

 **RUSKINN**

A DIVISION OF
THE BAKER COMPANY



UM-017

Bugbox Plus End User Manual

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1. Overview

Congratulations on the purchase of your Ruskinn Technology Limited Bugbox Plus workstation. Please read this manual carefully to familiarise yourself with the operation and maintenance of your Bugbox Plus workstation.

1.1 Safety Instructions

For your safety, the safety of others using the workstation and those around you;

- The covers on both ends and the top of the workstation must not be removed by anyone other than a qualified service engineer. There are no end user serviceable parts within these covers.
- The workstation must be connected to a protective earth.
- Only the power cord supplied with the workstation should be used to connect the workstation to the mains supply.
- Gas regulators must be used for each gas supply. A 2 stage regulator should be used for a bottled gas supply. The maximum supply pressure permissible is 4 bar gauge.
- The maximum permissible concentration of Hydrogen in the anoxic mixed gas is 10% Hydrogen.
- Only the gasses specified in this manual may be used.
- The maximum power rating of the internal socket must not be exceeded, if fitted.
- The humidifier screw cap must not be covered or blocked.
- The humidifier/ pressure relief tank must not be overfilled.
- The spot light should not be used continuously for more than 10 minutes. The spot light should be allowed to cool for at least 10 minutes between uses.
- The cooling fan covers and cooling vents must not be covered or blocked.
- The workstation should not be lifted by the glove ports, the interlock or the Single Plate Entry System (if fitted).
- The weight limit for the rear shelf is 5.5kg. The weight must be evenly distributed.

FAILURE TO ADHERE TO THESE SAFETY INSTRUCTIONS COULD CAUSE SERIOUS INJURY AND WILL INVALIDATE THE WORKSTATION WARRANTY. RUSKINN TECHNOLOGY LIMITED ACCEPTS NO RESPONSIBILITY FOR ANY ACCIDENT, INJURY OR LOSS CAUSED BY UNSAFE OPERATION OF THE WORKSTATION

1.2 Regulatory compliance










This product complies with the essential EEA requirements for Electrical Safety and the Low Voltage Directive 2006/95/EC as well as Electromagnetic compatibility as set out in the EMC Directive 2004/108/EC.

1.3 Symbols

Before using the Bugbox Plus, please ensure that you are familiar with the symbols on the Bugbox Plus. Fig.1 explains the symbols found on the Bugbox Plus;

Fig.1 Bugbox Plus symbols

Symbol	Meaning
	Refer to user manual.
~	Alternating current
O	Off
I	On
	Primary earth stud

Symbol	Meaning
	This product complies with the essential EEA requirements for Electrical Safety and Electromagnetic compatibility as set out in the EMC directive 204/108/EC and the Low Voltage Directive 2006/95/EC
	Caution, do not remove covers. No end user serviceable parts behind covers.
	Warning, this equipment contains high voltage circuitry
	Bugbox Plus contains hazardous components and must not be disposed of at a household waste site. Instead it should be taken to the appropriate collection point for the recycling of electrical and electronic equipment.
	Date of manufacture in format YYYY MM

1.4 Installation and relocation

Bugbox Plus should not be installed or relocated by anyone other than a qualified engineer. To arrange installation or relocation, please contact your local distributor.

1.5 Weight and dimensions

The Bugbox Plus workstation weighs approximately 55kg. Fig.2 lists the dimensions of the Bugbox Plus workstation;

Fig.2 Bugbox Plus workstation dimensions

External width	830 mm
External height	650 mm
External depth	660 mm
Workstation chamber internal width	500 mm
Workstation chamber internal height	420 mm
Workstation chamber internal depth	460 mm
Interlock internal width	150 mm
Interlock internal height	190 mm
Interlock internal depth	230 mm
Interlock outer door clear opening width	155 mm
Interlock outer door clear opening height	200 mm
Interlock inner door clear opening width	185 mm
Interlock inner door clear opening height	180 mm

2. Gas and electrical supply requirement

2.1 Gas supply requirements

The Bugbox Plus workstation requires 2 gas supplies;

- Anoxic mixed gas (up to 10% hydrogen, up to 10% carbon dioxide, remainder nitrogen)
- Oxygen free nitrogen.

The maximum permissible concentration of hydrogen in the anoxic mixed gas is 10%. The use of any other gas(ses) will invalidate the warranty and may cause serious injury.

2.2 Gas regulator requirements

Gas regulators must be used with all gas supplies to the workstation. A 2 stage regulator must be used for each bottled gas supply. Regulators should be available from your local gas supplier.

Ruskinn Technology Limited does not supply gas regulators.

The gas regulator should provide a minimum supply pressure of 3 bar gauge. The maximum supply pressure permissible is 4 bar gauge. A supply pressure greater than this will damage internal components of the workstation and will invalidate the warranty.

2.3 Electrical supply requirements

The workstation must be connected to a mains power supply. A power cord is supplied to connect the workstation to the mains supply. Only the power cord supplied should be used to connect the workstation to the mains supply. It is advised that the workstation be located no greater than 1 metre from the plug socket. The plug socket should not be obstructed by the Bugbox Plus workstation. The workstation must be connected to a protective earth.

2.4 Voltage and frequency requirements

To ensure safe operation of the workstation, it must be connected to a supply of the correct voltage and frequency. The mains supply voltage fluctuations must not exceed +/- 10% of the nominal mains voltage. The input voltage and frequency requirement for Bugbox Plus is 100 – 240V A.C, 50 – 60Hz.

2.5 Power consumption

Fig.3 shows the power consumption ratings;

Fig.3 Power consumption ratings

Supply voltage and frequency	Power consumption
240V A.C, 50Hz	150 W
110V A.C, 60Hz	200 W

Note that the power consumption is for normal operating conditions. Power consumption will vary dependent upon the conditions inside the workstation chamber and the conditions inside the room the workstation is located in.

2.6 Powering the workstation

To switch the workstation on, press the power switch (item 2 in fig.13, section 3.3.5, page 18). To switch the workstation off, press the power switch (item 2 in fig.13, section 3.3.5, page 18). Note that a glove port should be left open when the workstation is switched off, as the pressure inside the workstation will decrease as the workstation cools. The open glove port will allow the pressure inside the workstation chamber to equalise with the external pressure.

3. Workstation overview

3.1 Workstation layout

The Bugbox Plus workstation consists of 2 main areas; the workstation chamber and the interlock chamber. The workstation chamber is the main working area of the workstation. Access to the workstation chamber is provided by the glove ports and the interlock. The interlock consists of the interlock chamber, with an inner and an outer door. The Bugbox Plus workstation is controlled via the control panel.

