the water level in the waste bucket. The use of a T-piece just after the drain cup is recommended to avoid the possibility of forming a partial siphon.

NOTE: The end of the waste tube must never be submerged below the waste liquid level as this may prevent the natural draining of the beaker. This can cause erratic readings and potentially flood the bench.

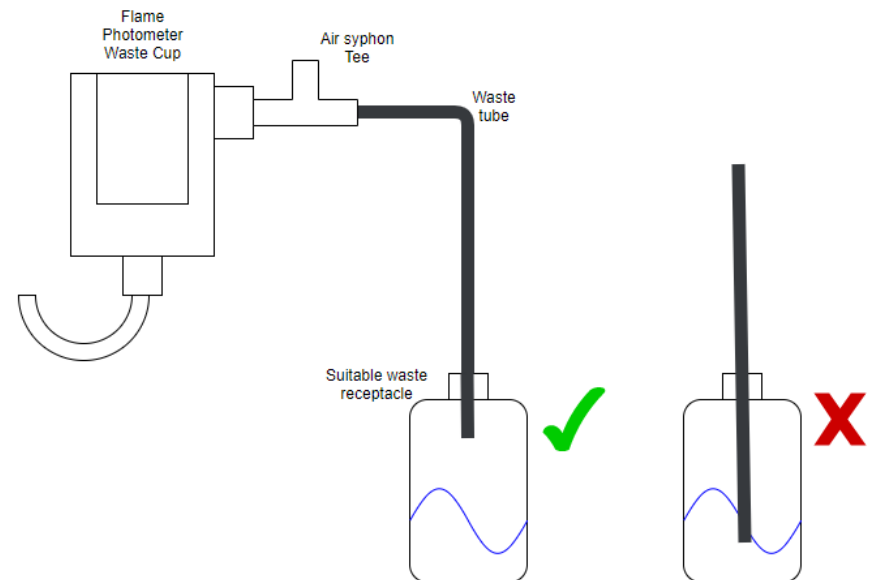
IQ OQ PQ

Our novel IQ OQ PQ programme enables a user to successfully validate the installation of the new flame photometer and operator functionality. Submission of the report document to BWB results in certification for performance and operation validation.



Find out more:

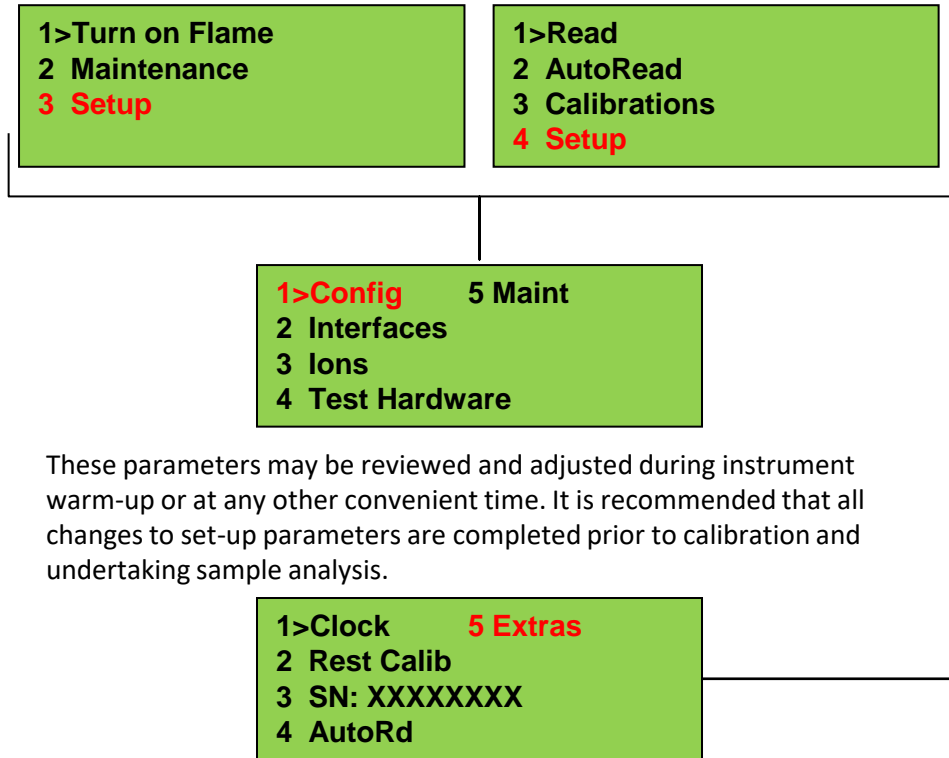
<https://www.bwbtech.com/iq-oq-pq>



The setup & service menu

The *Set Up* menu is available from both the *Welcome* menu and the *Main* menu.

Please note the text selected red is for the purpose of this manual only and indicates the option selected.



These parameters may be reviewed and adjusted during instrument warm-up or at any other convenient time. It is recommended that all changes to set-up parameters are completed prior to calibration and undertaking sample analysis.

Clock- sets time and date. The clock is factory set to GMT (Greenwich mean time) or BST (British Summer Time).

Reset Calib- erases all existing calibration data. A confirmation message prevents accidental deletion.

SN: XXXXXXXX- shows the instrument serial number.

Auto Read

This menu contains sub menus :

Max Results; sets the maximum number of results stored in the instrument (up to 200). Once the final number is reached it will overwrite existing results.

Time to Lock; the period the instrument uses to determine when the signal has stabilised. The shorter the time, the earlier the readings will be taken but accuracy may not be optimised. The longer the time, the later the reading will be taken. In this instance the accuracy may be improved, but response time will be increased. The instrument is factory set to 7 seconds.

1>BWB-XP
2 IntRef=OFF
3 Compressor=165
4 NA

BWB-XP: Indicates model parent (XP or BIO regardless of model type)

IntRef=OFF: If your model supports Internal reference you can toggle between the model specific parameters here (Li, Cs, Off).

Compressor= xxx: Set Compressor speed. The existing setting from the factory for the compressor is optimum for most circumstances. It is recommended that advice should be obtained from your local agent or BWB prior to altering the setting.

The setup & service menu

The interface menu

```
1>Config    5 Maint
2 Interfaces
3 Ions
4 Test Hardware
```

```
1>LCD Contrast: 40
2 Setup Chart
3 AFHS (OFF)
4 Printer (OFF)
```

Set LCD contrast- cycle through by pressing the *accept* key.

Setup Chart- used to configure the analogue output for use with a chart recorder or mA output depending on your model / optional extras fitted. Please note this functionality is not possible on the BIO or BIO AV models.

AFHS (ON/OFF)- if the Automatic Fluid Handling System (AFHS) is present this should be set to *ON* and the *Dwell Time* should also be set. (Refer to AFHS Manual).

Printer (ON/OFF)- if the Printer accessory is fitted this should be set to *ON* in order to print.

```
1>Config    5 Maint
2 Interfaces
3 Ions
4 Test Hardware
```

```
1>Ion Resolution
2 Next Calib: ppm
```

```
1>Na 1dp    5 Ba 1dp
2 K  1dp
3 Li 1dp
4 Ca 1dp    8 All
```

Ion Resolution:

This mode changes the amount of decimal places that will be shown on the Ion Readings. The factory default is 1 decimal place. This is optimum for most applications. Increasing the decimal places will make the readings appear to be less stable.

```
1>Ion Resolution
2 Next Calib: ppm
```

```
1>ppm      5 %
2 mg/l
3 meq/l
4 mmol/l   8 mg/kg
```

Next Calib:

Enables the operator to set the units of measure. Any change takes place on the next calibration. Existing calibrations are not changed and will remain in their calibrated units.

The setup & service menu

The Test Hardware menu

```

1>Config      5 Maint
2 Interfaces
3 Ions
4 Test Hardware
    
```

This diagnostic mode enables the hardware integrated with the flame photometer to be tested.

Selecting **4>Test Hardware** shows the following screen:

```

1>LED etc
2 V+T
3 KeyMatrix
4 OTA Raw
    
```

If a Service Key has been entered (Refer to Section 5.2) an additional option is displayed

```

1>LED etc      5 Relays
2 V+T
3 KeyMatrix
4 OTA Raw
    
```

Selecting **1>LED etc** shows the following screen:

```

LED: 01 = 1
Flame: 097% (1)
Fan : 0
UTube:OK      GasFB:0
    
```

This can be used to identify a failed LED, check Fan and Gas Solenoid supply status and check the operation of the U Tube Sensor

Cycles through 01 to 11 as status and warning LED's are illuminated.

Changes from 0 to 1 with each LED test cycle.

*Shows Fan status:
0 = OFF, 1 = ON*

*Shows U Tube Sensor status:
OK or ERROR based on the position of the sensor at the time. ERROR indicates a low level.*

```

LED: 01 = 1
Flame: 097% (1)
Fan : 0
UTube:OK      GasFB:0
    
```

Indicates Flame output level (%)

Changes from 0 to 1 & 2 as Flame output increases

*Shows Gas Control Solenoid status:
0 = Closed
1 = Open*

Selecting **2>V+T** shows the following screen

```

5v = 5.00V      OTA=26.9°
11v=11.0V      CPU=23
24v=24.0V      AIR=24.0
Alarm(0.5)     CHY=18.2
    
```

This screen (Voltages and Temperatures) shows the Power Supply voltages and internal temperatures in real time:

OTA (Optical Train Assembly) is the temperature within the OTA module of the instrument.

CPU (Central Processing Unit) is the current temperature of the central processor.

AIR (Air Circuit) is the current temperature of the internal air supply.

The setup & service menu

The voltages and temperatures will vary from those shown above, however the 5v supply should remain within $\pm 0.25\text{v}$ of nominal and the 12 and 24v supplies should remain within $\pm 0.5\text{v}$ of nominal. All supplies should be stable ± 2 LSD.

Use this display to diagnose possible power supply problems and/or excessive internal temperatures which may be giving rise to unstable results or more fundamental errors.

Selecting **3>KeyMatrix** shows the following screen

Key Matrix	- - - -
Rev:2	- - - -
Read+Stop	- - - -
To Abort	- - - -

Press each Keypad key in turn and note that the display indicates the specific key being pressed and its position on the keypad matrix. The key designation is displayed while the key is held down.

Use this function to diagnose possible data entry problems resulting from non-functional or intermittent keypad operation. If a defect is identified, failure of the keypad itself should be suspected in the first instance particularly if there are signs of excessive wear and tear, or chemical/physical damage. Refer to *Replacing the Keypad*.

Press the *read* and *back/STOP* keys together to return to the *Diagnostic* menu.

Selecting **4>OTA Raw** shows the following screen

Na ;	367 Raw
K ;	1698 Raw
Li ;	306 Raw
Ca ;	1133 Raw

The display indicates the raw OTA (Optic Train Assembly) readings for each ion. (Actual readings will vary from those shown). The *arrow* keys may be used to change the order of the ions on the screen.

Use this display to diagnose unstable readings or poor sensitivity. Always ensure flame setting has been optimised. Also check that the Nebuliser is aspirating satisfactorily and that Burner/Mixing Chamber and Optic Windows are clean and in good condition (Refer to Routine Maintenance) before suspecting the Optical Train Assembly of inadequate performance, it is very rare to find a defective OTA and more than likely that sub-optimal conditions are contributing to any instability. To replace the Optical Train Assembly refer to *Replacing the Optical Train Assembly*.

The setup & service menu

If a Service Key has been entered, a fifth option is displayed.

1>LED etc **5 Relays**
2 V+T
3 KeyMatrix
4 OTA Raw

Selecting **5>Relays** initiates a test cycle showing the following screens in sequence

(1) **Relay Test**
Gas
Gas FB= ON

The Gas Solenoid is energised (Gas flows to Mixing Chamber unless turned off at cylinder).

(2) **Relay Test**
Ignitor
Gas FB = OFF

The Gas Solenoid is de-energised and the igniter is activated for a few seconds. Observe the igniter functioning through the chimney inspection flap, ignition sparks should travel more often to the centre of the burner than the edge.

If sparks travel to anywhere but the burner the igniter requires replacement. Similarly, if a spark can be heard but not seen it is likely the igniter requires replacement as insulation has possibly broken down.

(3) **Relay Test**
Compressor
Gas FB = OFF

The Gas Solenoid remains de-energised, the igniter stops functioning and the Compressor runs for a few seconds (ensure Rear Panel switch is set to INT).

(4) **Relay Test**
Fan
Gas FB = OFF

The Gas Solenoid, Igniter and compressor stop operating and the Fan runs for a few seconds.

The test cycle repeats until the *back/STOP* key is pressed.

The maintenance menu

The Maintenance menu

The *Maintenance* menu is accessed via the *Setup* menu. To select the *Maintenance* menu, scroll to option 5 and press the *accept* key or select via the appropriate numerical key. The *Maintenance* menu has four options:

1>Run Compressor
2 Show Info
3 Flame Detect =80
4 Fan Temp =32

Run Compressor

If the *Maintenance* menu is accessed via the *Welcome* menu the *Internal* compressor can be run without igniting the flame. This may be used when performing the Nebuliser Test. When activated, the air compressor will start but the instrument will not enter the *Start Up* routine.

If the *Maintenance* menu is accessed via the *Setup* menu and the flame is lit, the compressor will continue to run, but the *1> Run Compressor* option cannot be activated.

NOTE: The compressor will not run if the *External* compressor has been selected on the rear panel switch.

Show Info

The instrument incorporates a timer that records the elapsed time (in hours) that the instrument has been alight. It can be used as a reminder of when to perform maintenance.

Also shown are the instrument serial number and the main firmware version, hardware version and OTA firmware. (This information will be required if contacting your local agent or BWB).

Hours: 85:35
Serial No: 00000000
F3.02X32 H3.00 02.08

LCD displays the Show Info screen

At this point the Service Passcode can be entered to gain access to restricted functions. For details of the Service Passcode contact BWB or your local distributor.

For the BIO range of models only, the Security key also permits a calibration to be performed which creates the fundamental curve relationship for the current batch of standards and for the range and Ion type being measured. Refer to the relevant BIO Operating Manual for full details.

Enter the Security Key Code using the numeric keypad. If the key code is entered successfully the following screen is displayed:

Hours: 85:35
Serial No: 00000000
F3.02X32 H3.00 02.08
TestMode: Service

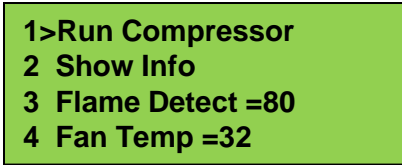
The maintenance menu

Once the Security Code is entered the instrument will remain in Service Mode until powered down or an attempt to enter the incorrect code is made.

Precautions should be taken to avoid non-authorized personnel gaining access to basic calibration or other service parameters if the instrument is left switched on and unattended.

To remove the Service Code from the system without shutting it down, navigate to the Show Info screen and type any key combination (any length) that is not in the Service Code. Use *back/STOP* and *accept* to navigate out and back in to the screen to confirm the code has been deactivated.

Press the *back/STOP* key to return to the *Maintenance* menu.



1>Run Compressor
2 Show Info
3 Flame Detect =80
4 Fan Temp =32

FDet (Flame Detection)

The flame detection option alters the sensitivity of the flame detector. The instrument will leave the factory with the optimum value pre-set. This varies from unit to unit but is generally either 80 or 60.

If problems are encountered whereby the flame extinguishes unexpectedly and the gas supply and connections are known to be in good condition, the sensitivity of the Flame Detector may be set too high. Pressing numeric key 3 will cycle the setting from 20 through to 200. If it is set to 60 adjust to 80, conversely, if set to 80 adjust to 60. Other settings may also prove effective at dealing with this problem

Fan

This enables the temperature to which the unit is controlled to be changed. The majority of BWB Flame Photometers will leave the factory with the Fan option set to 32. This is to ensure the instrument electronics maintain a constant temperature to maximise stability. This option has a minimum setting of 0 and a maximum setting of 50. It has been determined that in an ambient temperature of 20-25°C; 32 will provide the best degree of stability, however if the ambient temperature is routinely higher than 25°C an alternative setting may be more effective. Consult your local agent or BWB for advice.

Pressing numeric key 4 will cycle the setting from 20°C through to 50°C.

NOTE: This setting should not be altered unless the instrument is being used in abnormal ambient temperatures. Consult your local agent or BWB for advice.

Flame optimisation

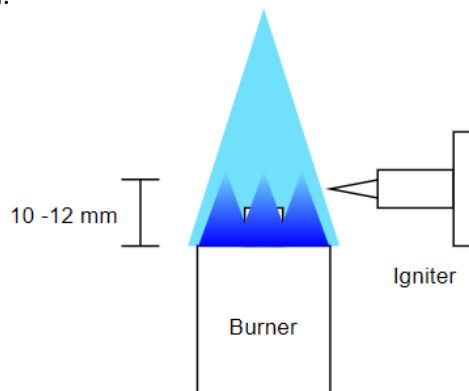
Flame optimisation



After the initial 2 minutes of start-up, once the internal pump has turned to operating speed; while viewing the flame through the inspection port, slowly adjust the gas flow with the Fuel-Adjustment valve located on the side panel allowing the flame to respond.

The correct height of the flame is achieved when the small inner cones of the flame are 8-12mm high.

If the gas flow is too low the flame will start but “lift off” the flame spreader and the flame will extinguish. It is recommended to start off with a slightly larger flame and reduce it once the flame has stabilised.



Be aware that opening the gas adjustment valve by too great an increment could result in flames occurring outside the chimney housing, leading to injury.

Aspiration

Aspirate deionised water through the aspiration tube connected to the nebuliser. The tube should be fully immersed in the solution and aspirated continuously at all times, other than when standards and samples are being measured. This ensures no air is drawn into the system and stable burner temperature is maintained for consistency of results.

Warm up

Once the instrument has been through the start-up routine and the flame is lit, it will be necessary to perform a warm-up period of 45 minutes to 1 hour. During this time deionised water should be aspirated continuously to allow the instrument to stabilise its temperature and to clean out any deposits from previous use which may have built up in the needle, nebuliser and mixing chamber.

NOTE: Deionised water should be aspirated at all times during warm-up and when the unit is between sampling to ensure the temperature remains stable, ensuring accuracy of results when testing recommences.

The recommended warm-up times, based on testing in a controlled environment are detailed below:

Ambient	Recommended warm-up
16°C	45 minutes
21°C	40 minutes
25°C	30 minutes

Chart recorder configuration

Chart recorder / 4-20mA output

A chart recorder may be connected to the instrument via the rear panel 4mm analogue output sockets (red and black).

A maximum analogue output of 2.5V will correspond to a user selected maximum concentration value.

The chart recorder can only monitor a single, user selected, ion.

Configuration

Select the *Set Up* menu from either the *Welcome* menu (option 3) or the *Main* menu (option 4). Select option 2 *Interfaces* and option 2 *Setup Chart*.

1>Config 5 Maint	1>LCD Contrast: 40
2 Interfaces	2 Setup Chart
3 Ions	3 AFHS (OFF)
4 Test Hardware	4 Printer (OFF)

The following display will be shown:

1>Ion: OFF
2 Max: 1000 ppm

Select option 1 *Ion*.

1 Na None	5 Ba None
2>K None	
3 Li. ppm	
4 Ca: ppm	8 Off

(In this example *Li* is shown as having a valid single point calibration, *Ca* as having a multi-point calibration).

Select the ion which is to be monitored by the Chart Recorder.

The display will revert back to the previous menu.

Select option 2 *Max*

Chart Max Enter Concentration (ppm):
--

Enter the concentration value which is to correspond to the maximum analogue output (i.e. 2.5V) using the *numeric* keys and press *accept*. The unit will allow you to enter up to 5 digits, or 4 digits and a decimal point. If you make a mistake *stop* will delete the last digit entry.

Press *back/STOP* 3 times to return to the *Welcome* or *Main* menu.

NOTE: The Chart Recorder configuration procedure is the same for the 4-20mA output option if this was specified at time of purchase.