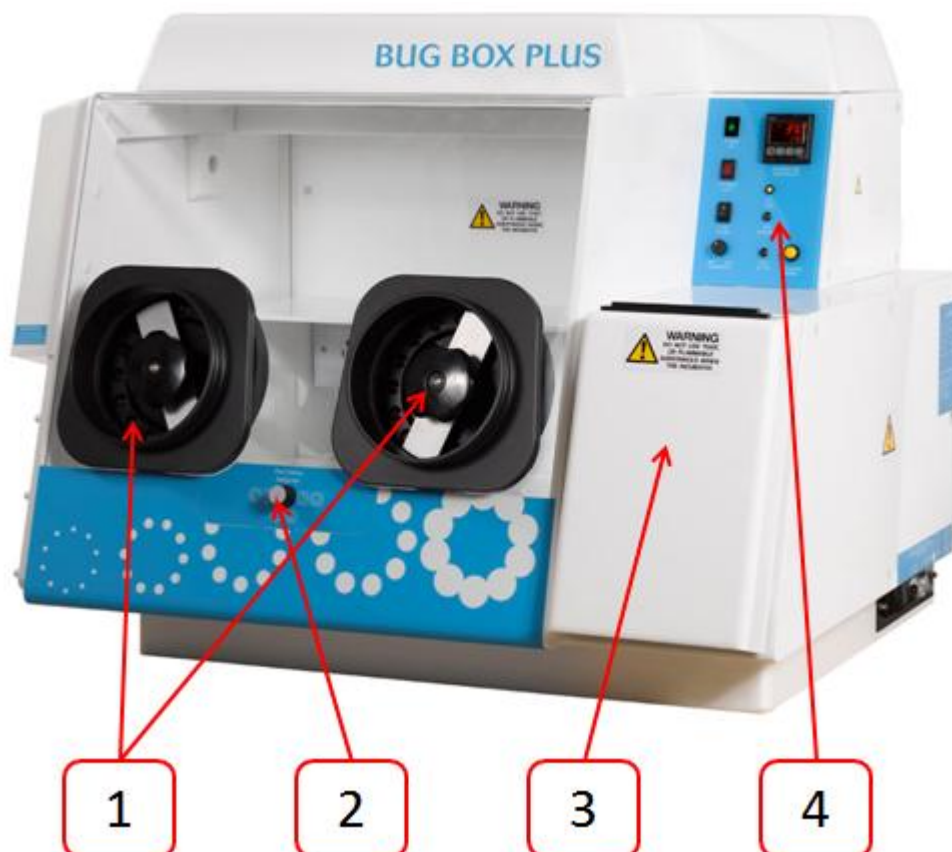
3.2 Component layout

Please familiarise yourself with the layout of your Bugbox Plus workstation.

3.2.1 Front view

Fig.4 shows the front view of the Bugbox Plus workstation;

Fig.4 Bugbox Plus workstation front view



1. Glove ports (shown without Ezee Sleeves™).
2. Port entry selector knob.
3. Interlock outer door.
4. Control panel.

3.2.2 Rear view

Fig.5 shows the rear view of the Bugbox Plus workstation;

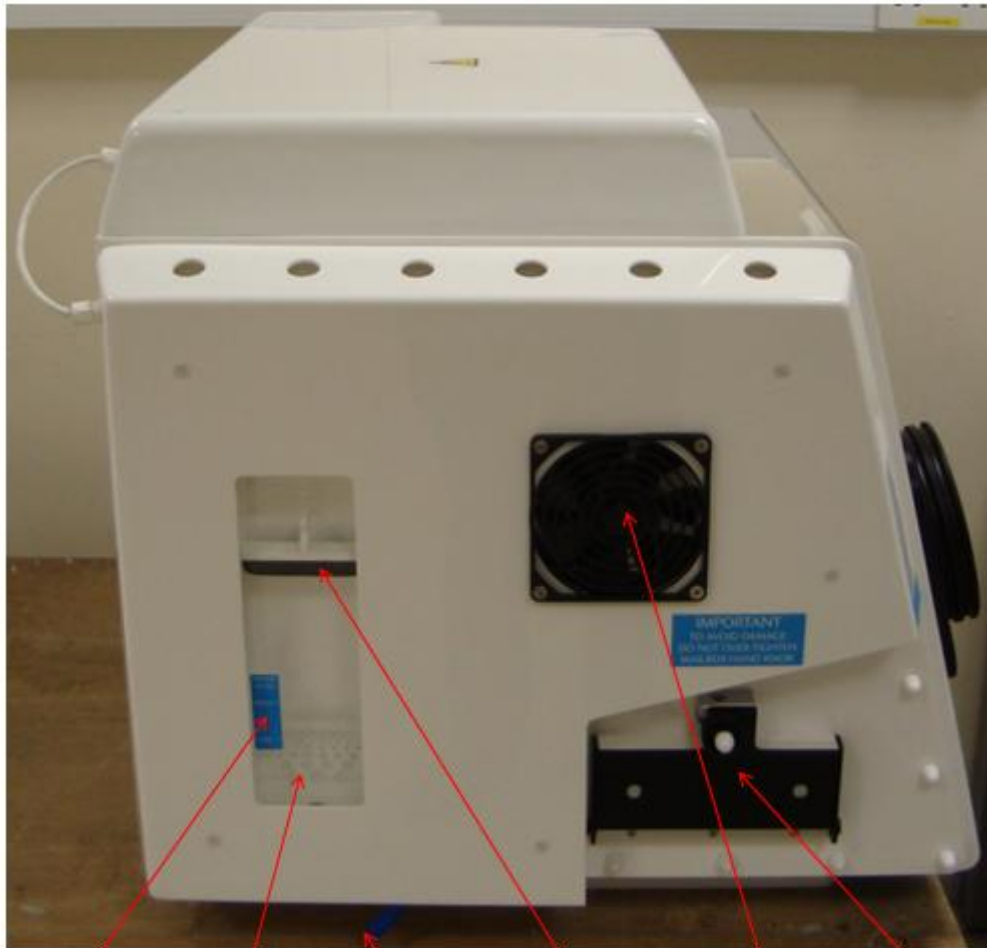
Fig.5 Bugbox Plus workstation rear view



3.2.3 Left side view – Standard humidifier

Fig.6 shows the left side view of the Bugbox Plus workstation with the standard humidifier;