Firmware updates (re-flashing)

BWB operate a policy of continuous development. It may occasionally be appropriate to update the firmware of a product to enable performance enhancements and provide the user with additional features and benefits. To facilitate re-flashing the product must be connected to a PC via the USB cable provided. The PC must have the FP-PC program loaded either from the USB stick supplied with the instrument, or from <http://www.bwbtech.com/>

Note: Prior to commencing this procedure it will be necessary to obtain a Service Key from BWB

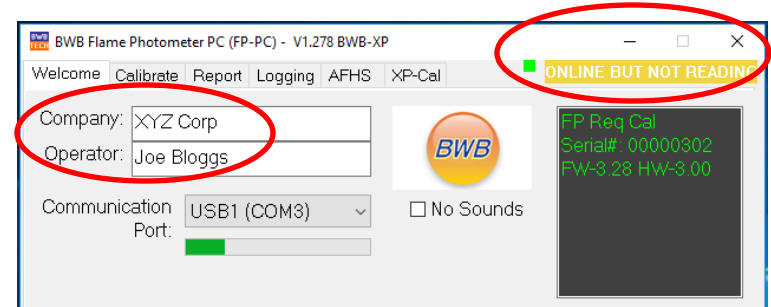
The firmware update will usually be supplied as an e-mail attachment or downloaded from <http://www.bwbtech.com/>. If working with Microsoft Windows default settings the download (from email or web) will be saved in your Downloads folder.

Open the Downloads folder and identify the re-flashing file. This will be in the form of **mainV286X22.nef**. Make a note of the file name for future reference

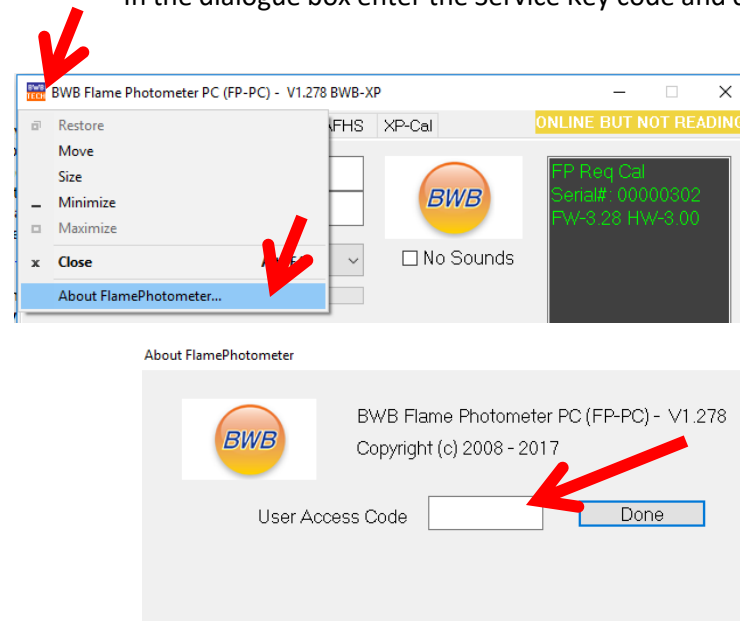
If the PC connected to the Flame Photometer is not network enabled, the file can be copied onto a USB stick to enable it to be transferred to this PC.

The FP-PC software **must** be running and the Flame Photometer switched on, but the flame **MUST NOT** be lit. Ensure the PC-FP software is communicating with the Flame Photometer (ONLINE) and that Company and Operator details have been entered.

Refer to the red circled items adjacent. 



- Click on the BWB logo in the top left-hand corner.
- Click on *About the Flame Photometer*.
- In the dialogue box enter the Service Key code and click OK

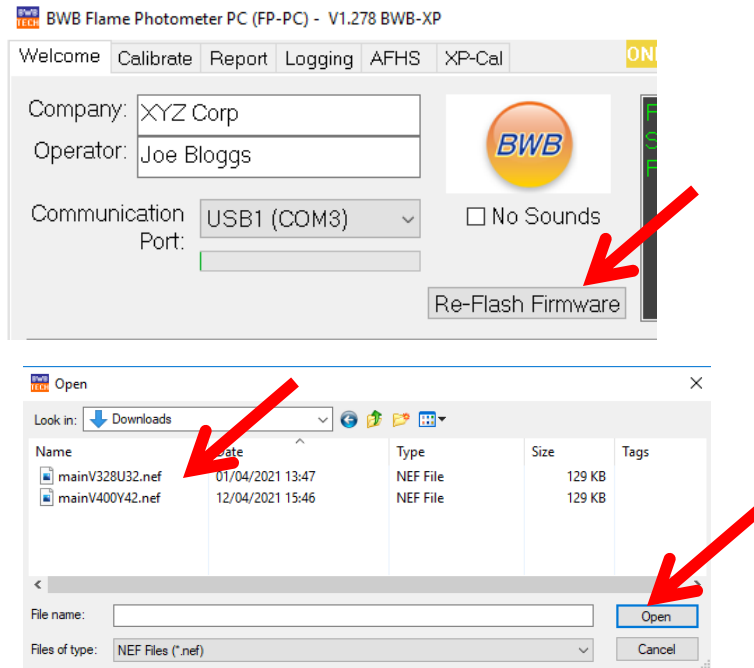


Firmware updates (re-flashing)

Return to the FP-PC *Welcome* tab and click on the *Re-Flash Firmware* button.

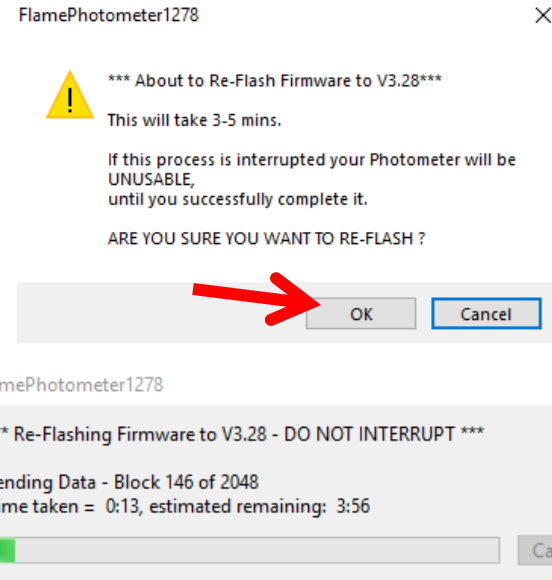
Navigate to the correct file location to find your Firmware file as supplied by BWB.

- Double check the file name is the one noted previously.
- Click on the file to transfer the file to the *File name* field and click *OK*.

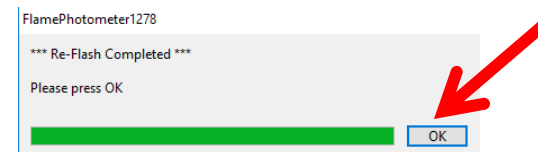


A warning message will be displayed. If you wish to continue with the re-flash click *OK*, (if not click *Cancel*).

A message will be displayed to indicate that re-flashing is in progress. The instrument display will blank and the Error and Status LEDs illuminate and extinguish in sequence.



During the re-flash process it is extremely important the process is not interrupted. An interruption can leave the instrument ceasing to function and will require a motherboard re-flash (normally conducted at BWB manufacturing facility or selected approved partners). When the re-flash download is complete a confirmation message will be displayed. Click *OK* to continue. The FP-PC software will now revert to the *Welcome* screen. Close the software to remove the re-flash capability and prevent unauthorised operators from tampering with the FW flashing functionality.



Firmware updates (re-flashing)

The Flame Photometer display will show the *Welcome* menu.
Select Option 3>*Setup*

1>Turn on Flame
2 Maintenance
3 Setup

Select Option 5>Maint and Option 2>*Show Info*.

1>Config 5 Maint
2 Interfaces
3 Ions
4 Test Hardware

1>Run Compressor
2 Show Info
3 Flame Detect =80
4 Fan Temp =32

Check the firmware version matches the downloaded file name.
Also check both the *Hours* reading and the *Serial No* have not been corrupted.

Hours: 85:35
Serial No: 00000000
F3.02X32 H3.00 02.08

If either The Hours reading or the Serial No. are incorrect, it will be necessary to enter the Service Key to reset these parameters.

Navigate to the *Config* Menu and select Option 2>*Reset Calib*. Press the *accept* key to reset the Hours counter (Any previous calibration data will also be erased). Select Option 3>*SN:0000XXXX* and enter the correct Serial number of the instrument against *Enter New:* and press *accept*.

Check *Option 1>Clock* and correct if necessary.

On completion, the instrument should be powered down to deactivate the Service Mode.

Check Analogue output settings if a Chart Recorder or Process control software is being used.

Recommended Tool kit

For routine maintenance, service and engineer access the following tools are required:



- Suitable PPE – this may include gloves or mask depending on the laboratory conditions and the type of samples the instrument has been sampling.



- Digital multimeter
- Small electronic flat screwdriver (Size 1)
- Phillips (Size 1) screwdriver



- Spanners in a variety of sizes (alternatively nut drivers may be used but in some instances a spanner provides greater access)



- 5mm
- 7mm
- 8mm
- 10mm
- 12mm
- 15mm

- Torx drivers in the following sizes



- T10
- T20
- T25

BWB Fasteners Kit

Order yours today (Part number: FSTN-KIT) to ensure you're never without a screw or critical component.

Category	Part Number	Qty	Description
NUTS	017-030	50	Nut M2.5 Nyloc
	017-031	50	Nut M3 Nyloc
	017-032	50	Nut M4 Nyloc
	017-034	50	Nut M6 Nyloc
WASHERS	017-101	50	Washer M3 Flat
	017-121	50	Washer M3 Shakeproof
	017-122	50	Washer M4 Shakeproof
	017-141	50	Washer M3 Fibre
	017-142	50	Washer M4 Fibre
SCREWS	017-296	50	M3x4 Torx Button
	017-301	50	M3x6 Torx Button
	017-302	50	M3x8 Torx Button
	017-399	50	M4x4 Grub Screw
	017-404	50	M4x6 Torx Button
	017-410	50	M4x8 Torx Button
	017-413	50	M4x8 Torx Button Flanged
	017-421	50	M4x10 Torx Button
	014-192	4	8mm P Clip
	014-542	1	Gas Sniffer PCB
MISC	017-430	5	Burner Thumb Screw
	017-949	4	Domed Grommet
	017-950	4	Air/Gas Tube Grommet
	017-951	4	Diaphragm Grommet (Large)
	017-956	4	Diaphragm Grommet (Small)
	018-051	4	Rubber Instrument Foot
	018-082	5	Drain Cup Clamp Screw
	018-102	1	Mixing Chamber Baffle
	018-104	2	Mixing Chamber Screen (Mesh)
	018-113	2	Nebuliser Clamp MK2
	018-114	2	Nebuliser Clamp MK3
	018-116	5	Nebuliser Clamp Screw
	TOOLS	999-006	1
999-007		1	Torx T10 Driver

Maintenance

The following are recommended intervals only. Every application and type of sample varies and it is the overall responsibility of the operator to determine the frequency of maintenance required based on the requirements or company SOPs.

Daily or 8 hours:

- Empty waste container, if used.
- Check U-tube is filled with water.
- Clean Aspiration Needle and Aspiration tubing, review replacing the aspiration tubing. (160mm length recommended).
- Clean any spills in tray.

Weekly or 40 hours:

- Carry out daily maintenance procedure.
- Check the operation of the Nebuliser.
- Check the Drain Cup, Burner, U-tube, Nebuliser, and waste tube. Clean as needed.
- Clean the Mixing Chamber and flush the nebuliser, using a good quality de-proteinizing solution such as Decon® 90 (2-5% mix with deionised water).
- Replace the aspiration tubing (160mm length recommended).

Monthly or 200 hours:

- Carry out weekly maintenance procedures.
- Check the air (if using external air sources) and fuel gas tubing (external to the instrument) and connections for leaks, using a soap solution or proprietary leak detection spray.
- Check the gas supply tubing (external to the instrument) for signs of stress cracking. Replace as needed.
- Clean the Burner, Nebuliser, and Drain Cup using a good quality de-proteinizing solution such as Decon® 90 (2-5% mix with deionised water).

Semi-annually or 1000 hours:

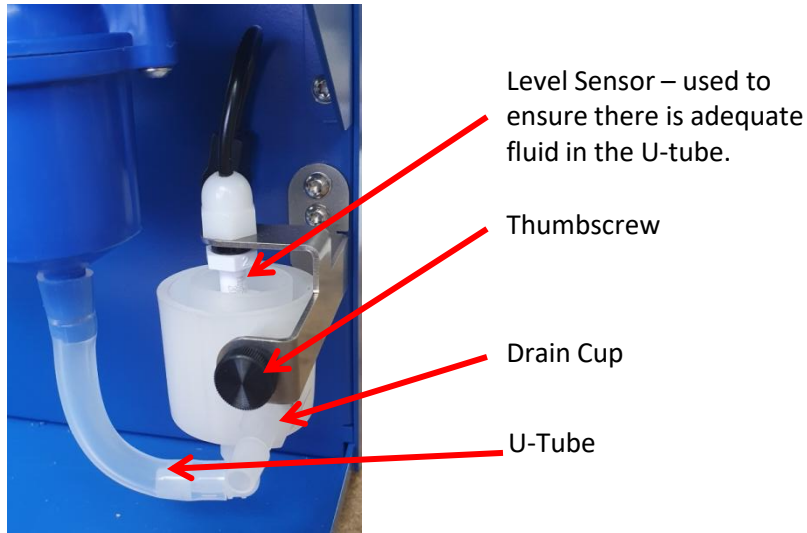
- Carry out the monthly maintenance procedures.
- Using the chimney inspection flap, inspect the clarity of the windows in view (inner chimney and optic) to ensure clarity remains. If in doubt, remove the inner chimney and clean both windows and the optic window.
- Replace U-tube and waste tubing.

Annually or 2000 hours:

- Carry out the semi-annual maintenance procedure.
- Replace gas sensing module
- Replace at a minimum:
 - Pump inlet filter,
 - Air filter,
 - Gas filter,
 - Igniter,
 - O-Rings.

BWB now offers an Annual Service Kit, containing all the parts you need to keep your Flame Photometer running at peak performance. It includes the parts listed above in addition to the mixing chamber.

Maintenance



U-Tube

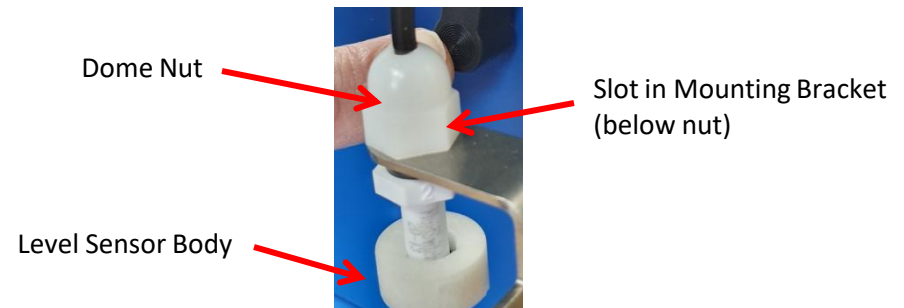
The U-tube must be as supplied and remain free of obstructions or ‘kinking’ that might inhibit waste flow out of the Mixing Chamber. For the start sequence to ignite the flame, the U-tube must be filled to overflowing with water.

NOTE: To clean, use a detergent solution (Decon50™) with subsequent thorough rinsing with tap water. Do not use organic solvents or alcohol based cleaners. They may cause the tubing material to expand and lead to permanent damage.

Drain Cup Cleaning

The Drain Cup has a float sensor that the firmware monitors during the *Start Up* cycle to ensure that the U-tube is filled with water. For the sensor to operate, be sure that the inner tube is filled to overflowing. The only maintenance needed is occasional cleaning.

1. Unplug the mains power cord.
2. Remove the U-tube and waste tube, taking care not to spill water.
3. Undo the thumbscrew and carefully drop the drain cup from the bracket and away from the level sensor.
4. To remove the Level Sensor from the bracket; hold the body of the sensor and unscrew the M6 dome nut using a 10mm AF side spanner. Carefully slide the dome nut up the cable. Drop the sensor down and pass the cable through the slot in the rear of the mounting bracket. Unplug the level sensor connector from the instrument and then carefully remove the sensor.
5. Clean with a detergent solution, mild acid, or Decon 90® (2-5% mix with deionised water). Rinse thoroughly with water. *Avoid any solution contact on the lead, connector or down the top of the sensor.* If this occurs, allow all parts to completely dry before refitting.
6. Check the level sensor float moves up and down freely without sticking. If necessary flush with deionised water to remove any salt deposits and recheck.
7. Move the drain cup back into position and secure with the thumbscrew.
8. Reattach the U-tube and waste tube.
9. When refitting the sensor to the bracket, note that the hole in the bracket is a larger diameter than the sensor thread. This enables the sensor to be centralised within the drain cup.



Maintenance



No attempt should be made to remove (or adjust) the Aspiration Needle from the nebuliser body.

Aspiration Needle and Aspiration Tubing

The heart of nebuliser function, the Aspiration Needle, should be cleaned daily or whenever the stability or accuracy of the instrument is in question. Cleaning periodically during the period of use usually keeps blockages to a minimum and may be conveniently carried out by gently forcing deionised water from the syringe through the aspiration tube.

More severe blockages can often be removed by running Nebuliser Cleaning Rod through the inside of the needle and/or replacement of the aspiration tubing. Refer to the Nebuliser Cleaning instructions detailed below for thorough cleaning in the case of stubborn blockages

Nebuliser

The Nebuliser should be checked according to the maintenance schedule, or more frequently if results are erratic or an obstruction is suspected.



Prior to carrying out this procedure ensure the flame is extinguished.

Checking the Nebuliser:

1. Ensure both the Needle and Aspiration Tube (max 160mm) used for the test are clean and free of obstructions.
2. Unscrew the Nebuliser Retaining Clip and remove the Nebuliser from the Mixing Chamber.
3. If alternate air supply is being used, switch this on and continue with step 7.
4. If using the internal air supply switch on the power to the instrument.
5. From the *Welcome* menu, choose *Maintenance* menu.
6. From the *Maintenance* menu, choose *Run Compressor* to start the air compressor.
7. Aspirate deionised water.
8. Measure the aspiration rate by timing how long it takes to aspirate a known amount of water. The aspiration rate should be within 2.8-4.5 millilitres/minute.
9. Observe the mist. It should consist of fine droplets extending about 15-20 cm. Larger droplets may also be emitted intermittently. This is normal. However, a constant stream of larger droplets could indicate a problem with the Nebuliser. Alternatively, if the aspiration rate is too low or there is no fine mist, the Nebuliser needs cleaning.
10. If the Nebuliser performance is satisfactory refit into the instrument and secure with the retaining clip.



No attempt should be made to remove (or adjust) the Aspiration Needle from the nebuliser body.

Maintenance



Prior to carrying out this procedure ensure the flame is extinguished.

Nebuliser Cleaning:

1. If necessary, unscrew the Nebuliser Retaining Clip and remove the Nebuliser from the Mixing Chamber.
 2. Remove the air supply tube and aspiration tubes.
 3. Use the Syringe filled with deionised water and a small length of clean aspiration tube to gently force the deionised water through the aspiration needle to remove any obstructing materials from the centre.
 4. Gently run the Nebuliser Cleaning Rod through the inside of the needle taking care not to abrade the inside surface. This should remove any stubborn deposits.
 5. Soak the Nebuliser in a good detergent solution such as the BWB cleaning agent.
 6. When fully clean, rinse the Nebuliser thoroughly with deionised water. Allow to dry.
 7. Re-fit the Nebuliser to the air line.
 8. Test the cleaned Nebuliser as above.
 9. If problems persist, remove the nebuliser from the instrument and soak in a detergent solution, de-proteinizing solution, and/or Decon 90® (2-5% mix with deionised water) overnight.
- DO NOT soak the nebuliser in organic solvents or alcohol.



Never attempt to adjust the Nebuliser.

Annual Service Kit

The BWB Technologies Annual Service Kit for your Flame Photometer instrumentation is available with the relevant training and installation. Feel free to contact us regarding any enquiries for our kits and services.



BWB Technologies

*image not depictive of service kit

Maintenance

Mixing Chamber Cleaning



The Burner must be completely cool before proceeding further.

1. Remove the Nebuliser from Mixing Chamber.
2. Disconnect the U-tube from Mixing Chamber.
3. Disconnect the blue gas tube from the mixing chamber (this can be a stubborn fit, be careful to pull in a straight direction and do not twist to prevent snapping the barb)
4. Gently spread the Release Tabs on the upper part of the mixing chamber just enough to clear the groove they are in and pull the Mixing Chamber down away from the burner.
5. Separate the Mixing Chamber halves by undoing the two screws that hold them together using a T20 Torx driver.
6. Note the orientation of the baffle in the lower half of the mixing chamber and carefully remove the baffle. (it is essential the baffle is replaced after maintenance in the same orientation – grooves located).
7. Remove the Quad-ring from the groove in the lower half of the mixing chamber.
8. Clean all parts with a detergent solution, de-proteinizing solution, and/or Decon 90® (2-5% mix with deionised water). **DO NOT** use organic solvents or alcohol as they may damage the mixing chamber body.
9. Rinse all parts well with deionised water.
10. Inspect the Quad-ring for any signs of deterioration or compression. Replace if necessary. Do not lubricate the o-ring in any media apart from DI water.
11. Make sure the Baffle is pushed securely and squarely into the lower half of the Mixing Chamber. it is essential the baffle is replaced after maintenance in the same orientation – grooves located).
12. Refit the Quad ring into the groove on the lower half of the mixing chamber.
13. Inspect the gauze for any signs of deterioration and replace if necessary (018-104).
14. Place the gauze in the top of the mixing chamber.
15. Locate the top and bottom of the mixing chamber sections together and secure with the two screws removed earlier. Do not overtighten.
16. Refit the Mixing Chamber into position on the Burner Tube, ensuring the tabs locate securely into the retaining groove.
17. Refit the U-tube and Nebuliser assembly.



Release Tabs



Baffle

Quad Ring



Gauze

Maintenance

Burner Cleaning



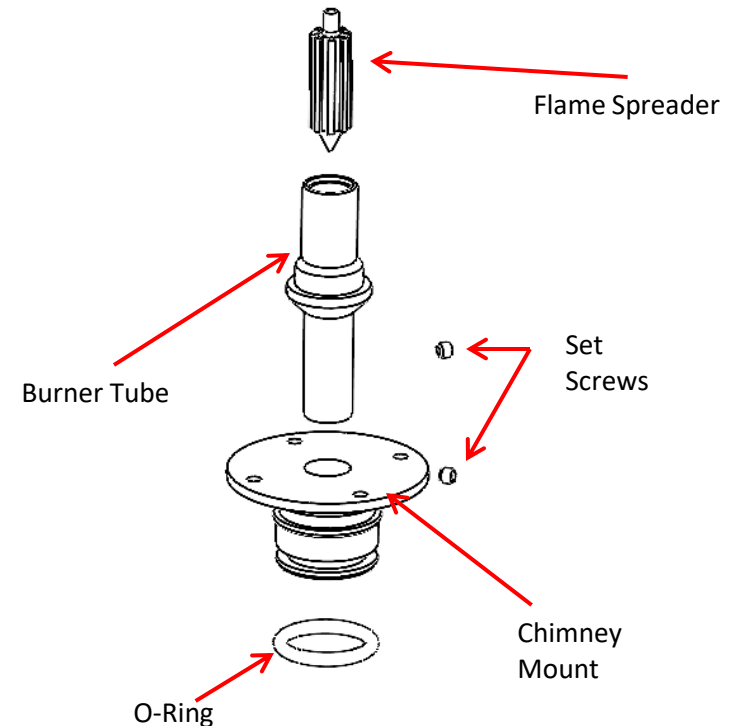
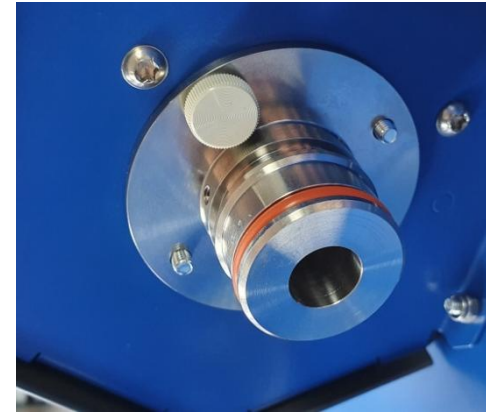
The Burner must be completely cool before proceeding further.

The Burner Assembly should be cleaned according to the maintenance schedule; or more frequently if the signal becomes erratic when aspirating deionised water.

1. Remove the Mixing Chamber as previously described.
2. Remove the 2 thumbscrews and withdraw the Burner Assembly.
3. The burner can be cleaned as a complete assembly by submerging the component into a bath of de-proteinizing solution, and/or Decon 90® (2-5% mix with deionised water). DO NOT use organic solvents or alcohol as they may damage the O-ring.

Alternatively, for stubborn contamination further disassembly is possible:

1. Undo the set screw on the Chimney Mount using a 2.1mm AF Allen Key. Carefully remove the Burner Tube.
2. Remove the Flame Spreader by undoing the set screw using a 2.1mm AF Allen Key.
3. Clean the Burner Tube and Flame Spreader with a detergent solution, de-proteinizing solution, and/or Decon 90® (2-5% mix with deionised water). DO NOT use organic solvents or alcohol as they may damage the O-ring.
4. Inspect the O-ring for signs of deterioration or splitting. Replace if necessary.
5. Re-assemble ensuring the Flame Spreader pointed end is downwards and that the set screw is aligned with one of the ridges in the flame spreader, NOT with a groove.
6. Offer the Burner Assembly up to the Chimney Assembly and refit the 2 retaining thumbscrews.
7. Replace the Mixing Chamber.



Maintenance

Inner Chimney/Ignition Electrode cleaning

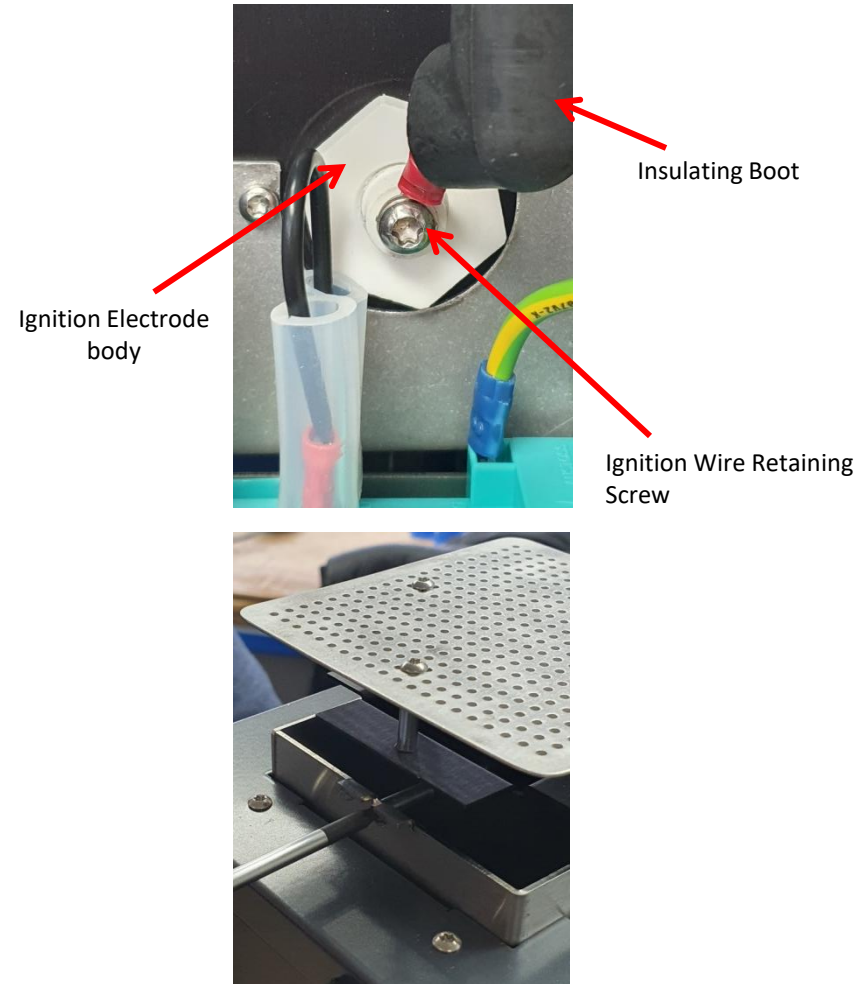


The Chimney Assembly and Burner must be completely cool before proceeding further.

The Inner Chimney and Igniter should be cleaned according to the maintenance schedule; or more frequently if ignition is unreliable or the signal becomes erratic.

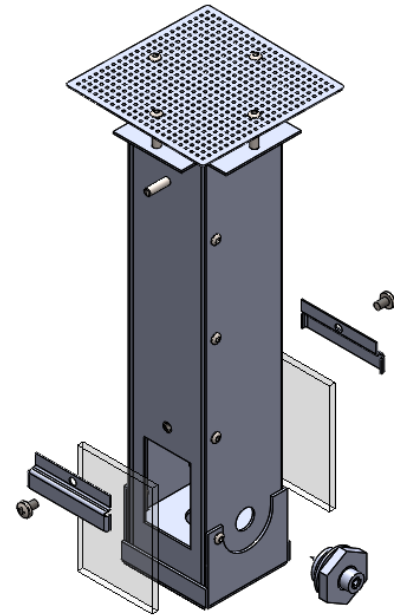
It is advised to ensure the optical glass is kept clean and free from finger grease and other such contaminants.

1. Unplug the mains power cord.
2. Remove the six Chimney Back Piece retaining screws using a T20 Torx driver.
3. Note the location of the chimney fan power cable and then disconnect this from the socket.
4. Carefully place Chimney Back Piece and screws to one side.
5. Identify the Ignition Electrode connection. Slide back the insulating boot and disconnect the wire using a T20 Torx driver.
6. Using a T10 Torx driver, remove the four screws holding the chimney top 'guard' to the outer chimney, place the guard to one side. Remove the 2 screws holding the Inner Chimney to the Top Cover after removing the 4 screws holding the mesh chimney top in place.
7. Lift the Inner Chimney Assembly up slowly and remove the air tube connection on the bottom of the chimney (*see overleaf*).
8. Continue raising the Inner Chimney in a vertical motion out of the Outer Chimney, being careful not to damage the Ignition Electrode.
 1. *If the user intends to clean or replace the Ignition Electrode during this procedure, undo the 25.4 (1") AF hexagonal Retaining Nut on the igniter.*
 2. *Remove one widow by loosening the clamping bracket using a T20 Torx driver.*
 3. *Replace the igniter and fit a new nut. Retighten.*

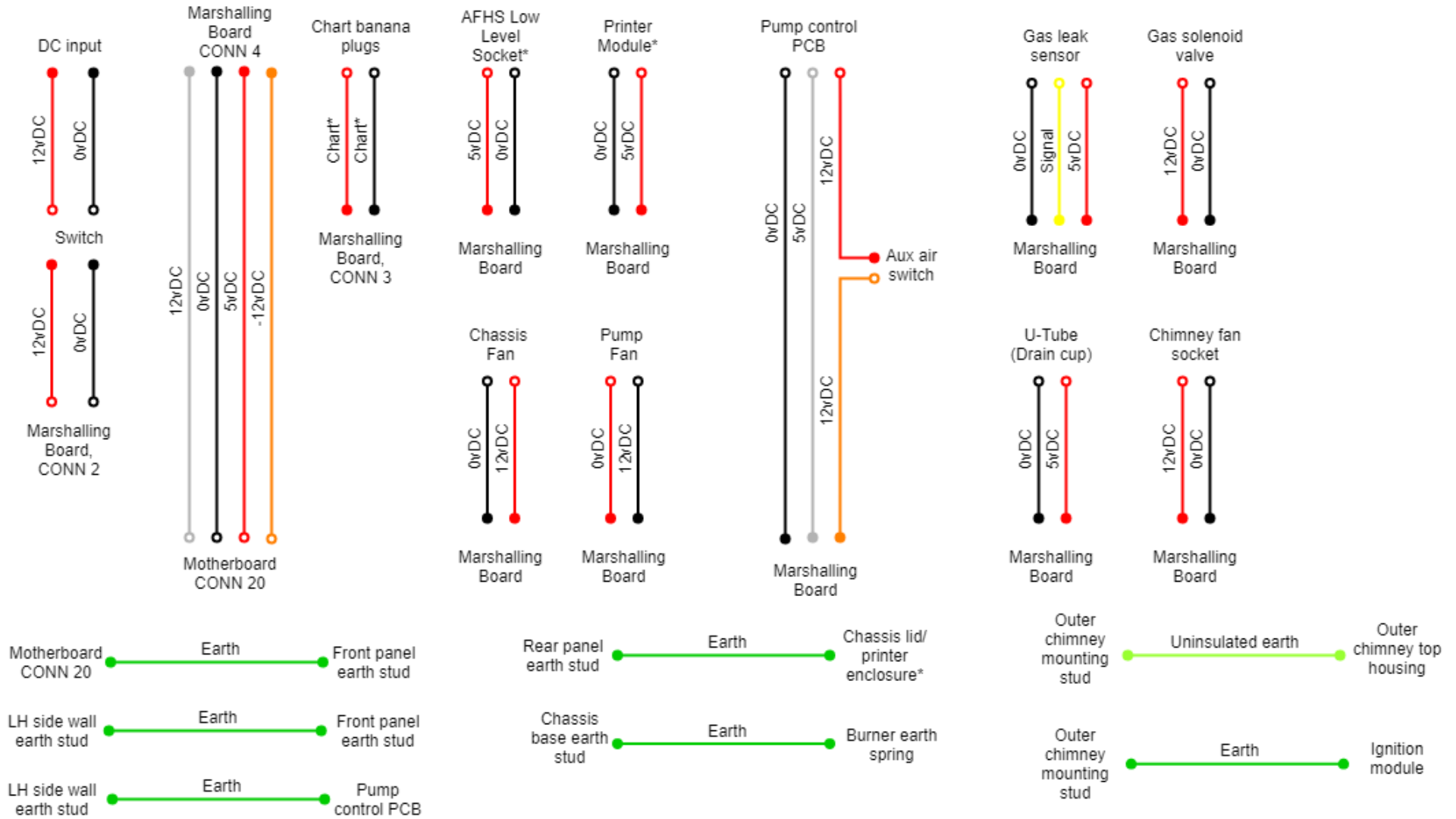


Maintenance

7. Remove the Inner Chimney Windows from the Inner Chimney by removing the screws from the window retainers.
8. Clean the glass windows and chimney pieces using a non-abrasive cleaner or mild detergent solution, taking care not to scratch any of the surfaces.
9. Reach into the Outer Chimney and clean the optic window very gently using a very soft cloth or cotton swab
10. If required, the Outer Chimney/Heat Shield Assembly can also be removed for cleaning by removing the 4 screws on the top of the chimney housing using a T10 Torx driver.
11. Re-assemble in reverse order, taking care not to damage or place finger grease on the windows.
12. Replace the Inner Chimney into the Outer Chimney. Reconnect the air tubing, the wire to the Ignition Electrode and replace the Rubber Boot.
13. Reconnect the chimney fan connection and ensure the cable is tucked between the ignition module and the space below the socket (this is critical).
14. Refit the Chimney Back Piece and all six retaining screws.
15. Refit the chimney top 'guard'.