Fig.6 Bugbox Plus workstation left side view

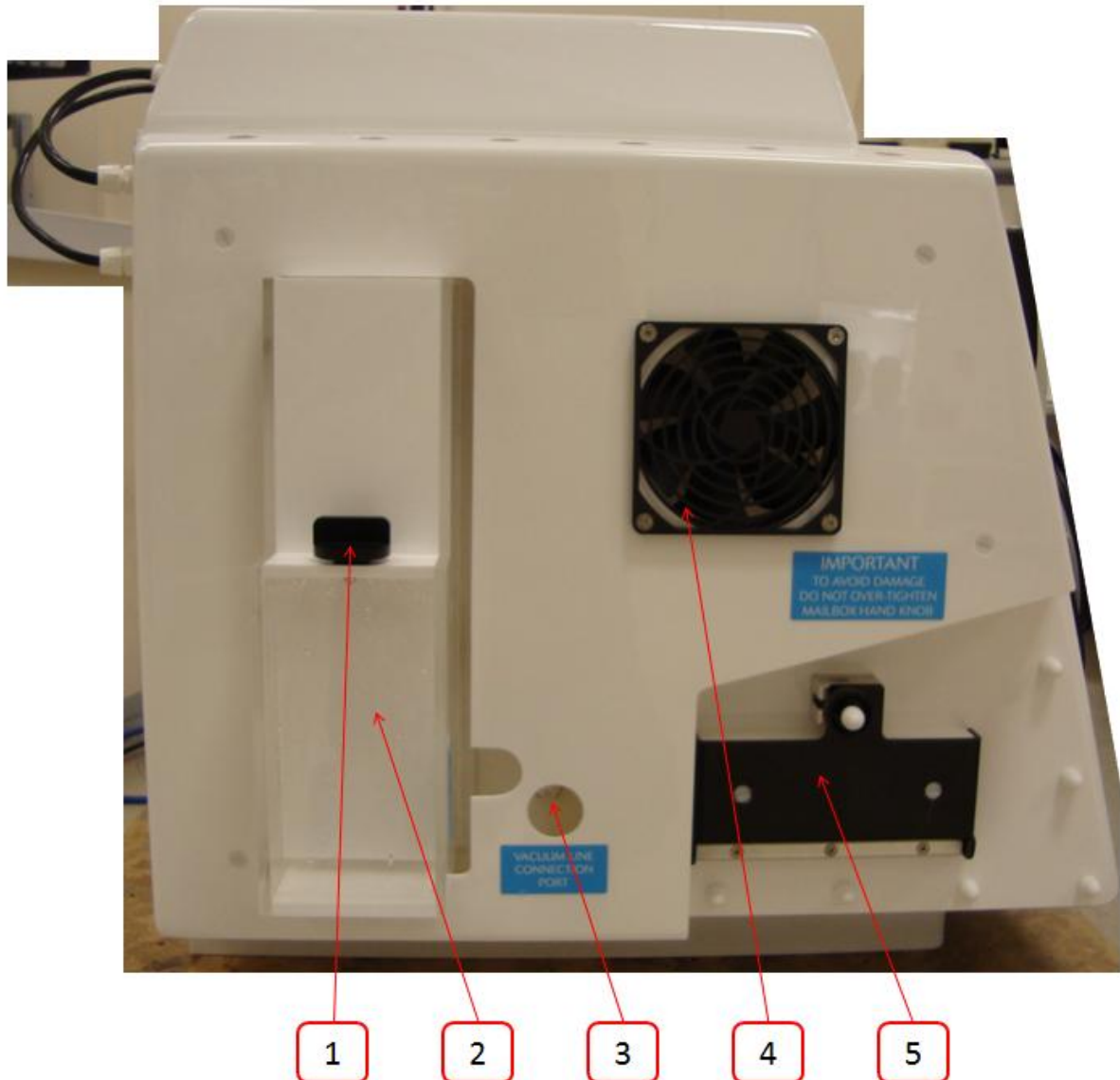


1. Pressure relief tank fill level indicator.
2. Pressure relief tank.
3. Pressure relief tank overflow pipe.
4. Pressure relief tank cover (pressure relief tank bung).
5. Condenser fan.
6. Single Plate Entry System (optional extra).

3.2.4 Left side view – Ultrasonic humidifier

Fig.7 shows the left side view of the Bugbox Plus workstation with the ultrasonic humidifier;

Fig.7 Bugbox Plus workstation left side view with ultrasonic humidifier

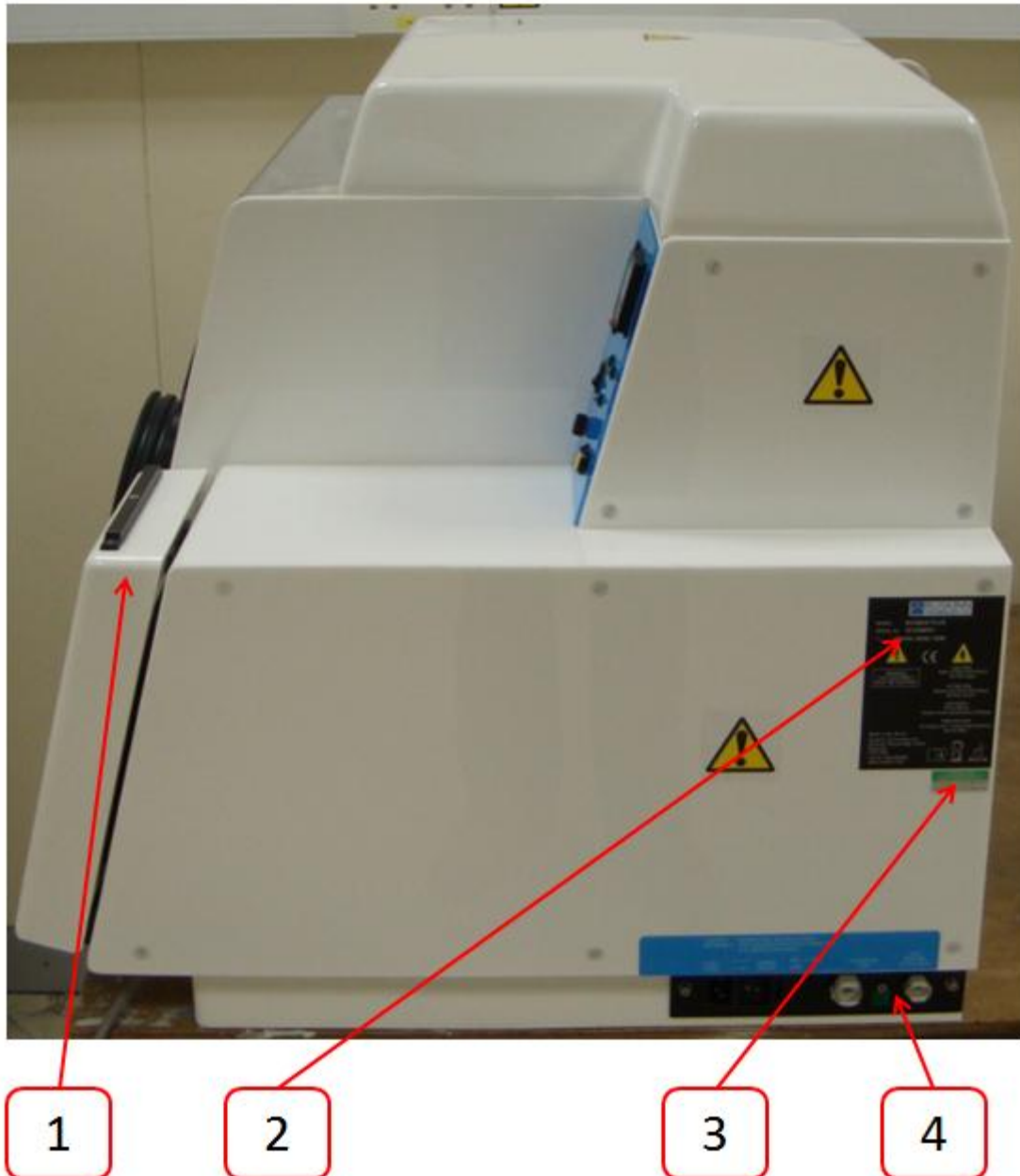


1. Humidifier screw cap.
2. Humidifier tank.
3. Vacuum port (optional extra).
4. Condenser fan.
5. Single Plate Entry System (SPES) (optional extra).

3.2.5 Right side view

Fig.8 shows the right side view of the Bugbox Plus workstation;

Fig.8 Bugbox Plus workstation right side view



1. Interlock outer door.
2. Serial number label.
3. PAT test label.
4. Power entry panel.

3.3 Control system layout

Please familiarise yourself with the control system layout of your Bugbox Plus workstation.

3.3.1 Control panel

Fig.9 shows the control panel of the Bugbox Plus workstation;

Fig.9 Bugbox Plus workstation control panel



1. Power indicator. Illuminates to indicate the workstation is connected to the mains and is switched on.
2. Temperature controller. See section 3.3.2 for more details.
3. Chamber light switch. Press to switch the chamber light on/ off. Note that the switch will illuminate when the chamber light is switched on.
4. N₂ low indicator. Illuminates to indicate that the nitrogen supply has run out.
5. ANO₂ low indicator. Illuminates to indicate that the anoxic mixed gas supply has run out.
6. Gas Alarm switch. Press to switch the gas alarm on/ off.
7. Gas demand indicator. Illuminates when there is a low pressure condition inside the workstation chamber.
8. Humidistat. Controls the level of humidity inside the workstation chamber.
9. Lock active indicator LED. Flashes to indicate that the interlock purge cycle is in progress.
10. Interlock purge button. Press to initiate the interlock purge cycle.

3.3.2 Temperature controller

Fig.10 shows the temperature controller;

Fig.10 Temperature controller



The red value is the actual temperature. The green value is the required value (the set point). All temperatures are in °C.

3.3.3 Port selector knob controller

Fig. 11 shows the port selector knob controller;

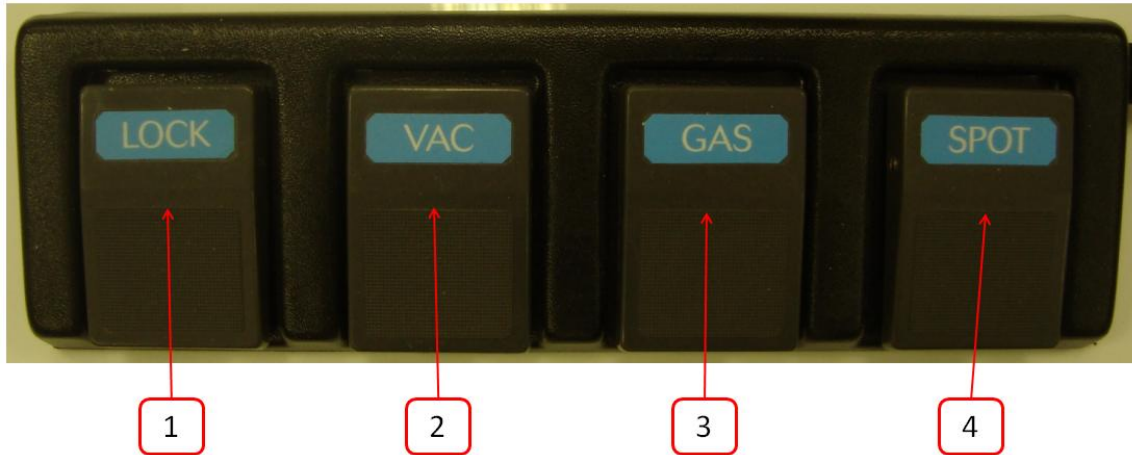
Fig.11 Port selector knob controller



3.3.4 Foot switch control panel

Fig.12 shows the foot switch controller;

Fig.12 Foot switch controller

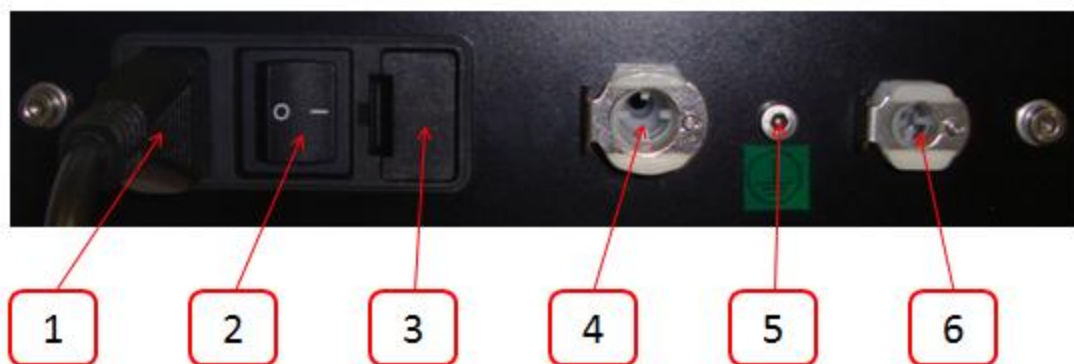


1. Lock foot pedal.
2. Vacuum foot pedal.
3. Gas foot pedal.
4. Spotlight foot pedal.

3.3.5 Power entry panel

Fig.13 shows the power entry panel;

Fig.13 Power entry panel

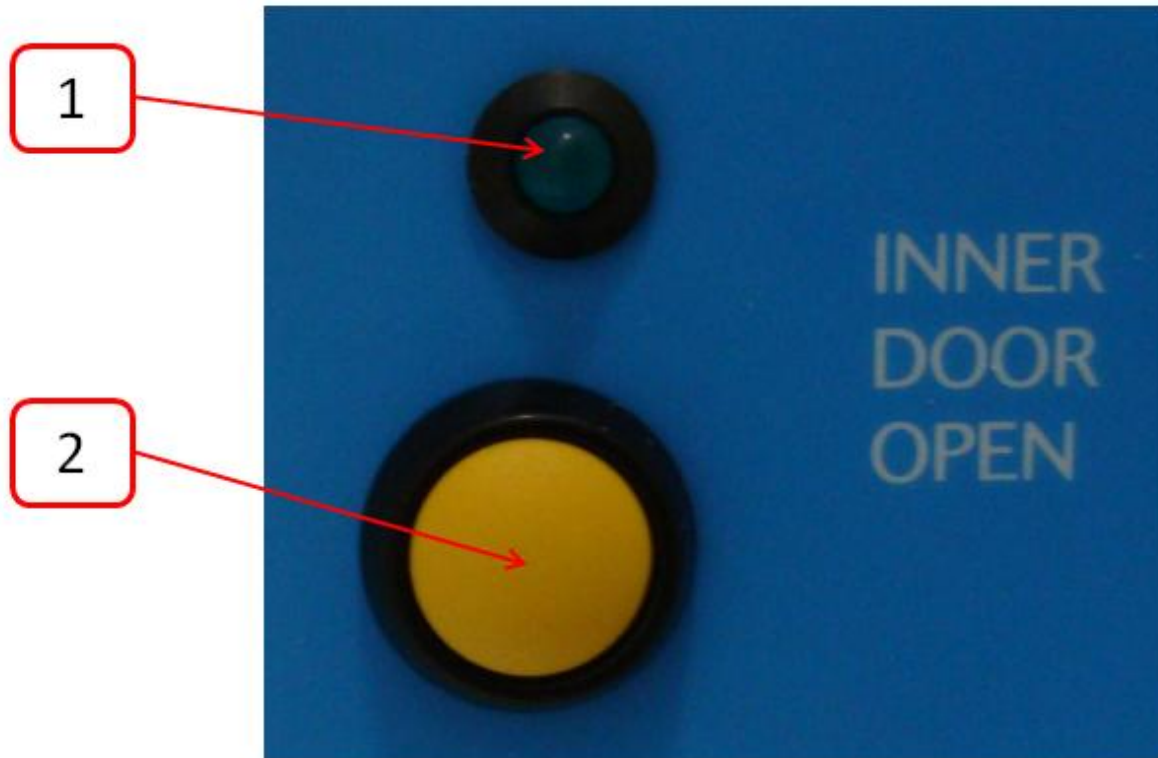


1. Mains lead connection.
2. On/ off switch.
3. Mains fuse holder.
4. Nitrogen inlet.
5. Primary earth stud.
6. Anoxic mixed gas inlet.