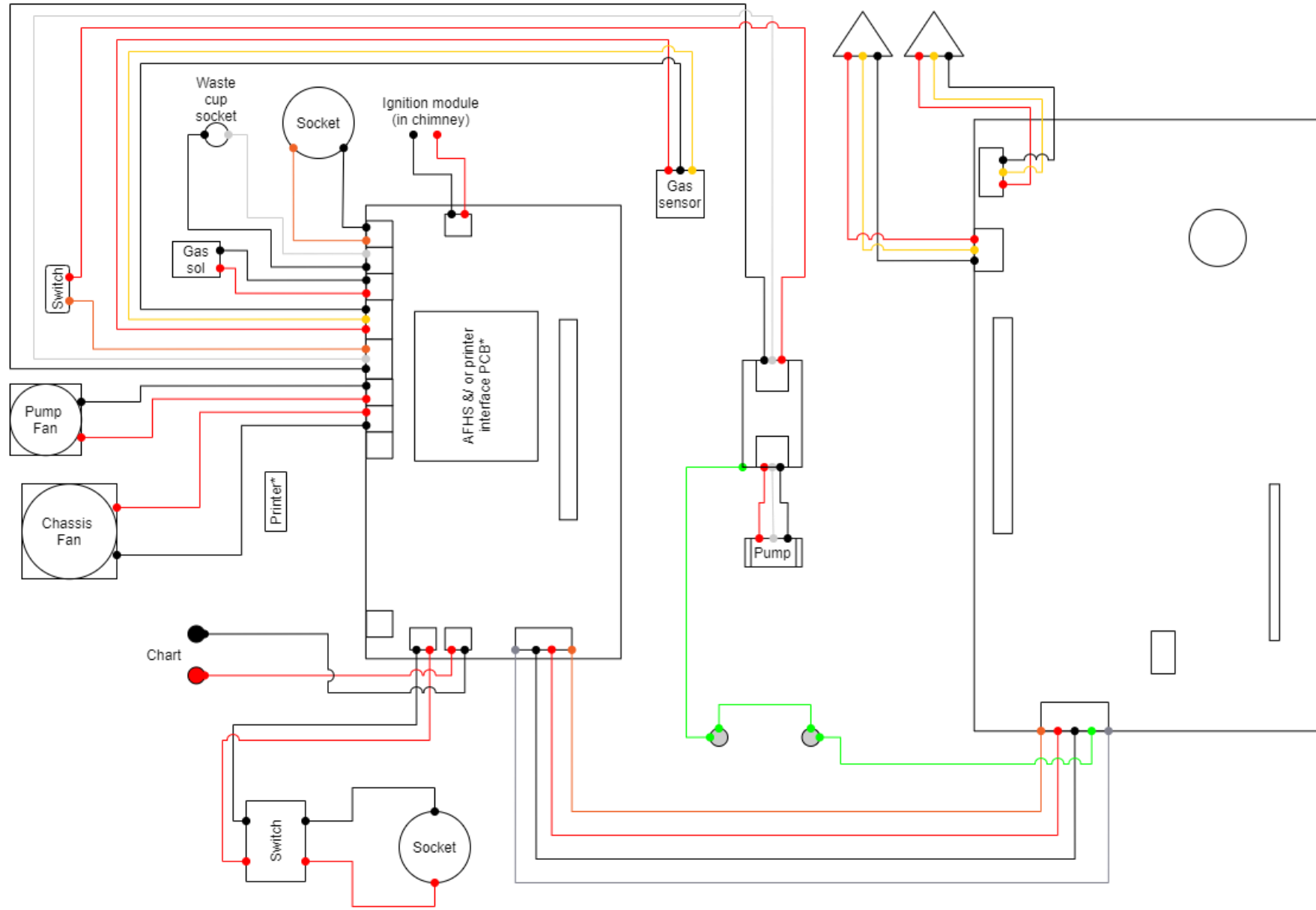


Electrical Schematic

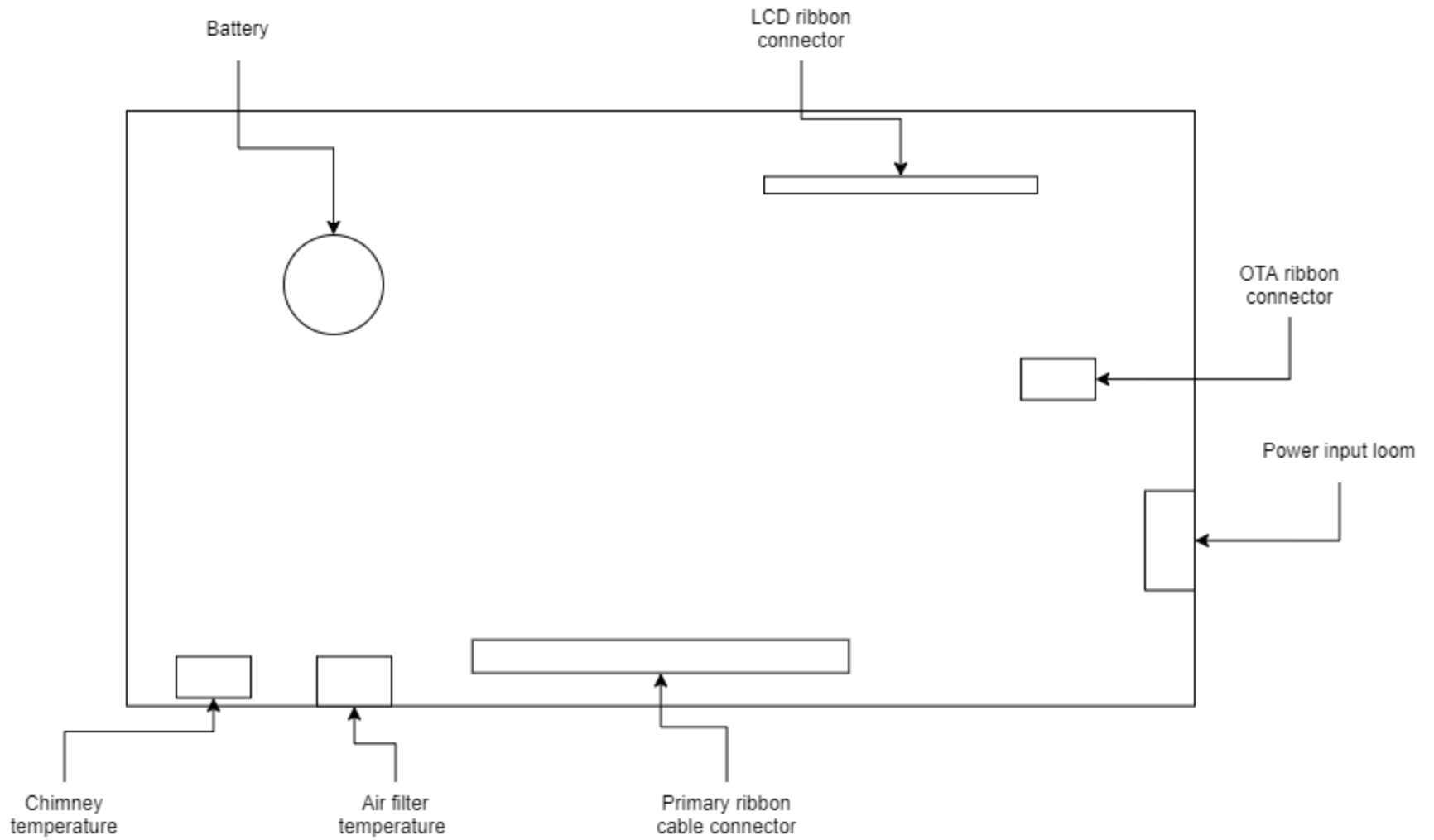


*indicates optional items based on model/ purchase configuration.
 Note: Ribbon cables are excluded from this diagram.

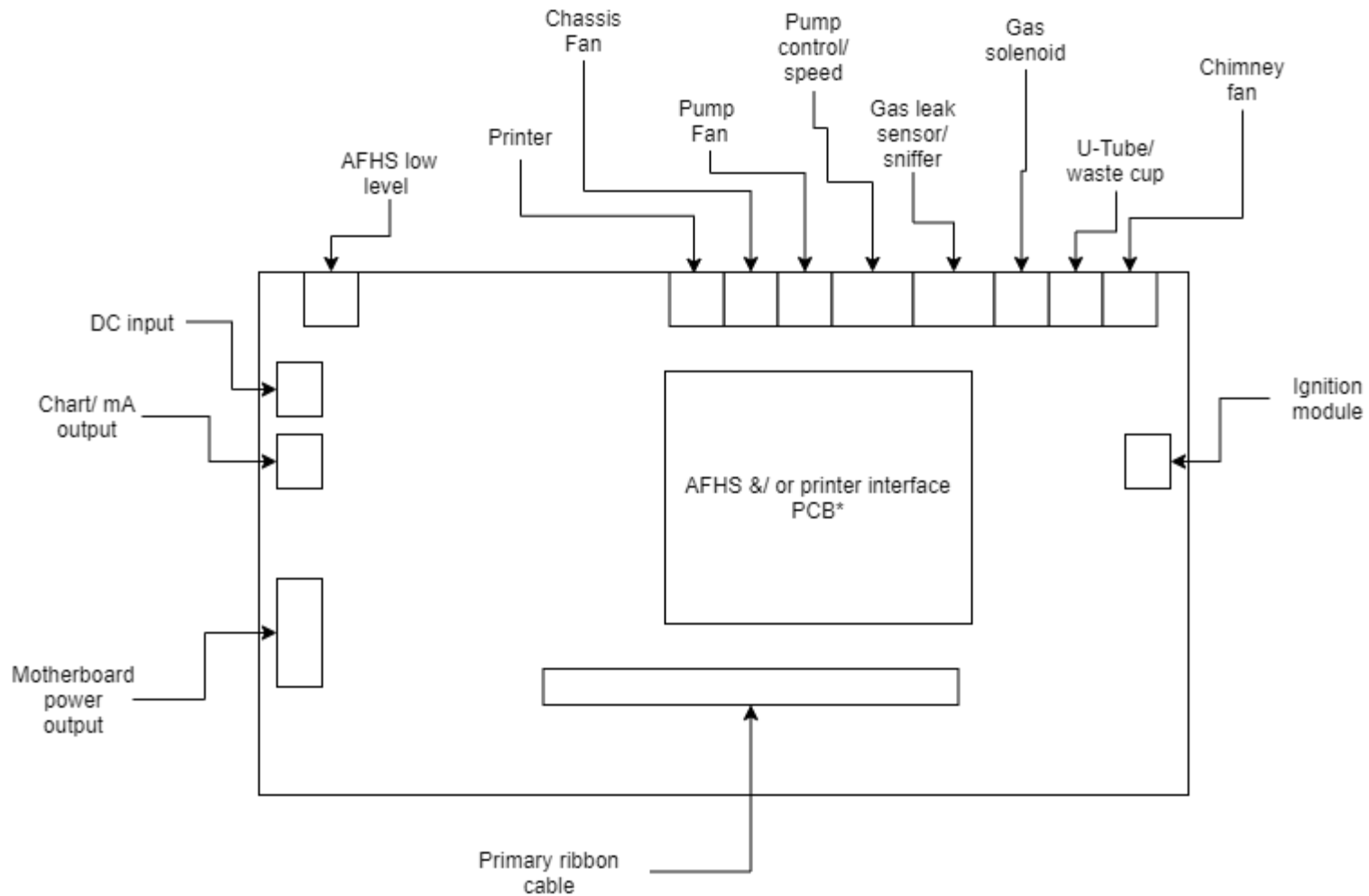
Wiring Schematic



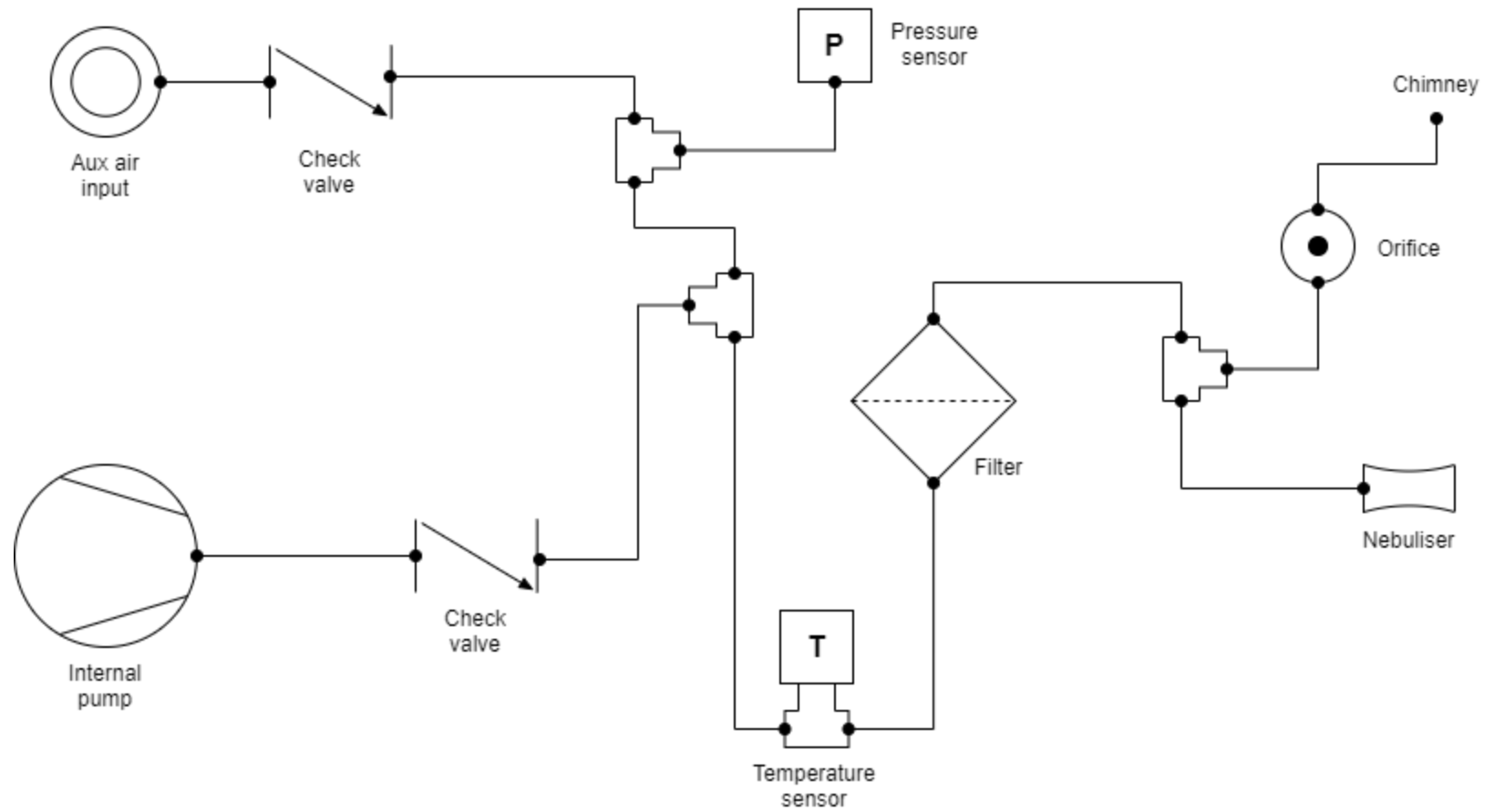
Motherboard Schematic



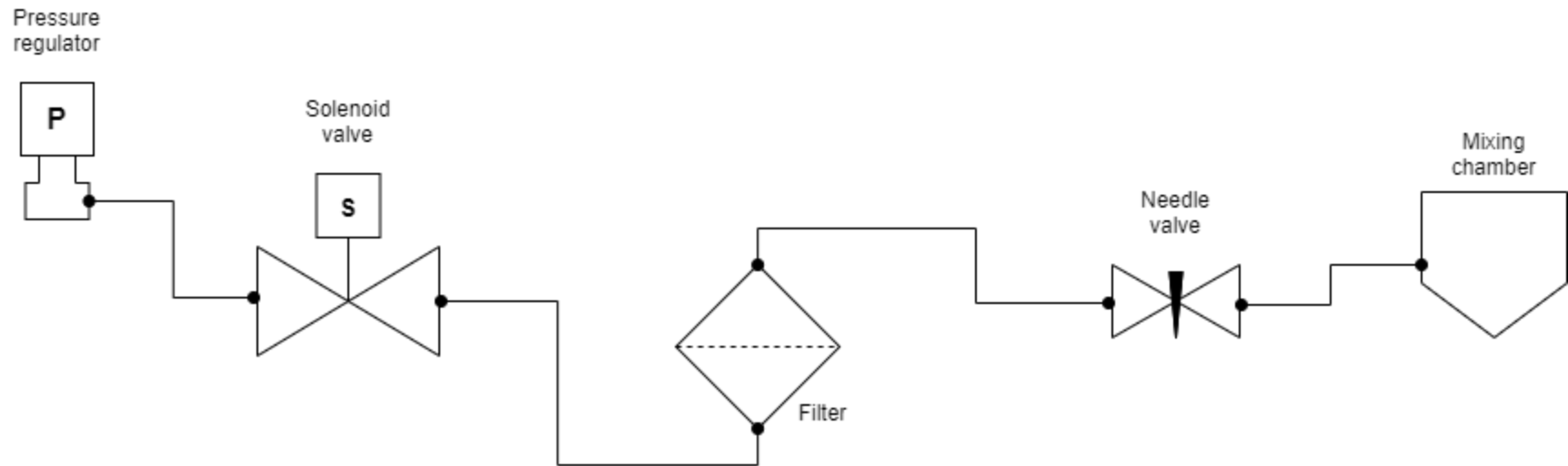
Marshalling Board Schematic



Air Flow Schematic



Gas Flow Schematic



Gaining access to the instrument enclosure

To perform the following component or sub-assembly replacement or servicing procedures it will first be necessary to access the interior of the instrument enclosure. This should be carried out as follows:-

1. Unplug the mains power cord.
2. Turn off the gas supply at source and switch off the external air supply (if used).

NOTE: It will not normally be necessary to disconnect the gas supply and external air supply (if used) from the instrument rear panel unless the servicing is to be performed at another location or if sufficient access cannot be gained without doing so.

3. Remove the four screws which secure the instrument top cover and remove the cover.



Some units have a printer unit fitted to this cover. In such cases care should be taken that the printer and its connection cables are not damaged when the cover is removed, particularly if it is left connected to the instrument during servicing activities. The cover will also always be attached to the instrument by an earth cable. If the cable is removed it is **essential** that the earth cable be replaced in the same position and the fixing is fully tightened when the cover is replaced.

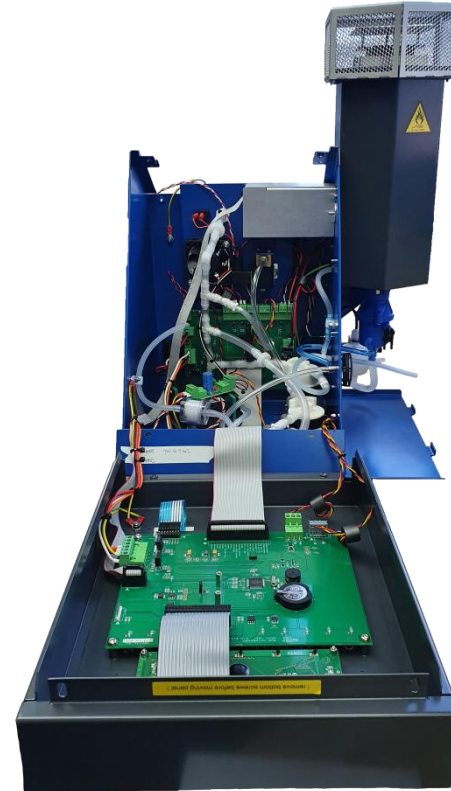


Gaining access to the instrument enclosure

4. Remove the four screws holding the Front Panel Assembly in place

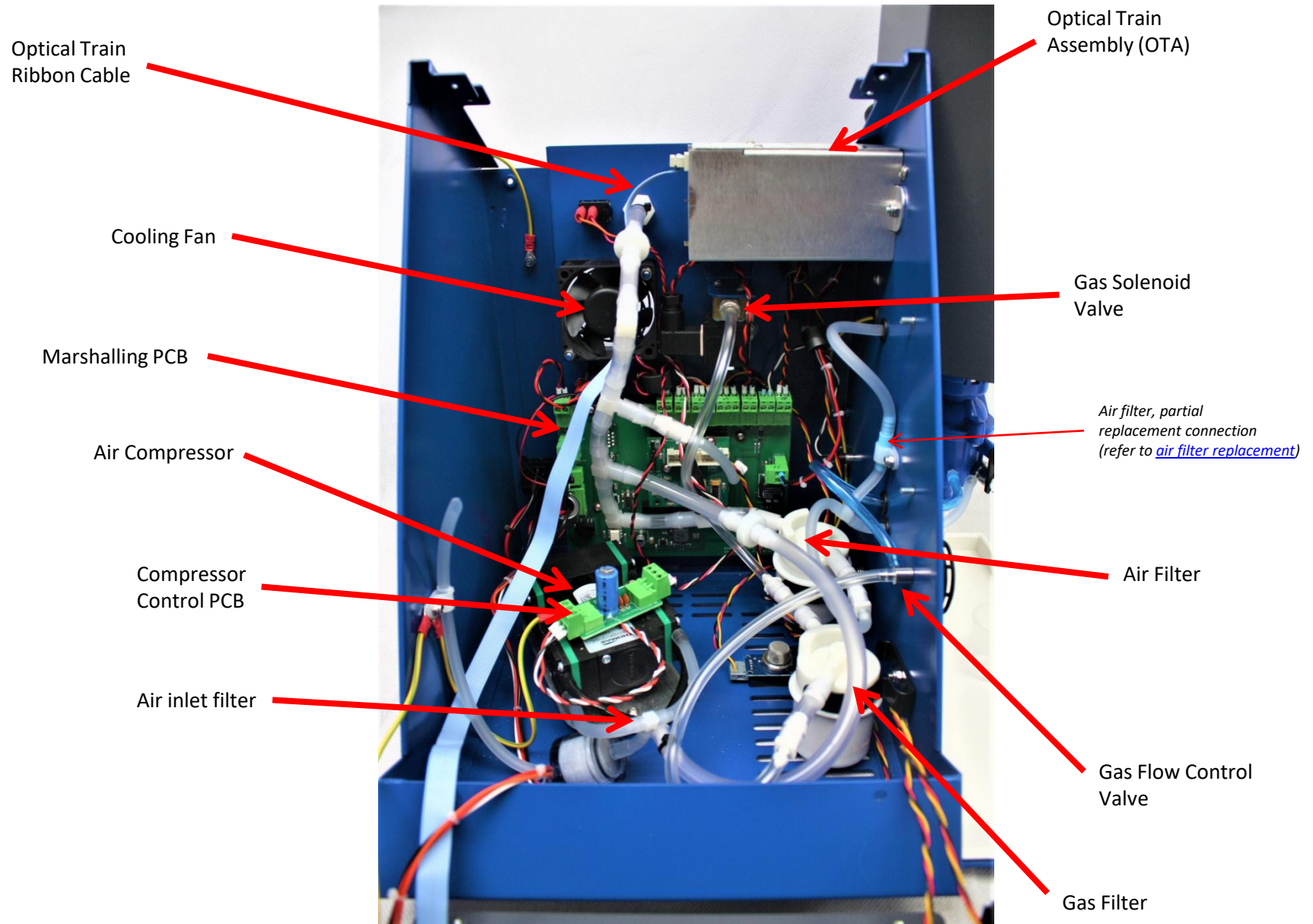


5. Place bubble wrap or a soft material on the table in front of the front panel to protect the keypad. Carefully lower the Front Panel Assembly down on the table being aware that it is retained to the instrument by cables at the bottom.

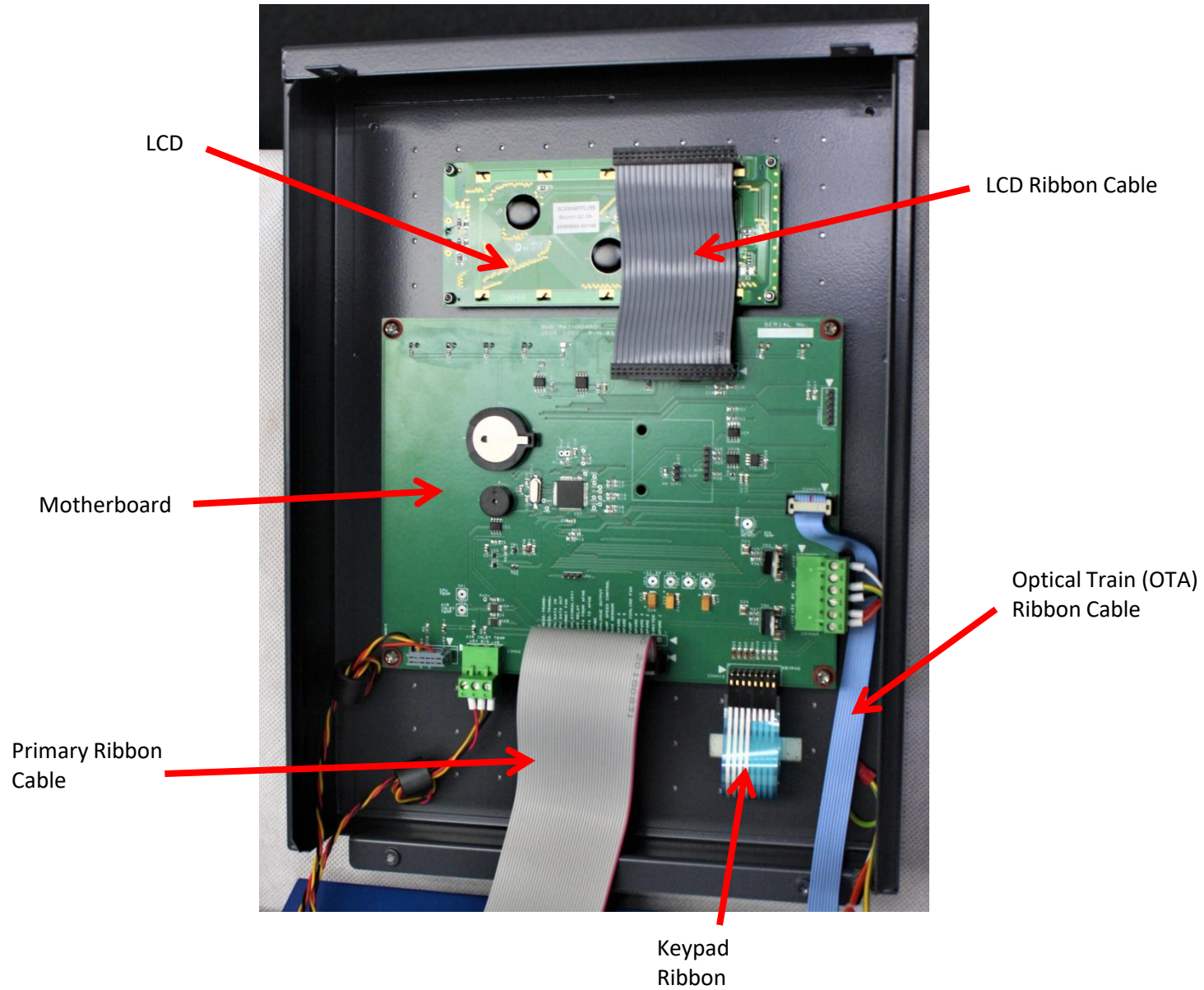


6. If wished the printer cables (if present) can now be disconnected and the earth wire removed to allow the top cover to be removed completely. Note however that these must be replaced during re-assembly of the instrument.

Instrument main chassis, component overview

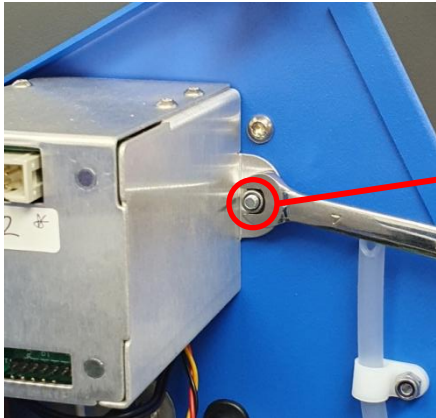


Instrument front panel, component overview



Replacing the OTA

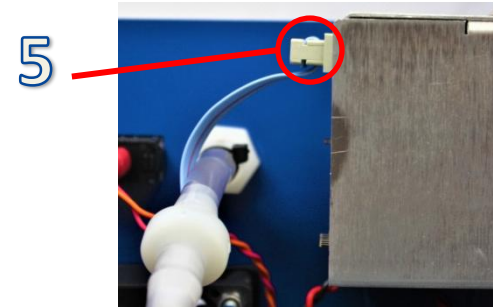
1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove internal fixing screw using a 7mmAF spanner or nut spinner.
3. Remove the screw in the rear panel fixing using a T20 Torx driver.
4. Remove the Optical Train Assembly, taking care not to touch the optical face.
5. Disconnect the ribbon cable.
6. To replace, reverse the procedure.



2

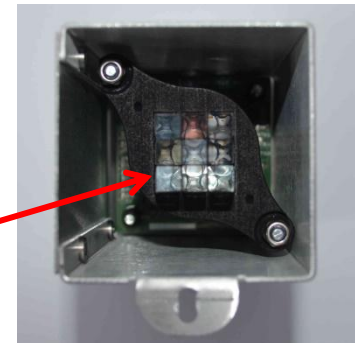


3



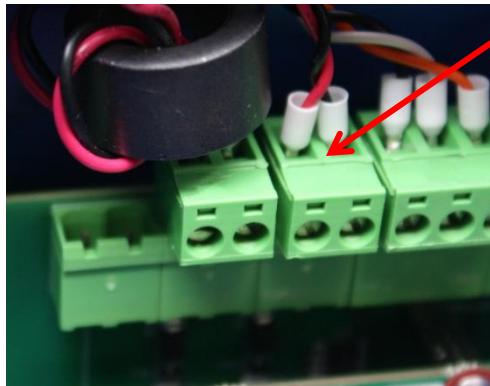
5

Optical face
DO NOT TOUCH

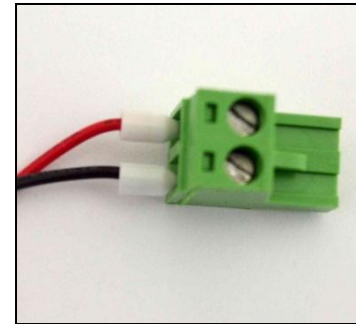
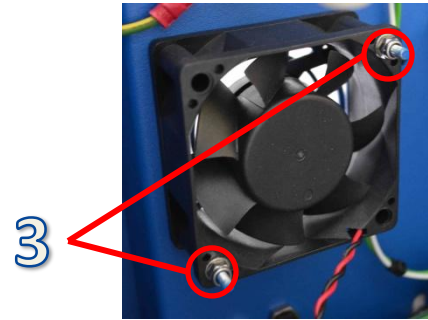


Replacing the Chassis Fan

1. Gain access to the instrument enclosure as previously described.
2. Identify the fan electrical connection on the Marshalling PCB.
Carefully unplug the connector by pulling upwards
3. Remove the 2 x 5.5mmAF nuts which secure the cooling fan to the rear panel and withdraw the fan
4. Refit the fan assembly, ensuring the fan is located with the label towards the rear panel of the instrument. Secure with the 2 x 5.5mmAF nuts and reconnect electrical connection to the Interface PCB.



2



Note the connector
polarity

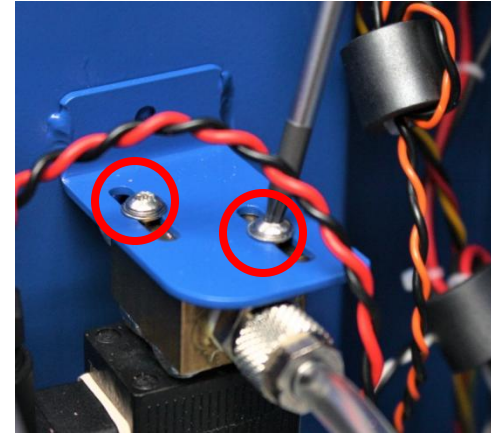
Replacing the Gas Solenoid

Note: It is recommended that the OTA is removed before attempting the removal of the Gas Solenoid to aid with access.

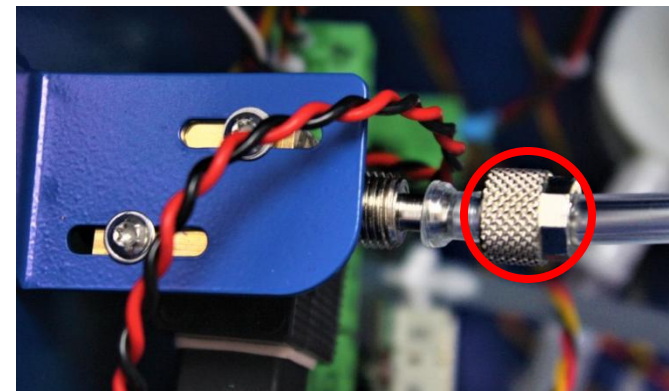
1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove the [OTA](#) as previously described.
3. Remove the 2 solenoid fixing screws using a T10 Torx driver.
4. Locate the gas regulator connecting collar and gently pull backwards on the collar, this will disengage the teeth holding the solenoid tube in location. With the collar pulled back the solenoid can be pulled in the opposite direction to disconnect the assembly from the regulator.
5. Using a 12mmA/F spanner loosen the flexible tubing knurled nut and disconnect the tube.
6. Remove the electrical plug securing screw using a Philips *1 driver and pull the plug away from the solenoid.
7. Replacement is undertaken in reverse order. Ensure that the electrical plug is orientated in the correct direction. It is not necessary to pull the collar when reconnecting the solenoid tube to the gas regulator, simply push it back to make the connection.

It is essential that a leakage check is performed using a soap solution or a BWB leak detection solution once the unit is put back to functional condition, but before replacing the Front Panel and Top Cover securing screws. Initiate a flame start sequence allowing the solenoid to pass gas, lower the Front Panel and check all gas connections for leaks whilst flame is alight. Once all connections have been confirmed as free from leaks, refit and secure the Front Panel and Top Cover.

3



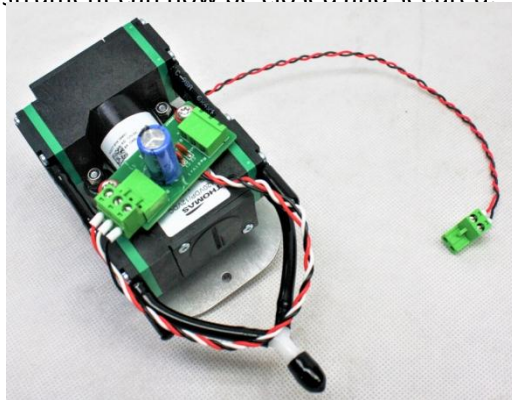
5



Replacing the Air Compressor

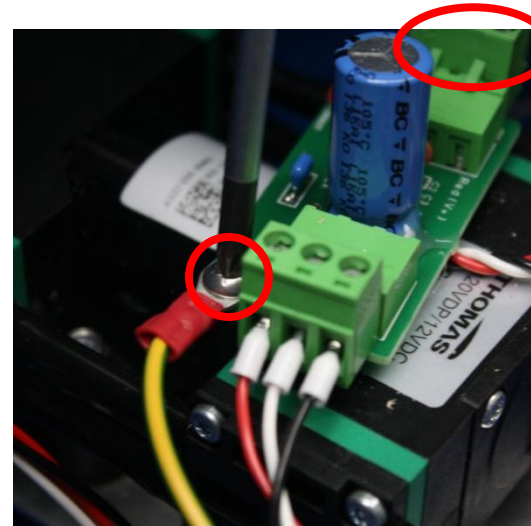
1. [Gain access](#) to the instrument enclosure as previously described.
2. Disconnect the power to the pump and remove the earth cable
3. Disconnect the pump fan from the Marshalling PCB.
4. Cut the cable tie and remove the air inlet air outlet tubes.
5. Identify the 3 securing screws and remove the pump assembly using a T20 Torx driver.
6. Replace the pump assembly and refasten the screws.
7. Reconnect the inlet and outlet tubes
8. Reconnect the electrical supply to the pump.
9. Reconnect the Pump Fan power supply to the Marshalling PCB.

It is advised that an operational test of the pump is performed before completely securing the instrument enclosure. Gently place the Front Panel back into position and power the instrument on. Navigate to the Maintenance Menu and Run Compressor. Ensure the compressor runs as expected. The instrument can now be closed and secured.

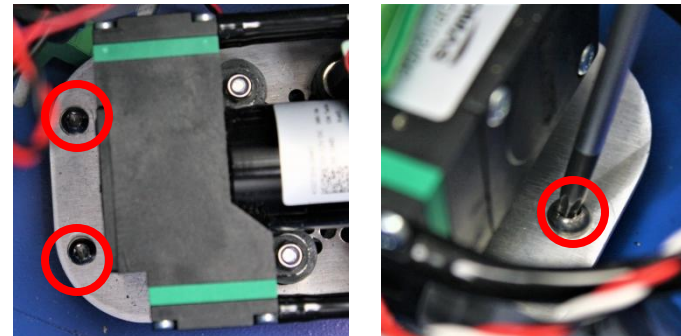


The Pump Assembly

2



4



Replacing the Air Filter

Access to the instrument enclosure and the outer chimney is required for a full replacement to take place. A partial replacement can be conducted without accessing the outer chimney by replacing the tube up to and including the blue connector piece on the inside of the main chassis.

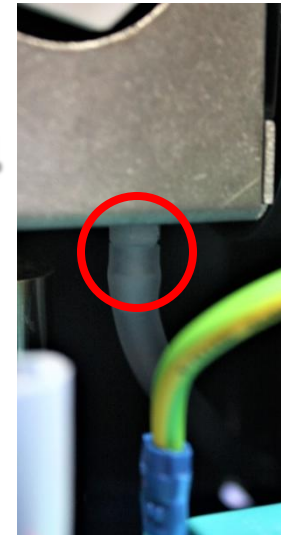
1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove the outer Chimney rear plate, (6 screws) using a T20 Torx driver.
3. It is recommended the chimney fan is unplugged and the ignition module removed (see relevant section) for ease of access.
4. Disconnect the air tube from the base of the inner chimney and feed this through the grommet into the main enclosure.
5. Cut the cable tie on the auxiliary air barb and the compressor outlet. Remove the tube from the barbed fitting.
6. Disconnect the tube from the air pressure sensor on the Marshalling PCB.
7. Disconnect the tube from the Nebuliser and pull the tube back through the grommet in the chassis wall.
8. Unplug the temperature probe cable from the motherboard.
9. Release the air filter from the retaining clip.
10. Replacement of the air filter is carried out in reverse.

If a partial replacement is to be conducted the tube can be disconnected from the [blue connector](#) to prevent having to access the outer chimney.

2



4



5



Continues on next page

Replacing the Air Filter

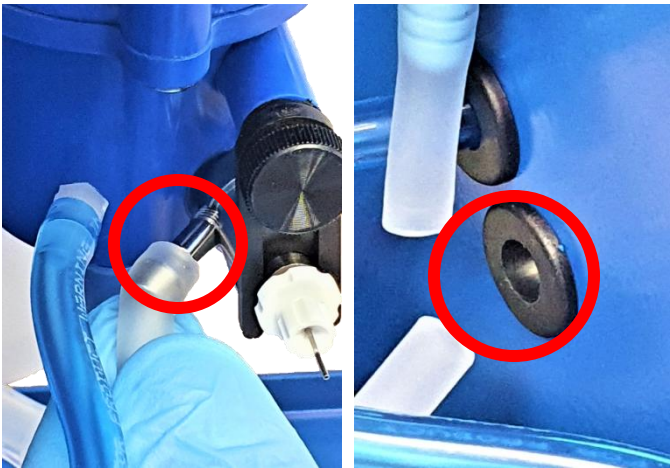
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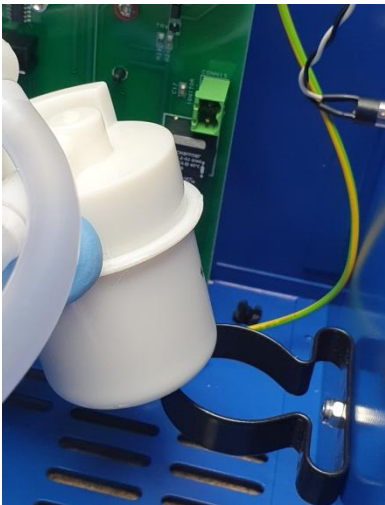
8



7

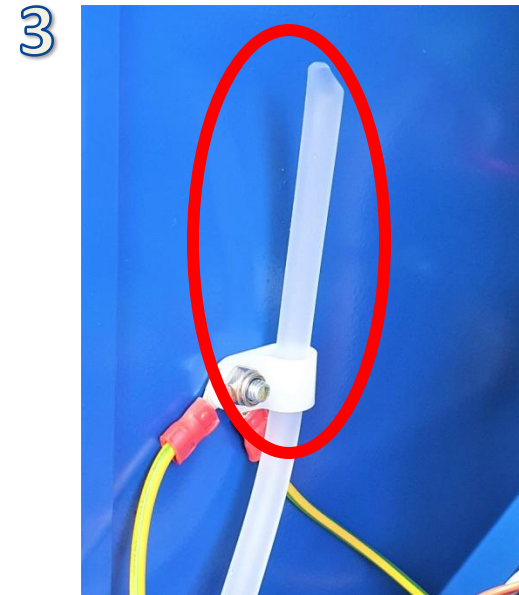
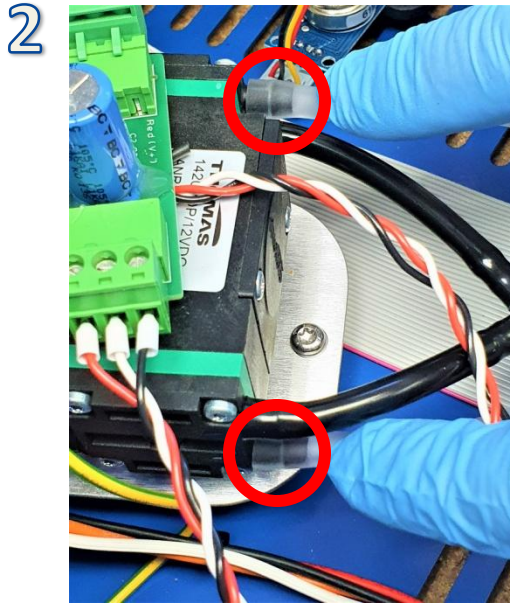


9



Replacing the Air Inlet Filter

1. [Gain access](#) to the instrument enclosure as previously described.
2. Locate the air inlet filter and remove the tube from the barbed fittings on the pump.
3. Replace the assembly and feed the suction tube through the P clip on the left hand chassis wall (this ensures air flow consistency is maintained).