3.3.6 Interlock inner door control panel

Fig.14 shows the interlock inner door control panel;

Fig.14 Interlock inner door control panel



1. Interlock inner door LED indicator. Illuminates when the interlock inner door is open.
2. Interlock inner door button. Press to open the interlock inner door (when available).

4. Temperature and humidity control

4.1 Temperature control

The Bugbox Plus workstation can control the workstation chamber temperature between ambient plus 5°C and 45°C.

The temperature in the main chamber can be set using the temperature controller on the control panel.

Setting the temperature;

Referring to fig.10, section 3.3.2;

- To increase the temperature set point, press button 4.
- To decrease the temperature set point, press button 3.

The temperature set point will increase or decrease in intervals of 0.1°C.

4.2 Humidity control

The Bugbox Plus workstation can control the workstation chamber humidity between ambient and 85% relative humidity.

Note that any equipment installed in the workstation chamber must be suitable for the humidity level inside the workstation chamber. If in doubt, consult the owner's manual for any equipment that is installed in the workstation chamber. Ruskinn Technology Limited accepts no responsibility for damage to any equipment installed in the workstation chamber that is not suitable for the conditions inside the workstation chamber.

4.2.1 Humidity control overview

There are 2 methods of humidity control on Bugbox Plus workstations;

- Standard
- Ultrasonic

Humidistat is the standard method of humidity control on the Bugbox Plus workstation. Ultrasonic is an optional extra. Note that Ultrasonic humidity can only be fitted at time of order; it cannot be added after manufacture of the workstation.

For Bugbox Plus workstations fitted with standard humidity, a Petri dish/ tray of distilled water should be placed in the workstation chamber to provide the humidity source for the workstation chamber.

4.2.2 Humidistat humidity control

To control the humidity of the workstation chamber using the humidistat;

- To increase the humidity, rotate the humidistat clockwise.
- To decrease the humidity, rotate the humidistat anti-clockwise (counter-clockwise).

5. Environmental gas composition control

The Bugbox Plus workstation provides an anoxic (oxygen free) environment for the incubation of samples and cultures.

5.1 Environmental control overview

To provide an anoxic environment, anoxic mixed gas is injected into the workstation chamber. The hydrogen in the anoxic mixed gas reacts with any oxygen in the workstation chamber in the presence of a catalyst to form water. The excess water is then removed by the humidity control system.

5.2 Using the anaerobic indicator strips

Anaerobic indicator strips are provided with the Bugbox Plus to verify that the conditions inside the workstation chamber are anoxic. Additional anaerobic indicator strips can be ordered from your local supplier. See section 7.4.2 for more details. The anaerobic indicator strips should be stored sealed and at between 2°C and 8°C. To check the condition of the environment inside the workstation chamber using the anaerobic indicator strips;

- Open the interlock outer door (see section 6.1.2 for more details).
- Place the anaerobic indicator strips in the interlock.
- Close the interlock outer door (see section 6.1.2 for more details).
- Start the interlock purge cycle by either pressing the interlock purge button (item.10 in fig.9, section 3.3.1, page 16) or the lock pedal (item.1 in fig.12, section 3.3.4, page 18).
- Access the workstation chamber via the Ezee Sleeves™ (see section 6.2.2 for more details).
- Open the interlock inner door (see section 6.1.3 for more details).
- Remove the anaerobic indicator strips from the interlock.
- Close the interlock inner door (see section 6.1.3 for more details).
- Open the packet of anaerobic indicator strips. Take care not to touch the anaerobic indicator strips.
- If the strip stays white, the environment is anoxic. If the strip turns pink, there is oxygen in the environment.

Note that the anaerobic indicator strips should not be opened outside of the workstation chamber. Take care not to touch the anaerobic indicator strips, as this will cause them to turn pink. It is recommended that gloves are worn when using the anaerobic indicator strips.

6. Using the workstation

6.1 Using the interlock

The Bugbox workstation has a 6.5 litre interlock for transferring materials and samples into and out of the workstation chamber.

6.1.1 Interlock overview

The interlock consists of 3 main components;

- Interlock outer door
- Interlock inner door
- Interlock chamber

The interlock is accessed by opening either the outer or inner door. Note that both doors should not be opened at the same time.

6.1.2 Opening the interlock outer door

To open the interlock outer door, pull the interlock door towards you using the black strip. Fig.15 shows how to open the interlock outer door;

Fig.15 Interlock outer door opening



To close the interlock outer door, push the door. The door lock will click when the door closes.

Note: Do not open the interlock outer door if the interlock inner door is open. Do not place object(s) on the interlock outer door when open, as this may damage the workstation.

6.1.3 Opening the interlock inner door

To open the interlock inner door;

- Access the workstation chamber via the Ezee Sleeves™. See section 6.2.2 for details.
- Press the interlock inner door button (item 2 in fig.14, section 3.3.6, page19).
- Slide the interlock inner door backwards to open.

To close the interlock inner door, slide the inner door forwards.

Note: The interlock inner door should only be open when transferring materials from the interlock chamber to the workstation chamber and vice versa. The interlock inner door should not be opened if the interlock outer door is open.

6.1.4 Transferring material into the workstation chamber via the interlock

To transfer material into the workstation chamber via the interlock;

- Open the interlock outer door by pulling interlock door towards you using the black strip (fig.15, section 6.1.2, page 23).
- Pull the interlock outer door down until it is horizontal.
- Place the material into the interlock chamber. Do not place material on the interlock outer door, as this may damage the workstation.
- Close the interlock outer door.
- Start the interlock purge cycle by pressing the interlock purge button (item 10 in fig.9, section 3.3.1, page 16) or the lock foot pedal on the foot switch control panel (item 1 in fig.12, section 3.3.4, page 18). The interlock purge cycle takes 30 seconds.
- Access the workstation chamber via the Ezee Sleeves™. See section 6.2.2 for details.
- When the interlock purge cycle has completed, indicated by the Lock active indicator LED (item 9 in fig.9, section 3.3.1, page 16) not being illuminated, press the inner door button (item 2 in fig.14, section 3.3.6, page 19).
- Slide the interlock inner door backwards to open the interlock door.
- Move the material from the interlock chamber into the workstation chamber.
- Close the interlock inner door by sliding the interlock inner door forward.

6.1.5 Removing material from the workstation chamber via the interlock

To remove material from the workstation chamber via the interlock;

- Open the interlock inner door by pressing the inner door button (item 2 in fig.14, section 3.3.6, page 19) and sliding the interlock inner door backwards.
- Move the material from the workstation chamber into the interlock chamber.
- Close the interlock inner door by sliding the interlock inner door forwards.
- Exit the workstation chamber via the Ezee Sleeves™. See section 6.2.3 for details.

- Open the interlock outer door by pulling interlock door towards you using the black strip (fig.15, section 6.1.2, page 23). Pull the interlock outer door down until it is horizontal.
- Remove the material from the interlock chamber. Do not place material on the interlock outer door, as this may damage the workstation.
- Close the interlock outer door.

6.2 Hand access to the main chamber

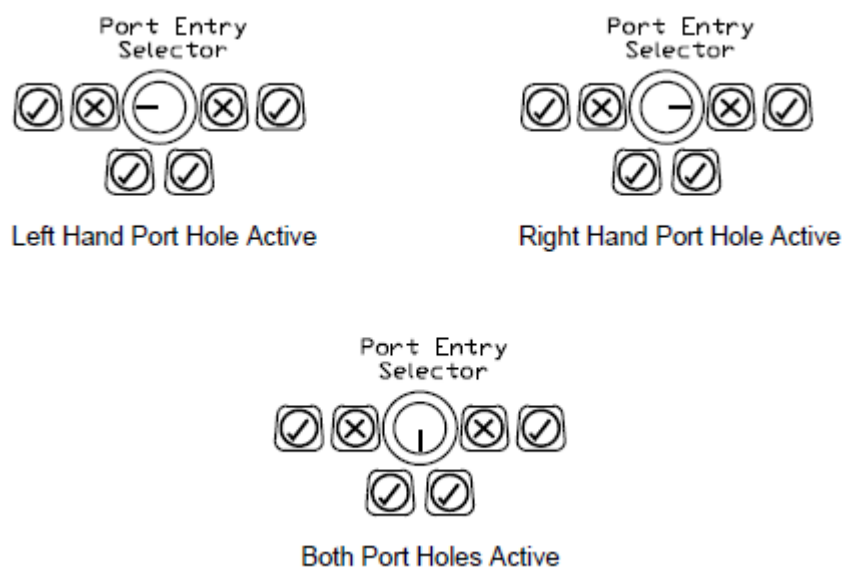
Direct hand access to the workstation chamber is provided via the glove ports and the Ezee Sleeve™ system. The Ezee Sleeves™ provide direct bare hand (or gloved) access to the workstation chamber.

The glove ports and Ezee Sleeves™ can be used in 3 ways;

- Left hand glove port only, for loading items into the workstation chamber via the Single Plate Entry System (SPES), if fitted. The SPES is an optional extra, see section 6.5.1 for more details.
- Both glove ports, for working inside the workstation chamber, loading items into the workstation chamber via the SPES and unloading the interlock.
- Right hand glove port only, for unloading the interlock.

For each method of entry, the glove port selector knob (fig.11, section 3.3.3, page 17) must be set in the correct position. Fig.16 shows the positioning of the glove port selector knob for each mode of operation;

Fig.16 Glove port selector knob positioning



6.2.1 Ezee Sleeve™ overview

The Ezee Sleeves™ consists of a sleeve and a cuff. There are 3 sizes of Ezee Sleeve™ available; small, medium and large. See section 7.4.2 for ordering details.

The sleeve attaches to the glove port via 2 O-rings. The cuff is then attached to the sleeve via an O-ring. Note that the workstation should not be used without the Ezee Sleeves™ attached.

6.2.2 Entering the workstation chamber using the Ezee Sleeves™

To enter the workstation via the Ezee Sleeves™;

- Set the glove port selector switch (Fig.11, section 3.3.3, page 17) to the correct position for the desired hand entry (fig.16, section 6.2, page 25).
- Hold the desired Ezee Sleeve™ cuff with the opposite hand.
- Supporting the Ezee Sleeve™ cuff, push the desired hand through the cuff of the Ezee Sleeve™. Fig.17 shows this procedure;

Fig.17 Entering the cuffs of the Ezee Sleeves™



- Repeat the procedure for the other hand (if both hands are to enter the workstation chamber).
- Press and hold the vacuum pedal with your foot (item 2 in fig.12, section 3.3.4, page 18) until the internal gas volume in the sleeves has been evacuated (the sleeves will now be tight around your arms), then remove your foot from the vacuum pedal.
- Press and hold the gas pedal with your foot (item 3 in fig.12, section 3.3.4, page 18) until the sleeves have inflated, then remove your foot from the gas pedal.
- Repeat the vacuum and gas process 3 times to remove oxygen from the Ezee Sleeves™.
- Unscrew the glove port cover knob by turning it anti-clockwise (counter-clockwise).
- Rotate the glove port bar until it is horizontal.
- Whilst holding the glove port cover knob, push the glove port cover and your hand into the workstation chamber slowly.
- Place the glove port cover in the glove port cover holder. Fig.18 shows the glove port cover holder;

Fig.18 Glove port cover holder



6.2.3 Exiting the workstation chamber using the Ezee Sleeves™

To exit the workstation chamber using the Ezee Sleeves™;

- Remove the glove port cover from the glove port cover holder (Fig.18, page 27).
- Holding the glove port cover by the glove port cover knob, slowly pull the glove port cover into the glove port with the glove port bar horizontal.
- Rotate the glove port bar inside the glove port so that it is vertical.
- Tighten the glove port cover knob. Do not over tighten the glove port cover knob.
- Press the gas pedal with your foot (item 3 in fig.12, section 3.3.4, page 18) until the sleeves have inflated, then remove your foot from the gas pedal.
- Supporting the Ezee Sleeve™ cuff with your opposite hand, pull your hand through the cuff of the Ezee Sleeve™.
- Repeat for the opposite hand if required.

6.2.4 Arm gas displacement volume and pressure changes

When entering or exiting the workstation chamber via the Ezee Sleeves™, the internal volume of the workstation chamber changes due to the displacement of your arms. The change in volume changes the internal pressure. To minimise the effect of the pressure change, enter and exit the workstation chamber slowly.

6.3 Internal lights

2 internal lighting systems are provided for the workstation chamber;

- Main chamber light.
- Spot light.

To switch the main chamber light on, press the chamber light switch (item 3 in fig.9, section 3.3.1, page 16). The switch will illuminate and the main chamber light will come on.

To switch the main chamber light off, press the chamber light switch (item 3 in fig.9, section 3.3.1, page 16). The switch will no longer illuminate and the main chamber light will go off.

To switch the spotlight on, press and hold the spot pedal on the foot switch control panel (item 4 in fig.12, section 3.3.4, page 18). To switch the spotlight off, remove your foot from the spot pedal on the foot switch control panel (item 4 in fig.12, section 3.3.4, page 18).

Note that the spot light should not be used continuously for a period of more than 10 minutes, as this will cause the spot light to overheat. The spot light should be allowed to cool for a period of 10 minutes after each use.

6.4 Rear shelf

The Bugbox Plus workstation has a rear shelf for additional storage within the workstation chamber. The weight limit for the shelf is 5.5kg. The weight on the shelf must be evenly distributed.

6.5 Optional extras

Your Bugbox Plus workstation may be fitted with optional extra parts to provide added functionality. The available optional extra parts for Bugbox Plus workstations are;

- Single Plate Entry System (SPES).
- Internal socket.
- Cable gland.
- Gas sample port.
- Ultrasonic humidity control.
- Vacuum port.