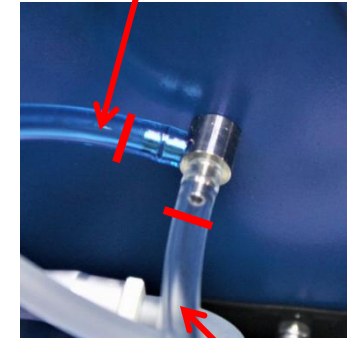
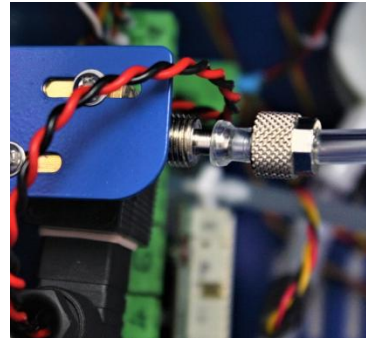


Replacing the Gas Filter

1. [Gain access](#) to the instrument enclosure using as previously described.
2. Undo the knurled nut on the gas solenoid using a 12mm A/F spanner. Remove the tube from the solenoid and retain the nut.
3. Cut the blue tube away from the gas flow adjustment valve (it is important not to pull this away from the valve as it is a very tight fit and damage to the valve can occur, it is also important when cutting not to apply pressure with a sharp edge to the barb on the gas valve so as not to score the sealing face).
4. Pull the white tube from the gas adjustment valve.
5. Carefully pull the blue tube from the mixing chamber barb (in a straight direction to prevent snapping the barb) and feed the blue tube through the grommet in the chassis wall.
6. Release the gas filter from the retaining clip and remove the assembly.
7. The assembly can be replaced in the reverse order.

It is essential that a leakage check is performed using a soap solution or BWB leak detection solution once the unit is put back to functional condition, but before replacing the Front Panel and Top Cover securing screws. Initiate a flame start sequence allowing the solenoid to pass gas, lower the Front Panel and check all gas connections for leaks whilst flame is alight. Once all connections have been confirmed as free from leaks, refit and secure the Front Panel and Top Cover.

1



Blue tube

Transparent tube



Gas Filter

Gas Filter
Retaining clip

Replacing the Gas Fuel Adjustment Valve

1. [Gain access](#) to the instrument enclosure as previously described.
2. Cut the blue tube away from the gas flow adjustment valve (it is important not to pull this away from the valve as it is a very tight fit and damage to the valve can occur, it is also important when cutting not to apply pressure with a sharp edge to the barb on the gas valve so as not to score the sealing face).
3. Pull the white tube from the gas adjustment valve.
4. Unscrew the fuel gas guard using an anti-clockwise rotation.
5. Remove the valve from the chassis.
6. Replace the valve and refit the gas fuel guard.
7. Ensure the tubes are replaced in the correct orientation as displayed in the image (2).

It is essential that a leakage check is performed using a soap solution or BWB leak detection solution once the unit is put back to functional condition, but before replacing the Front Panel and Top Cover securing screws. Initiate a flame start sequence allowing the solenoid to pass gas, lower the Front Panel and check all gas connections for leaks whilst flame is alight. Once all connections have been confirmed as free from leaks, refit and secure the Front Panel and Top Cover.

2



4



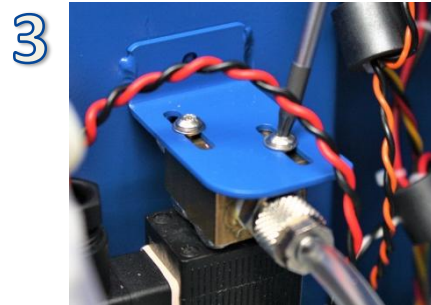
Replacing the Gas Regulator

The gas regulator contains no user serviceable parts. DO NOT attempt to disassemble the gas regulator.

Note: It is recommended that the OTA is removed before attempting the removal of the Gas Solenoid to aid with access. Removal of the Marshalling board will be required during this process.

1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove the [OTA](#) as previously described.
3. Remove the 2 solenoid fixing screws using a T10 Torx driver.
4. Locate the gas regulator connecting collar and gently pull backwards on the collar, this will disengage the teeth holding the solenoid tube in location. With the collar pulled back the solenoid can be pulled in the opposite direction to disconnect the assembly from the regulator. The solenoid can be left loose in the enclosure.
5. Remove the [Marshalling PCB](#).
6. Remove the screws and nuts that secure the gas regulator using a T25 Torx Driver and 8mm A/F spanner. The gas regulator (including the plastic mounting bracket) can be removed from the chassis.
7. Reassemble in reverse order ensuring all connectors and tubing are correctly and firmly attached and that wiring and tubing is not snagged or pinched.

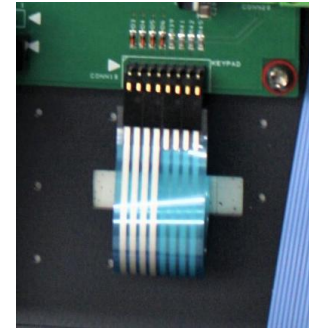
It is essential that a leakage check is performed using a soap solution or BWB leak detection solution once the unit is put back to functional condition, but before replacing the Front Panel and Top Cover securing screws. Initiate a flame start sequence allowing the solenoid to pass gas, lower the Front Panel and check all gas connections for leaks whilst flame is alight. Once all connections have been confirmed as free from leaks, refit and secure the Front Panel and Top Cover.



Replacing the Keypad

1. [Gain access](#) to the instrument enclosure as previously described.
2. Identify and disconnect the keypad connector from the motherboard.
3. Carefully place the Front Panel Assembly back into position on the instrument. Using a knife blade or a thin flat screwdriver, carefully lift a corner of the membrane (2). Grasp the lifted corner and peel the membrane away from the metal panel.
4. If necessary clean off any adhesive deposits on the metal panel using IPA. Remove the adhesive backing from the replacement membrane keypad. Pass the membrane cable through the aperture in the panel, carefully locate the membrane in position and smooth firmly in place.
5. Remove the Front Panel Assembly from the instrument and place it back on the protected surface. Connect the membrane cable to the Motherboard.
6. Before reassembly it is advised the Keypad is tested for operation. Place the Front Panel Assembly back into position on the instrument and power the instrument on. Navigate to Setup > Test Hardware > Keypad. Pressing each key on the keypad should display the reference on screen. If confirmed operational the instrument can be fully reassembled.

2



3

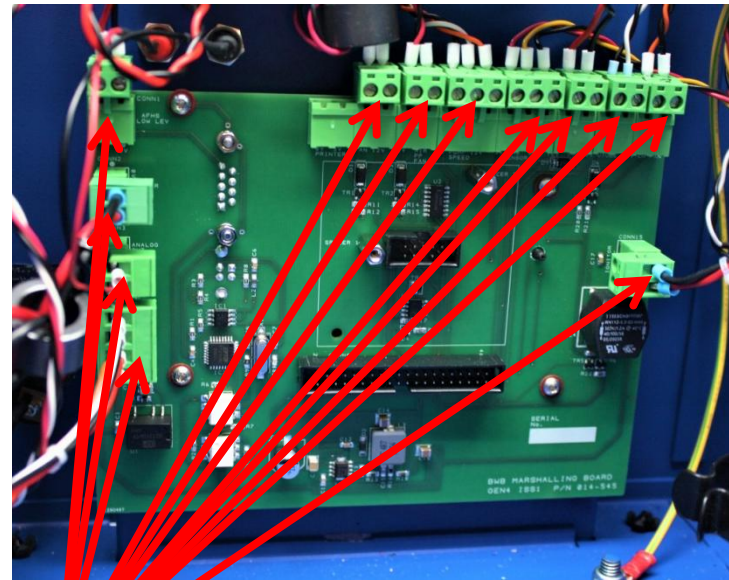
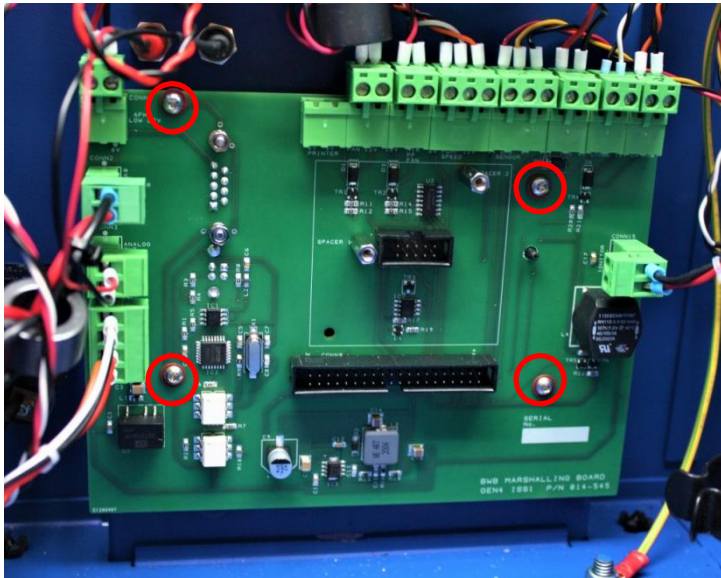


6

Key Matrix	- - - -
Rev:2	- - - -
Read+Stop	- - - -
To Abort	- - - -

Replacing the Marshalling Board (PCB)

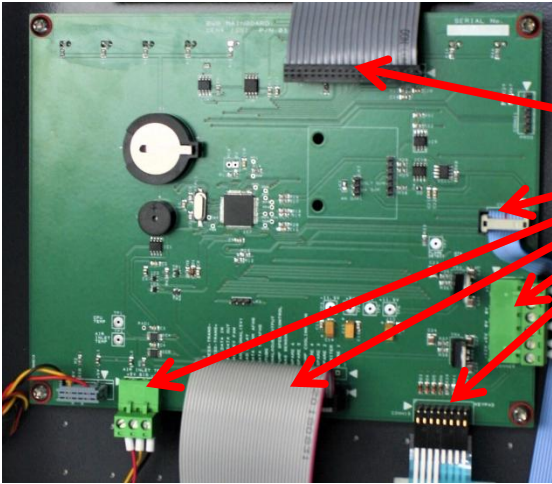
1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove any USB or RS232 connections from the rear of the instrument.
3. Disconnect all connections from the marshalling board.
4. Remove the 4 retaining screws using a T10 torx driver.
5. Once removed from the housing the AFHS/ Printer Interface PCB can be removed (if fitted), fit this to the new marshalling board.
6. Replace the marshalling board.
7. Reassemble the instrument in reverse order.



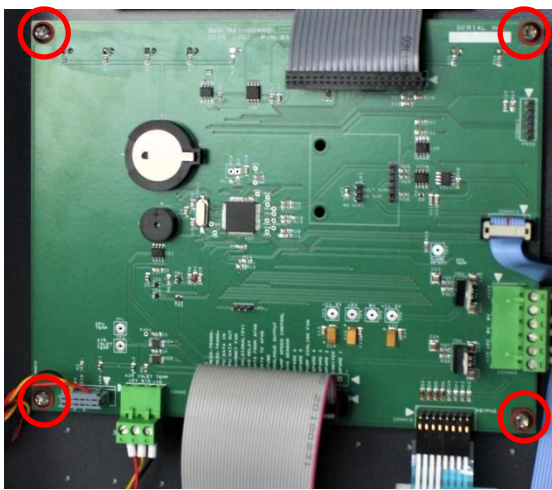
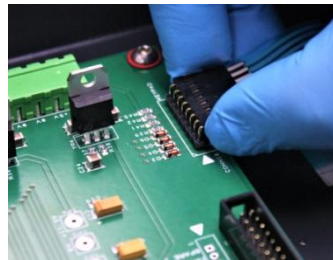
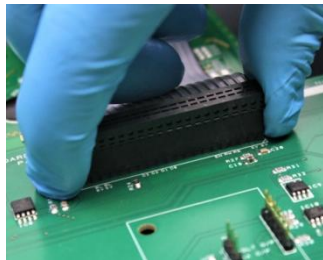
Disconnect all connectors including the ribbon cable (already shown removed)

Replacing the Motherboard (PCB)

- 1. [Gain access](#) to the instrument enclosure as previously described.
- 2. Disconnect all connections from the motherboard.
- 3. Remove the 4 retaining screws using a T20 torx driver.
- 4. Replace the motherboard.
- 5. Reassemble the instrument in reverse order.

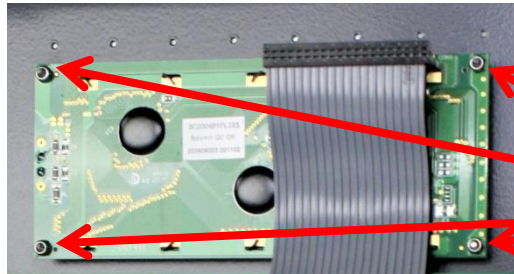
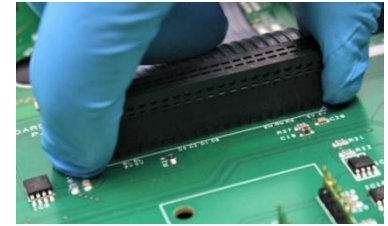


Disconnect all connectors

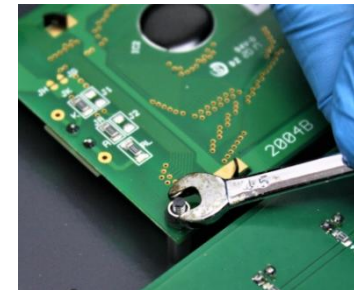


Replacing the LCD / LCD ribbon

1. [Gain access](#) to the instrument enclosure as previously described.
2. Disconnect the ribbon cable from the LCD and motherboard.
3. Remove the 4 retaining screws using a A/F 3.5mm spanner.
4. Replace the LCD and ribbon cable.
5. Reassemble the instrument in reverse order.

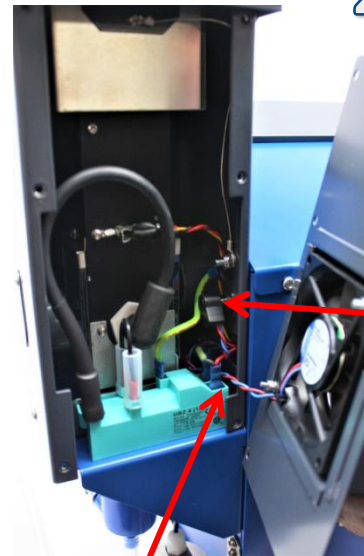


Remove the four LCD retaining nuts



Replacing the Ignition Module

1. Access the rear of the chimney by removing the 6 retaining screws using a T20 torx driver.
2. Unplug the chimney fan from the connection on the chassis side wall. Note the cable location (tucked down the side of the ignition module – it is vital the cable is placed back in this position). Place the chimney rear plate assembly to one side.
3. Remove the HT cable boot from igniter and remove the screw securing the cable using a T20 torx driver.
4. Use a 7mm spanner to remove the nut securing the earth cable to the chassis. Remove the earth cable from the stud.
5. Disconnect the power cables connected to the module.
6. Use a flat screwdriver to press in the release tab on the left hand side of the module, carefully ease the module away from the mounting bracket. (Alternatively, the whole bracket and module may be removed in one piece by removing the 2 bracket securing screws on the underside (near the burner thumb screws)).
7. Replace the module and reassemble in reverse order taking care to ensure the chimney fan power cable is returned to its location down the side of the module.



Note location of power cable routing.

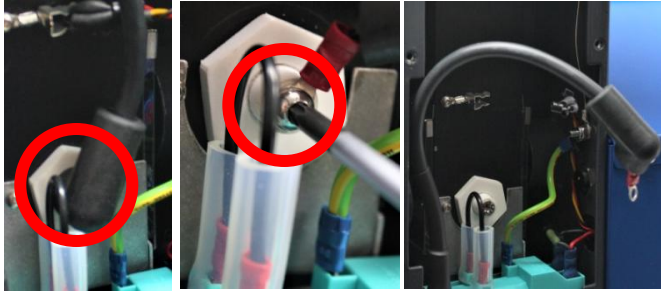


Power connector socket

Continues on next page

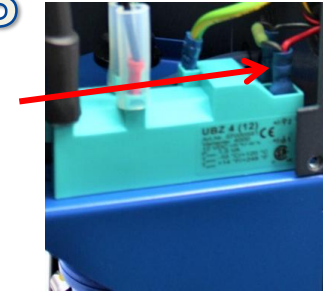
Replacing the Ignition Module

3

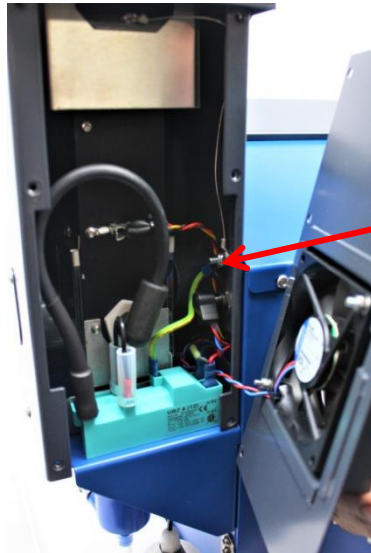


5

Power cable connections



4



Earth stud, cable and nut

6

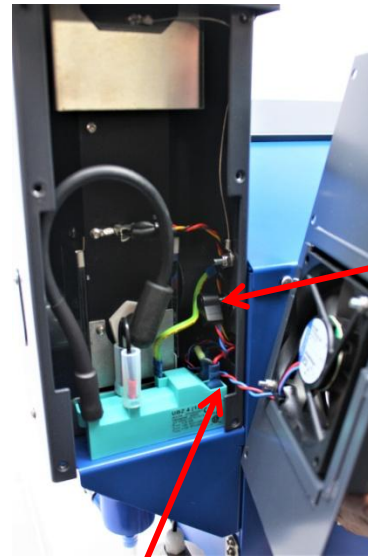
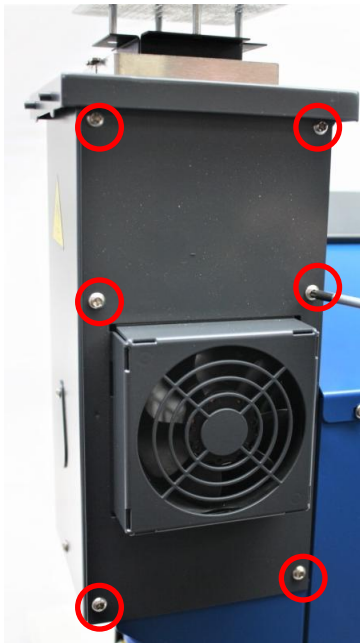


Please note, for clarity the bracket is shown with the chimney removed. It is not necessary to remove the chimney!

Replacing the Chimney Fan

1. Access the rear of the chimney by removing the 6 retaining screws using a T20 torx driver.
2. Unplug the chimney fan from the connection on the chassis side wall. Note the cable location (tucked down the side of the ignition module – it is vital the cable is placed back in this position).
3. Remove the 2 fan securing nuts using a 7mm A/F spanner.
4. Replace the chimney fan ensuring the orientation is as pictured.
5. Reassemble the instrument in reverse order, ensuring the chimney power cable is tucked down the side of the ignition module.

1



Power connector socket

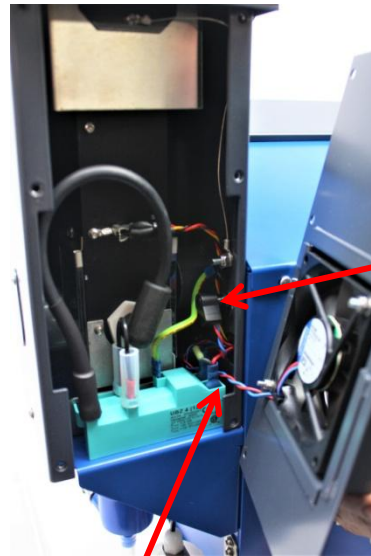
Note location of power cable routing.

Note orientation of fan



Replacing the Igniter

1. Access the rear of the chimney by removing the 6 retaining screws using a T20 torx driver.
2. Unplug the chimney fan from the connection on the chassis side wall. Note the cable location (tucked down the side of the ignition module – it is vital the cable is placed back in this position). Place the chimney rear plate assembly to one side.
3. Remove the 4 screws retaining the chimney top protection mesh with a T10 torx driver and place this part to one side.
4. Remove the HT cable boot from igniter and remove the screw securing the cable using a T20 torx driver.
5. Remove the 2 screws retaining the inner chimney using a T10 torx driver.
6. Disconnect the air tube from the base of the inner chimney.
7. Unclip the temperature sensor from the inner chimney.
8. Carefully raise the inner chimney in an upwards motion out of the chimney housing.
9. Remove 1 window from the inner chimney to enable access.
10. Using a 15 spanner, remove the securing nut for the igniter.
11. Replace the igniter and ensure the nut is reasonably tight (note – overtightening the plastic thread may cause thread damage – do not overtighten).
12. Reassemble the instrument in reverse order ensuring the chimney power cable is tucked down the side of the ignition module.