Note that these parts are not available as aftermarket upgrades; they must be fitted during the manufacture of the workstation.

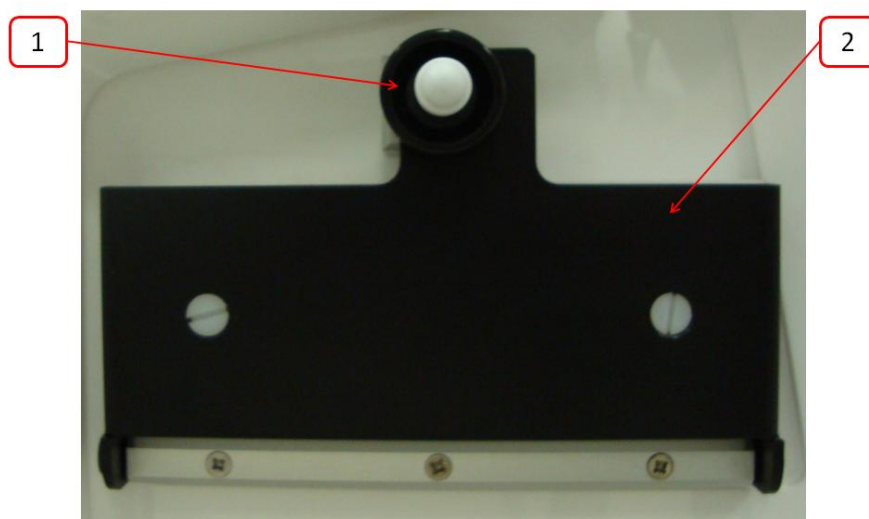
6.5.1 Single Plate Entry System (SPES)

A SPES is provided for quick and easy direct access to the workstation chamber, for loading materials. The SPES is also known as the mailbox.

6.5.1.1 SPES overview

The SPES consists of an external hinged flap and an internal hinged flap. The external flap is held in place by a thumb screw when not in use. The internal flap is self closing. Fig.19 shows the external view of the SPES;

Fig.19 SPES external view



1. Thumb screw.
2. SPES external flap.

Fig. 20 shows the internal view of the SPES;

Fig.20 SPES internal view



6.5.1.2 Using the SPES

To use the SPES;

- Undo the thumb screw on the external flap (item 1 in fig.19, page 29).
- Whilst supporting the SPES external flap, swing the thumb screw to the left.
- Lower the SPES external flap.

Fig.21 shows the SPES when opened;

Fig.21 SPES with external hinged flap opened



- Push materials through the SPES internal flap into the workstation chamber. This should be done as quickly as possible to minimise gas loss from the workstation chamber.
- When all materials have been added, lift the SPES external flap back to its closed position.
- Whilst holding the SPES external flap, swing the thumb screw right to slot into the SPES external flap.
- Tighten the thumb screw.

Note: Do not over tighten the thumb screw. Note also that it may be easier to have your right hand in the left hand Ezee Sleeve™ if loading multiple items.

6.5.2 Internal power socket

An internal power socket is provided within the workstation chamber. The socket is located on the left hand side, underneath the rear shelf.

The maximum permissible power rating of equipment connected to the internal socket is shown in fig.22;

Fig.22 Internal socket power ratings

Supply voltage	Power rating
110V A.C, 60Hz	85W
240V A.C, 50 Hz	190W

6.4.3 Cable gland

The cable gland is used to allow cables to enter the workstation chamber without affecting the internal environment of the workstation chamber. The cable gland is suitable for cables of diameter 3.5mm to 7mm. The cable gland port is located on the left hand side.

Fig.23 shows the cable gland;

Fig.23 Cable gland



To use the cable gland;

- Turn the grey collar anti-clockwise (counter-clockwise) to loosen the cable gland.
- Remove the red plug.
- Push the cable through the cable gland.
- Tighten the grey collar by turning clockwise until tight. Do not over tighten the cable gland.

6.4.4 Gas sample port

The gas sample port can be used to collect a gas sample from the workstation chamber. To use the gas sample port;

- Remove the outer cap.
- Push a needle connected to a syringe through the internal sponge of the gas sample port.
- Pull back the syringe to withdraw a sample of gas.
- Remove the needle from the internal sponge of the gas sample port.
- Replace the outer cap.

6.4.5 Vacuum port

The vacuum port is used to remove liquids from the workstation chamber, for example excess media from Petri dishes. The vacuum port is located on the left hand side of the workstation (item 3 in fig.7, section 3.2.4, page 14).

To use the vacuum port;

- Connect the vacuum source to the external part of the vacuum port by pushing a tube from the vacuum source onto the vacuum port hose connection.
- Insert the internal vacuum hose into the internal section of the vacuum port. Fig.24 shows the internal part of the vacuum port;

Fig.24 Internal part of vacuum port



- When the vacuum is no longer required, remove the internal vacuum hose from the vacuum port by pressing the top of the metal part of the internal section of the vacuum port and pulling the vacuum hose. The hose should release from the vacuum port, sealing the vacuum port.
- Remove the vacuum source from the outside of the vacuum port.

6.5 Online video user guides

Further information and demonstrations can be found at Ruskinn Technology Limited's YouTube channel;

<http://www.youtube.com/ruskinntechnology>

7. Cleaning and maintenance

7.1 Cleaning the workstation

To ensure that your Bugbox Plus workstation remains at optimum working conditions, it must be cleaned on a regular basis. A basic clean is required after each use. Deep cleaning is required at regular intervals, dependent upon the nature of the materials used in the workstation. As a guide, a deep clean should be performed at between 3-6 month intervals.

7.1.1 Cleaning agents

The correct cleaning agents must be used to clean the workstation. The use of incorrect cleaning agents will damage the workstation and invalidate the warranty. The following cleaning agents are permitted;

- Ethanol, laboratory grade at a maximum concentration of 70% by volume ethanol in distilled water.
- Propanol, laboratory grade at a maximum concentration of 70% by volume propanol in distilled water.
- Tristel Fuse Sachet, 1 sachet diluted in 3 litres of distilled water, or Tristel Duo Foamer. Tristel Fuse Sachets and Duo Foamer are available from Ruskinn Technology Limited, see section 7.4.2 for details.
- Ruskinn Technology Limited anti static cleaner.
- Distilled water.

No other cleaning agents are permitted. Cleaning agents should be applied to a clean paper towel and then to the workstation, then removed using a clean paper towel. Cleaning agents should not be sprayed directly onto the workstation, as this may damage the shell of the workstation. The use of UV light is not permitted in the workstation, as it will damage the acrylic shell.

7.1.2 Cleaning procedure – during and after each use

During use, clean any spills immediately using paper towels soaked in an appropriate cleaning agent. Wipe dry using a dry paper towel.

After each use;

- Remove all waste materials from the workstation chamber.
- Wipe the workstation chamber floor tray using paper towels soaked an appropriate cleaning agent.
- Wipe the workstation chamber floor tray clean using paper towels to dry.
- Wipe the interlock floor using paper towels soaked in an appropriate cleaning agent.
- Wipe the interlock floor using paper towels to dry.