Note location of power cable routing.

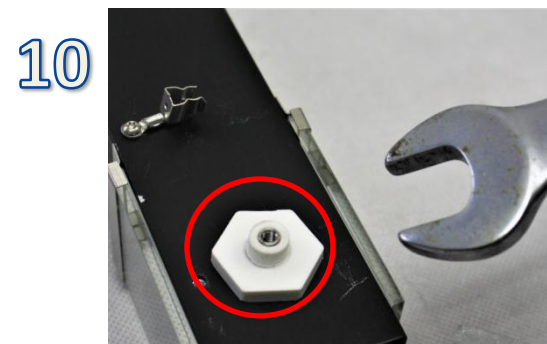
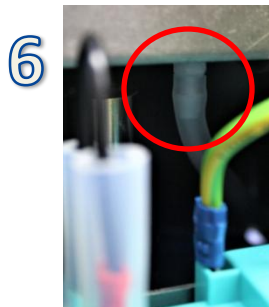
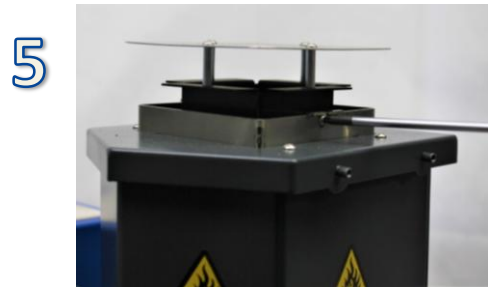
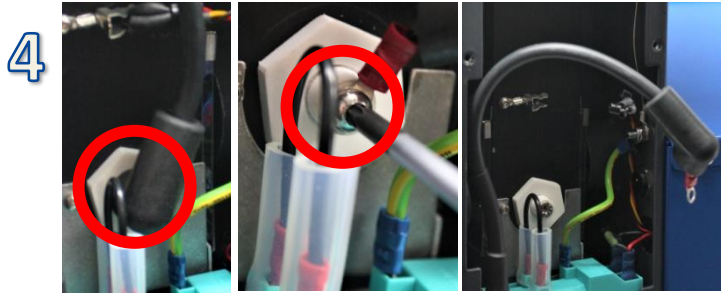


Power connector socket



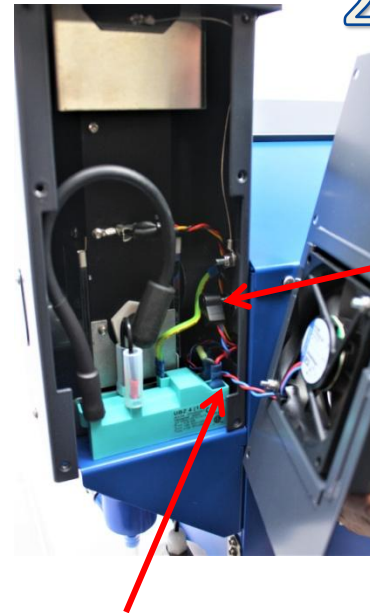
Continues on next page

Replacing the Igniter



Replacing the Inner Chimney Windows

1. Access the rear of the chimney by removing the 6 retaining screws using a T20 torx driver.
2. Unplug the chimney fan from the connection on the chassis side wall. Note the cable location (tucked down the side of the ignition module – it is vital the cable is placed back in this position). Place the chimney rear plate assembly to one side.
3. Remove the 4 screws retaining the chimney top protection mesh with a T10 torx driver and place this part to one side.
4. Remove the HT cable boot from igniter and remove the screw securing the cable using a T20 torx driver.
5. Remove the 2 screws retaining the inner chimney using a T10 torx driver.
6. Disconnect the air tube from the base of the inner chimney.
7. Unclip the temperature sensor from the inner chimney.
8. Carefully raise the inner chimney in an upwards motion out of the chimney housing.
9. Remove the window retaining screws and bracket using a T20 torx driver.
10. Replace the windows and refasten the bracket windows.
11. Reassemble the instrument in reverse order ensuring the chimney power cable is tucked down the side of the ignition module.



Note location of power cable routing.

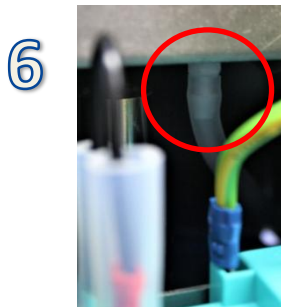
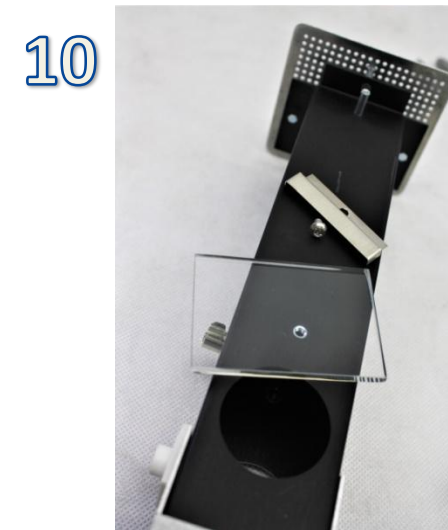
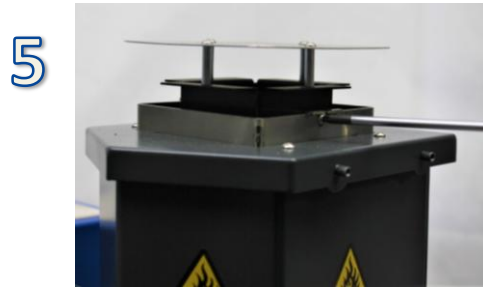
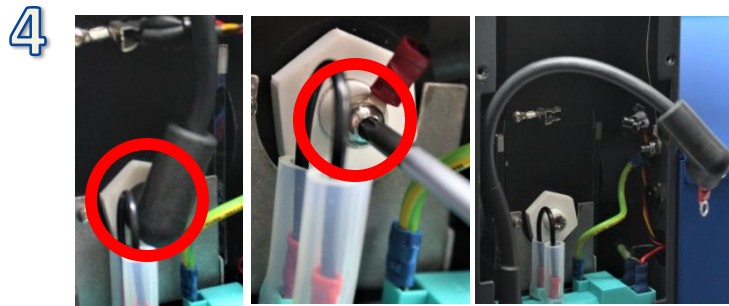


Power connector socket



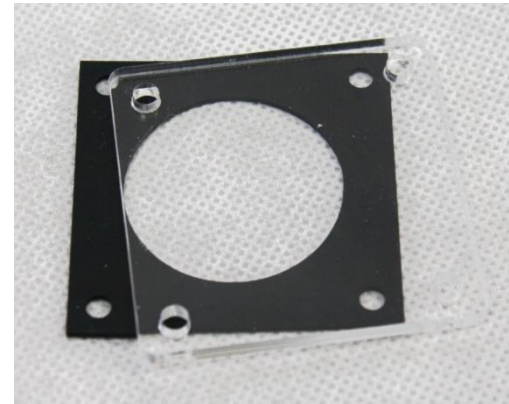
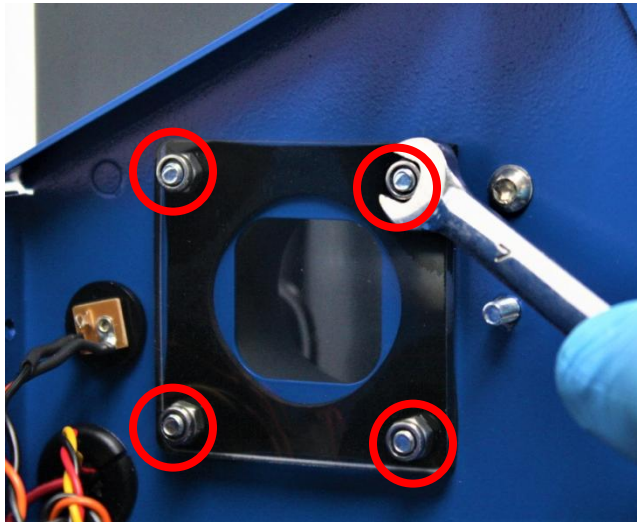
Continues on next page

Replacing the Inner Chimney Windows



Replacing the Optic Window

1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove the OTA assembly as previously described.
3. Remove the 4 optic window retaining nuts using a 7mm A/F spanner.
4. Replace the window (and gasket if required).
5. Reassemble the instrument in reverse order.

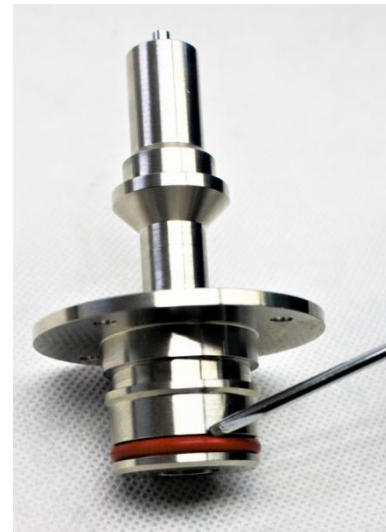
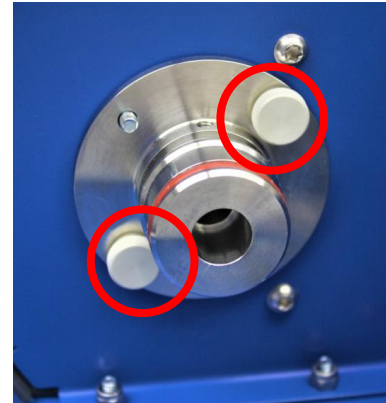


Replacing the Burner

1. Remove the mixing chamber by gently pulling back on the 2 release tabs and pulling the mixing chamber in a downwards direction.
2. Remove the 2 thumb screws holding the burner flange into position, whilst securely holding the burner (failure to hold the burner will cause it to drop out when the screws are removed).
3. Carefully lower the burner from the housing.
4. Replace the burner.
5. Reassemble in reverse order.



Release tabs



Replacing the Mixing Chamber

1. Remove the nebuliser from the mixing chamber.
2. Disconnect the gas tube from the mixing chamber.
3. Remove the U-Tube from the base of the mixing chamber.
4. Remove the mixing chamber by gently pulling back on the 2 release tabs and pulling the mixing chamber in a downwards direction.
5. Replace the mixing chamber.
6. Reassemble the instrument in reverse order.



Release tabs

Replacing the O-Rings (O-Ring Kit)

An O-Ring kit is generic to all models and backwards versions. Not all O-Rings supplied may be required for your model or instrument version.

1. Remove the drain cup from the mounting bracket and use a 10 spanner to remove the outlet drain barb, replace the o-ring.
2. Remove the internal bucket from the drain cup by unscrewing it (a pair of plyers may be used to grip the bucket). Replace the O-Ring found in the bottom of the drain cup.
3. Remove the mixing chamber and open the chamber, replace the gasket. (instructions for removing and opening can be found in the [maintenance section](#)).
4. Remove the nebuliser from the mixing chamber and replace the O-Ring.

1



2



3



4



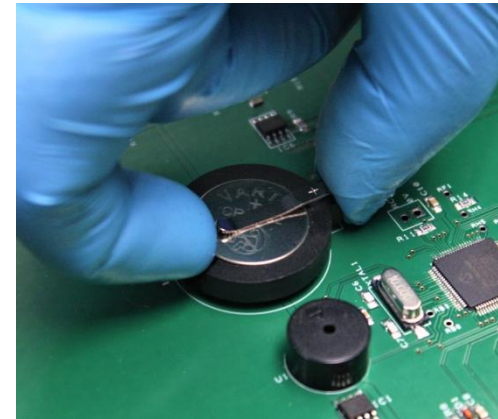


Replacing/ removing the Motherboard Battery

The European Parliament and EU Council have set the goal of reducing the amount of Waste Electrical and Electronic Equipment (WEEE) going to landfill and reducing the hazardous substance content of Electronic and Electrical Equipment (EEE).

Please follow the following steps to decommission your flame photometer prior to recycling

1. [Gain access](#) to the instrument enclosure as previously described.
2. Locate the battery on the motherboard.
3. The battery is held in place with a light spring, one edge of the black surrounding ring is open to allow finger access, carefully prise the battery away from the spring and remove it from the black ring.
4. The battery can now be disposed of in a safe manner or replaced as required.
5. Reassemble in reverse order.



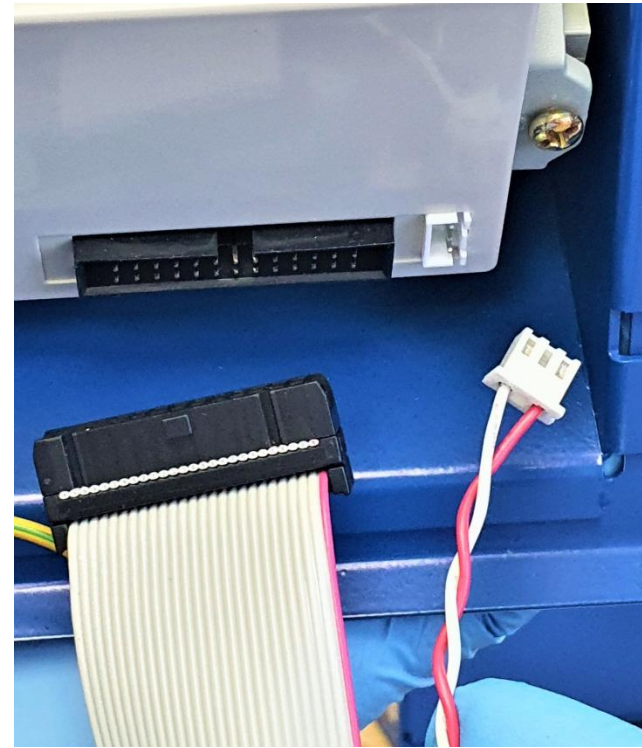
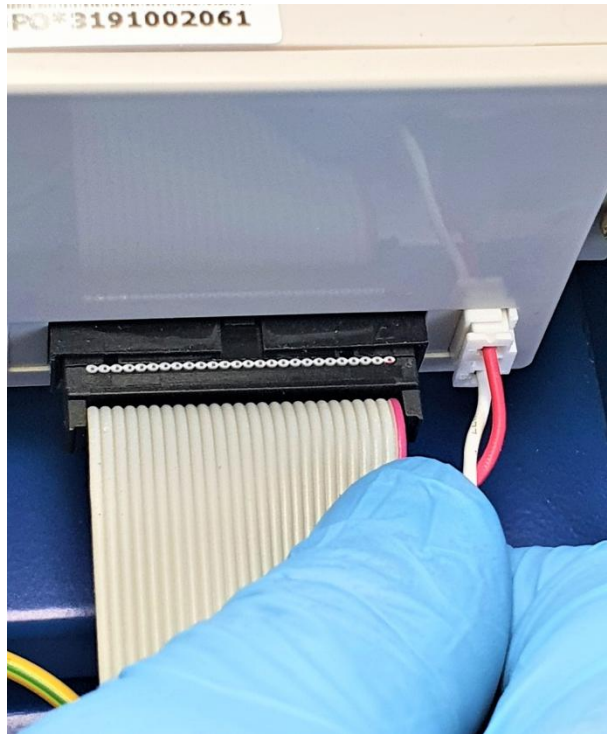
Replacing the Printer

1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove the earth cable from the printer housing.
3. Disconnect the power cable and ribbon cable from the printer.
4. Replace the printer enclosure with the new component.
5. Refit the earth cable and cable connections.
6. Reassemble the instrument.

2

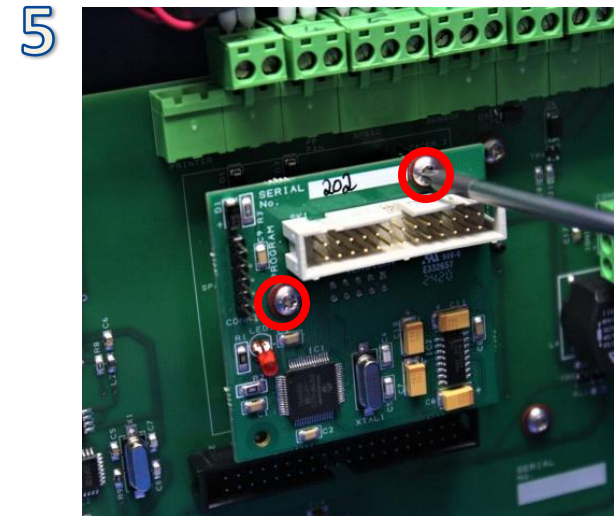
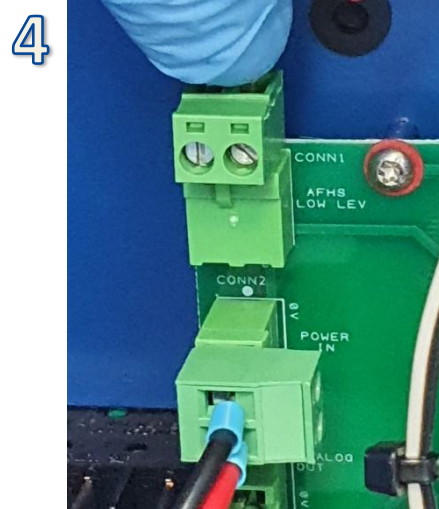
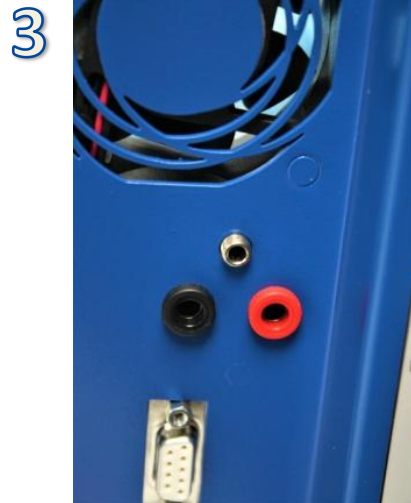


3



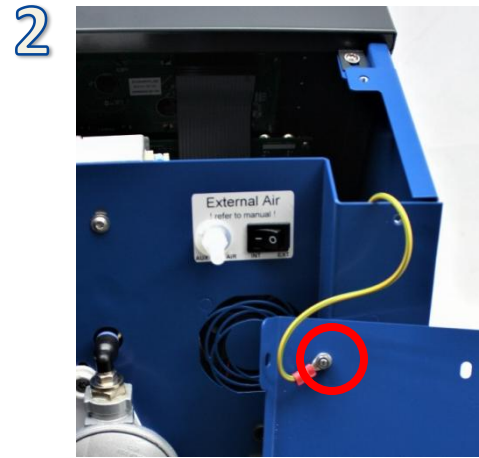
Upgrading to 'AFHS enabled'

1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove the blanking grommet from the rear of the instrument by pushing it out from the inside.
3. Insert the AFHS Reservoir Low Level socket assembly as provided in the kit of parts. Secure this using the supplied nut.
4. Plug the low level socket into the connection on the marshalling board as identified.
5. Plug the AFHS interface PCB into the socket on the marshalling board and secure it in place using the 2 supplied screws in the holes as identified in the image.
6. Reassemble the instrument.
7. The AFHS functionality will need enabling in the Interfaces menu within the menu structure of the instrument.



Upgrading (installing) the Printer Module

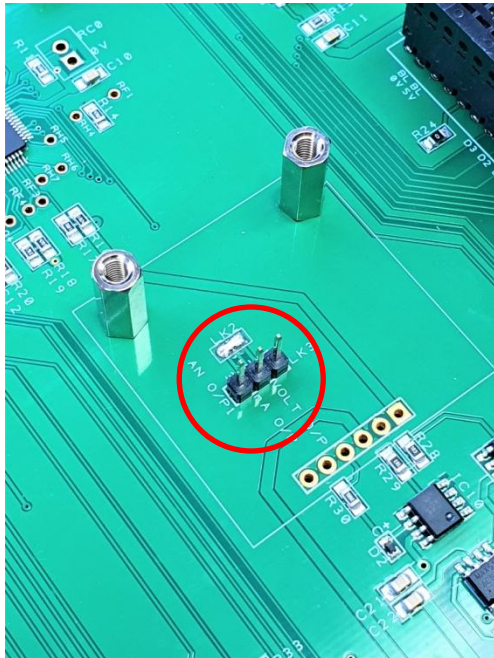
1. [Gain access](#) to the instrument enclosure as previously described.
2. Remove the earth cable from the top panel cover.
3. Plug the Printer Interface PCB into the socket on the marshalling board and secure it in place using the 2 supplied screws in the holes as identified in the image.
4. Connect the printer ribbon cable to the Printer Interface PCB and plug the printer power cable into the [identified socket](#) on the marshalling board.
5. Connect the earth cable to the printer enclosure.
6. Reassemble the instrument.
7. The printer functionality will need enabling in the Interfaces menu within the menu structure of the instrument.



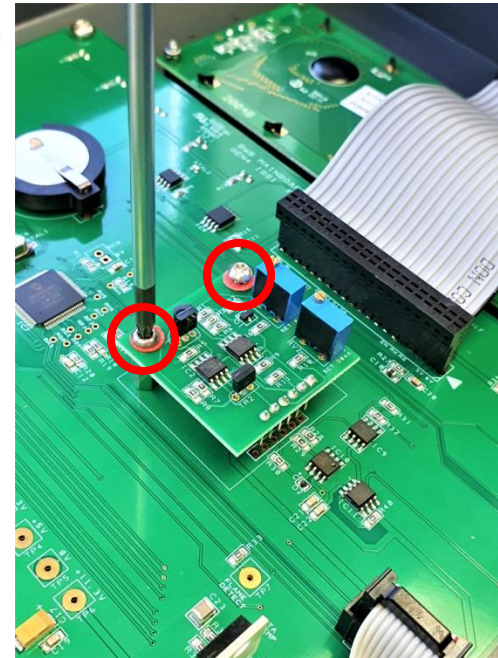
Upgrading to mA Output functionality

1. [Gain access](#) to the instrument enclosure as previously described.
2. Locate the 'jumper link' on the motherboard and re-position it to the 2 alternate pins.
3. Fit the mA interface PCB using the supplied screws and fasten using a T10 torx driver.
4. Reassemble the instrument in reverse order.

2



3



Use this space for your own notes

Use this space for your own notes

Annex A

Generic Risk Assessment for BWB Flame Photometer Instrument Range

Assessor: Hozan Edwards for BWB Technologies Ltd

Date of Assessment: 26.04.2021

Planned Review Date: 26.04.2022

Important Note:

This document is a general risk assessment for the use of BWB Flame Photometer Range. This risk assessment should be reviewed fully by users of the instrument prior to use for the first time and in the event that it is not sufficient to control the risk posed by the model in question then the user should include additional risk control measures and more specific information on the particular application, it is the responsibility of the organisation to ensure the risks identified by BWB and/or your own assessment are mitigated and employees or operators of the system are sufficiently protected from harm. Risk Assessments require review and in some cases revision to ensure the assessment continues to reflect current working practices. A review should be conducted in response to significant changes to the area / application or if an accident or incident has occurred.

The following assessment has been carried out to UK legislation and working practices, these may differ in your country or region.

Recommendations to reduce risk:

Persons using the instrument must wear clothing suited for the environment and application or as defined by your company's documentation. Long hair must be tied back and if possible cosmetic products (hair gels for example) should not be worn in the hair. Ensure other laboratory users are made aware when the flame photometer is turned on.

Description of Activity:

Use of the BWB Flame Photometer (all variants) which requires bottles or pipe fed propane, butane or natural gas to fuel an enclosed naked flame. Consideration of other ongoing activities and workers in the vicinity of the flame photometer. Use of electrical equipment (Flame photometer).

Key comments:

Operators must be trained sufficiently by either the manufacturer or distributor, supporting documentation is supplied in digital format with the BWB USB stick, accessible online through the customer portal or by request by emailing BWB directly info@bwbtech.com. Maintenance and safety checks are to be completed by the manufacturer or appointed distributors only. BWB will not take responsibility for damage or accident caused by non-qualified personnel carrying out service or maintenance work.

Significant Hazard	Perceived Nature of Risk	Control Measures	Residual Risk Low (L) / Medium (M) / High (H)
Flammable / Explosive Substances	Gas (propane, butane, natural gas)leak leading to explosion	<p>Local exhaust ventilation covering the region where equipment is to be used.</p> <p>Upon initial connection of gas tube and propane tank, joints are to be checked with a “digital gas sniffer”, leak detection spray or other suitable test.</p> <p>Joints are to be checked for “tightness” prior every ignition of the instrument.</p>	M
Exposure to Hazardous Substances	Some samples / standards may be hazardous	<p>Follow safe working procedures for the correct handling of chemicals, samples or standards based on material safety data sheets.</p> <p>PPE, Gloves and safety glasses are to be worn in the vicinity of the Flame Photometer or sample/ standard preparation area.</p>	L
Burns / Fire	Burns to user from instrument exhaust / chimney. Fire caused exhaust heat to clothing / materials.	<p>Do not reach over the instrument for any reason.</p> <p>Ensure other users are made aware when the instrument is turned on.</p> <p>Do not touch the chimney or place anything in contact with the chimney.</p> <p>Ensure the clearance room above the chimney is to that specified in the manual.</p> <p>Do not use the exhaust gases as a “heating” or “warming” method for any material.</p> <p>Do not insert your finger or any other part of body/ object/ component through the chimney inspection flap.</p>	M

Significant Hazard	Perceived Nature of Risk	Control Measures	Residual Risk Low (L) / Medium (M) / High (H)
Chemical Storage	<p>Flammable organic liquids in vicinity of flame photometer.</p> <p>Storage of propane cylinder.</p>	<p>Flammable materials/ fluids should be stored away from the flame photometer at all times, ideally in protective cabinets. Bottles containing solvents or fluids with flammable vapors to be kept in fume cabinet or stored away from flame photometer.</p> <p>Gas cylinders should be stored in designated areas compliant with local regulations when not in use.</p>	M
Hazardous Waste Disposal	Disposal of harmful samples and or standards	Segregated and well labelled waste containers should be used and disposed of at regular intervals using the correct means based on local regulations.	L
Discharge / Leak	Discharge of propane from cylinder	<p>No attempts should be made to use regulators other than the manufactured supplied regulator. Connections and hoses should conform to local regulations.</p> <p>Should gas be smelt by any user in the lab or vicinity the instrument should be immediately shut down and power turned off. The gas bottle or source should be turned off. Corrective action to find and prevent the leak re-occurring should be taken once the lab or vicinity has been adequately ventilated.</p>	M

Significant Hazard	Perceived Nature of Risk	Control Measures	Residual Risk Low (L) / Medium (M) / High (H)
Electrical Safety	Power to instrument	<p>Carry out regular PAT testing according to company's PAT testing routine and process.</p> <p>Only approved persons, the manufacturer or appointed distributors are to carry out electrical work inside the instrument.</p> <p>Ensure any spills in the vicinity of the instrument or power line are cleared up adequately and immediately and any decontamination is undertaken.</p>	L
Manual Handling	<p>Replacing propane bottles.</p> <p>Moving the instrument from storage to area of use.</p>	<p>Small propane cylinders are recommended.</p> <p>The instrument weighs 11kg, follow correct manual handling lifting technique. Ask for help if required.</p> <p>Refer to your companies manual handling risk assessment.</p>	L
Storage / housekeeping	As Above "Chemical Storage"	As above "Chemical Storage"	M
Pressure/ Vacuum systems	Propane cylinder is at high pressure	<p>Refer to the manufacturers guidelines for the safe storage, location and operation of the gas supply cylinder.</p> <p>Store and use in line with local regulations.</p>	L
Temperature	Hot surfaces on the flame photometer chimney and exhaust region.	<p>Use adequate signage to ensure other workers know the instrument is on and hot.</p> <p>See above "Burns / Fire"</p>	M
Lone Working	All of the above	Ensure you are familiar with your companies "lone working" document and regulations. Assess as appropriate.	L

Annex B

Customer Returns Notification Form

This form must be stuck to the outside packaging of the returning instrument and emailed to technicalsupport@bwbtech.com prior to the instruments return. Please contact BWB on +44 (0) 1787 274 870 or speak to your local distributor should you require any advice in completing this form. An A4 print ready version can be found on your memory stick supplied with the instrument or alternatively downloaded from the BWB Customer Online Portal.



Your order may be delayed if this form is not fully filled in, please use block capitals and the English language.

PO or RMA number:
BWB reference number:
Unit Serial Number:
Instrument fault / description of return:

Contamination Information: Please tick all that apply. (The warning symbol may not dictate actual contaminant).

- | | |
|--|--|
| <input type="checkbox"/> Acids (corrosive and non-corrosive) | <input type="checkbox"/> Blood (or products of) |
| <input type="checkbox"/> Urine (or other human liquids) | <input type="checkbox"/> Cancer-Causing (carcinogenic) |
| <input type="checkbox"/> Radioactive | <input type="checkbox"/> Organic Solvents |
| <input type="checkbox"/> Plant / Biological substances | <input type="checkbox"/> Instrument not used |
| <input type="checkbox"/> Other _____ | |

Unless otherwise specified by BWB Technologies UK, the “wet assembly” (nebuliser, mixing chamber, burner and drain cup) are to be thoroughly washed with an agent to rid them of relevant contamination. The outside of the instrument is to be washed at minimum with BWB recommended cleaning agent. If there is a cause to suspect the chassis of the instrument has faced contamination it must be washed with an agent to remove it.



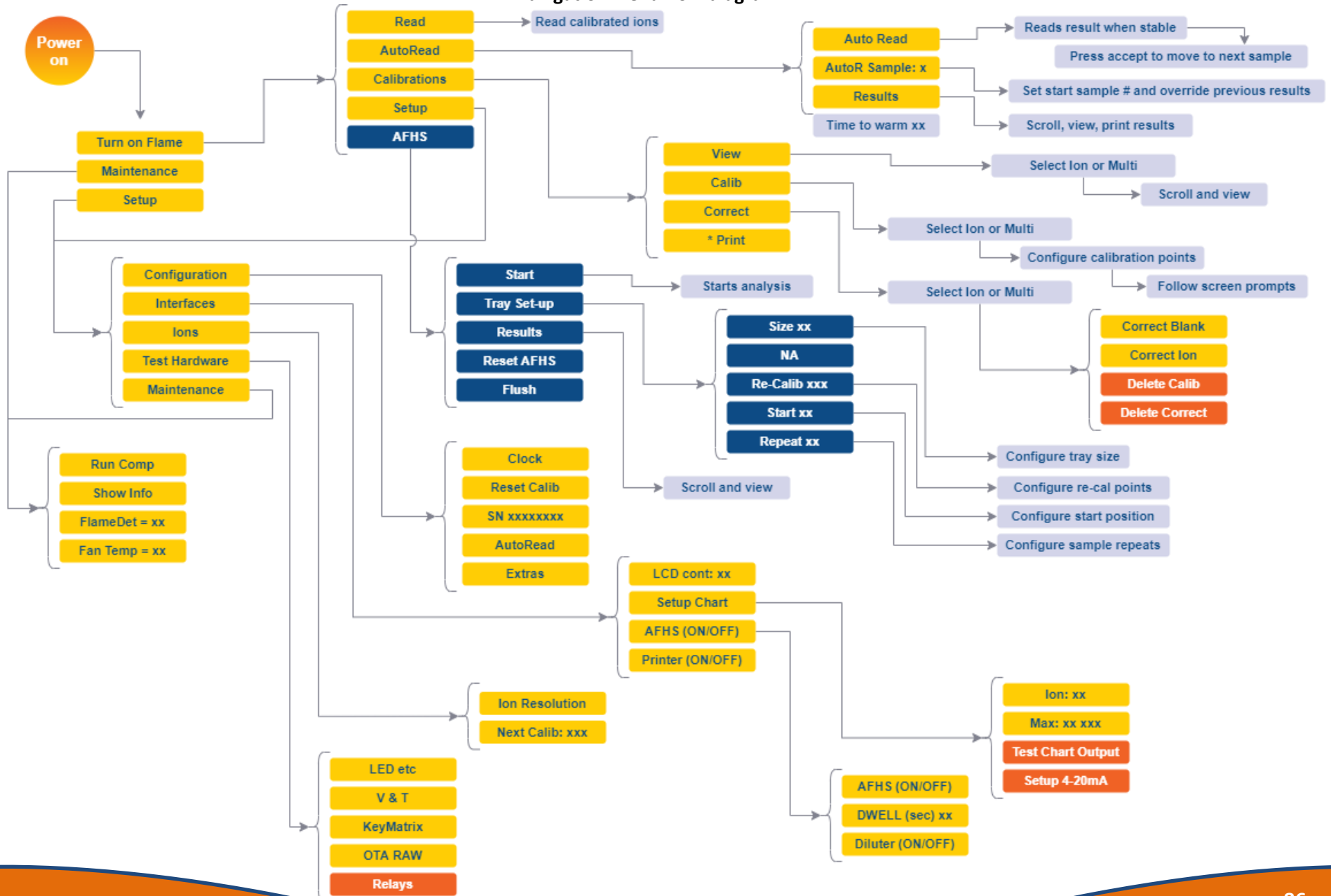
Material Safety Data Sheets must be attached for any media that has contaminated the instrument.

I certify that the information provided is true and accurate. I understand that I may be held liable for any contamination related injury or health hazard caused to personnel during the handling and testing of this instrument. I understand that the instrument will be returned to me at my expense if this information is not fully complete or the instrument is clearly contaminated.

Name:	Date:
Signature:	Position:

Annex C

Navigation menu flow diagram



Annex D

LCD error messages

***** ERROR *****
*** Pre-Flame level ***

Resetting instrument

Indicates too much 'stray' light is entering the device, the sensors consider the flame is already lit.

- Ensure the chimney inspection flap is closed, the instrument is not located near a window (or the blinds are closed) and that exceptionally bright LED lighting is not positioned directly above the instrument.
- Ensure the flame is in fact not lit.

***** ERROR *****
*** Flame gone out***

Resetting instrument

Indicates the flame has failed. If it is the first occasion during flame start up then repeat the process it can take some time for gas to fill the system. Ensure the flame once lit is set to a sufficient level. Ensure that the flame is not too small during the 2 minute pump warmup phase.

- Ensure the gas supply is not interrupted and that sufficient gas at source is provided.
- Ensure that the air flow is not interrupted and that sufficient air flow is permitted.
- Conduct an aspiration test.
- If using alternate air, ensure that the pressures and flow meet the supply requirements.

***** ERROR *****
*** U-Tube Fault ***

Resetting instrument

Indicates that the drain cup switch has not detected a suitable level of water in the drain cup.

- Ensure water is present in the U-Tube and the inner bucket of the drain cup is filled to overflowing.
- Ensure the float on the liquid level detection monitor is free to move and not binding to the side of the cup.
- Ensure the float detection switch is plugged in fully within the suitable port on the side of the instrument.

Annex D

LCD error messages

***** ERROR *****
*** Gas Leak Detected ***

Indicates the gas sniffing module has detected a presence of gas (or other substance). See detailed instructions:

The gas sensors are very sensitive and any background 'smells' or other equipment can raise the bottom end, the same goes for environment and humidity.

The gas sniffers have a tolerance of adjustment to overcome false alarms. It should be noted that you should only increase the level at which the device alarms if you are confident that no leaks within the instrument or vicinity are noted.

The adjacent instructions enable the adjustment the level of 'alarm':

If after completing the steps, the alarm continues to provide a false result then the environment and aspects undertaken in close proximity of the instrument should first be evaluated. IPA used in relatively close proximity for example will trigger the alarm, as is the same with other organic compounds.

If a false alarm continues then it is possible to disconnect the module and prevent further alarms whilst a new module is requested from BWB.

In order to disconnect the sensor please follow the instructions for module replacement within the service manual, or available upon request.

1. Turn on instrument power
2. Press 2 (maintenance)
3. Press 2 (show info)
4. Enter service code 1267988
5. Bottom line of LCD should display "Test Mode: Service"
6. Press back
7. Press 8 (Gas)
8. Change the setting, it is set at 0.5 from the factory and can go up to 0.9. A small increase to 0.7 is first recommended before setting the alarm to the maximum value.
9. Therefore press 7 (the 0. is set as standard)
10. Press accept
11. Press back
12. Turn on flame through the normal routine.
13. With the flame lit navigate to view the reading of the gas sniffing module:
 - a. Press 4 (setup)
 - b. Press 4 (test hardware)
 - c. Press 2 (V&T)
 - d. The gas sensor feedback is displayed on the bottom line, the setting for the alarm that we've just set to 0.7 is displayed next to it in brackets. As long as the feedback stays under 0.7 then it won't trigger. Watch it for some time 5-10 minutes and see where it settles.
14. If the above steps have failed to overcome the false alarm the steps can be repeated to increase the level or alarm to the maximum value of 0.9.

Annex D

LCD error messages

Warm-up in XX min

Indicates that the instrument flame has not been on for a sufficient time to reach optimum warm up. It should be considered to hold off conducting the chosen process until the warm up time message has elapsed. This can be ignored and the process conducted regardless if you wish. Note: the display will not refresh until you navigate away and back to it.

***** ERROR *****
*** Flame gone out***

Low air pressure

Indicates that the air pressure detected by the instrument is not sufficient.

- If using an external air supply ensure that it meets the requirements.
- If the internal supply is being used:
 - Ensure the compressor is set to 165 in the maintenance menu.
 - Ensure the nebuliser is aspirating and bubbles are not forming in the sample pot.
 - Check the aspiration rate is approx 3 - 5ml/min
 - Gain access to the instrument enclosure and ensure the tube is connected to the pressure sensor and that other tubes are not loose. Refer to the service manual.

Bad Correct-Cal Req

Indicates that the calibration correction just performed was not successful/ has altered the calibration curve beyond acceptable limits and a complete recalibration is required.

CRC-FAULT

Indicates a circuit fault between the Optic and Motherboard.

- Turn the instrument off and back on again using the [shut down sequence](#).
- Open the instrument and ensure the ribbon cable is connected.
- Refer to the service manual for voltage checks.

Annex D

LCD error messages

**** Service Mode Req'd ****

Indicates that service mode is required to perform the intended functionality.

***** ERROR *****

*** Gas relay fault***

Resetting instrument

Indicates a suspected fault with the gas relay and/ or gas supply.

- Check the gas supply connections and ensure gas is fed to the instrument.
- Ensure the gas valve opens during the ignition routine, this test can be performed by disconnecting the blue tube from the mixing chamber and placing the end of it in a sample pot of water, bubbles should appear indicating gas flow.
- Refer to the service manual for voltage tests and component replacement.

***** ERROR *****

*** HIGH CHIMNEY TEMP***

Resetting instrument

Indicates the internal chimney is above the limits for temperature and suggests that the chimney cooling fan has stopped operating or flow rate through the fan is impeded.

- Ensure nothing is blocking the fan on the rear of the chimney.
- Power off the instrument and turn it back on, for the first few seconds the chimney fan should operate, indication operation is ok. Failure to operate could suggest a faulty component or voltage problem. Refer to the service manual.

Wrong Soln! ACCEPT?

Suggests that the instrument believes the wrong solution has been aspirated (during a correction routine) as the % change is larger than expected. Accept the change or go back and repeat the process.

No Ions Calibrated

Indicates (when in READ mode) that no elements have been calibrated and so results cannot be determined. Carry out a calibration.

**Found an error message not listed here?
Contact technical support and we'll help out
technicalsupport@bwbtech.com**



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Manufactured in Newbury, County of Berkshire, England

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