7.1.3 Cleaning procedure – deep clean

To deep clean the workstation;

Preparing the workstation

- Remove all cells/ samples to an alternative storage facility.
- Switch the workstation off at the mains and remove the plug from the mains.
- Remove the Ezee Sleeves™ (see section 7.2.2, page 36 for more details).
- Remove any other equipment installed in the workstation chamber.

Cleaning the workstation chamber

- The items inside the workstation chamber that require cleaning are;
 - The floor tray.
 - The ceiling panel.
 - The shelf panel.
 - The left hand wall.
 - The right hand wall.
 - The interlock inner door.
 - The glove port covers.
 - If fitted, the inside of the SPES.
- For all workstation components, wipe with a paper towel soaked in an appropriate cleaning agent. Take care not to get cleaning agents on the fans (below the shelf panel) and if fitted, the plug socket .
- Wipe dry using paper towels.

Cleaning the interlock chamber;

- The items inside the interlock chamber that require cleaning are;
 - The floor.
 - The interlock outer door.
 - The Petri tube holder.
 - The inside wall.
 - The interlock inner door.
- For all interlock components, wipe with a paper towel soaked in an appropriate cleaning agent.
- Wipe dry using paper towels.

Reinstalling workstation components

- Reinstall any equipment removed from the workstation chamber.
- Reinstall the Ezee Sleeves™ (see section 7.2.2, page 36 for more details).

7.2 Maintaining the workstation – End user maintenance

To ensure that your Bugbox Plus workstation remains at optimum working conditions, it must be maintained on a regular basis. Many basic tasks can be performed by the end user.

7.2.1 Filling the pressure relief/ humidifier tank

The pressure relief/ humidifier tank requires refilling if the water level is on or below the low level indication. Fig.25 shows the pressure relief/ humidifier tank level indicator;

Fig.25 Pressure relief/ humidifier tank level indicator



To refill the pressure relief/ humidifier tank;

- Open one of the glove port covers (see section 6.2.2, page 26), to equalise the pressure between the workstation chamber and the external environment.
- Remove the pressure relief tank cover/ humidifier screw cap.
- Top up the pressure relief/ humidifier tank until the water level is between the low and high level indicators.
- Replace the pressure relief tank cover/ humidifier screw cap.
- Close the glove port cover.

Note; only distilled or deionised laboratory grade water should be used. Gloves should be worn during refilling to avoid contaminating the pressure relief/ humidifier tank. The pressure relief/ humidifier tank should be refilled slowly and only up to the high level indicator. Do not overfill the pressure relief/ humidifier tank. If fitted, the SPES can be opened instead of a glove port cover.

7.2.2 Replacing an Ezee Sleeve™

To remove an Ezee Sleeve™;

- Ensure that the glove port covers are closed.
- Remove the O-rings that hold the Ezee Sleeve™ to the glove port. Note that the O-rings will be tight. Fig.26 shows the O-ring removal;

Fig.26 O-ring removal



- Remove the Ezee Sleeve™.

To install an Ezee Sleeve™;

- Place the new Ezee Sleeve™ onto the glove port, ensuring that the O-ring grooves are completely covered and that the Ezee Sleeve™ is not kinked or overlapping.
- Reinstall the O-rings over the Ezee Sleeve™. Note that the O-rings will be a tight fit. This is intentional, to provide a gas tight seal. Note that the O-rings must completely cover the Ezee Sleeve™ to provide a gas tight seal.

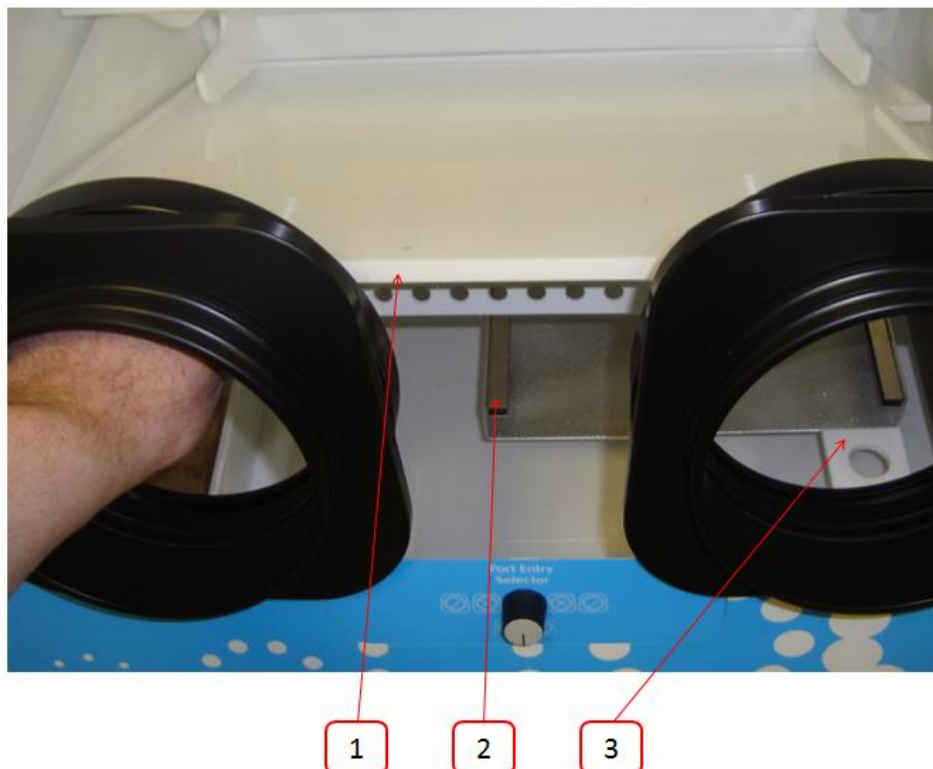
7.2.3 Replacing the detox and catalyst sachets

A detox and a catalyst sachet are supplied with the Bugbox Plus workstation. The detox sachet adsorbs volatile organic compounds, improving the air quality within the workstation chamber. The catalyst sachet contains the catalyst required for the hydrogen to react with any oxygen in the workstation, to produce an anoxic environment. The detox sachet and the catalyst sachet need to be replaced annually. See section 7.4.2 for ordering details. It is recommended to replace both sachets at the same time. Note that both sachets are replaced as part of an annual service.

To replace the detox sachet and the catalyst sachet;

- Remove any samples to an alternative storage facility.
- Switch off Bugbox Plus and disconnect from the mains power supply.
- Remove the Ezee Sleeves™ (see section 7.2.2, page 36 for more information).
- Undo the glove port covers and place on the rear shelf.
- Lift the floor tray at the front to expose the detox and catalyst sachets. Fig.27 shows the location of the sachet holders;

Fig.27 Sachet holder location



1. Floor tray.
2. Sachet holder. The second sachet holder is located behind and to the left of the first sachet holder.
3. Floor tray locator.

- Slide the sachets forwards to remove them from their holders.
- Remove the sachets via the glove ports.
- Lower the floor tray, ensuring that the floor tray leg has located in the floor tray locator (item.3 in fig.27, page 37).
- Remove the new sachets from their packaging.
- Whilst lifting the floor tray at the front, slide the sachets into the sachet holder.
- Lower the floor tray, ensuring that the floor tray leg has located in the floor tray locator (item.3 in fig.27, page 37).
- Close the glove ports using the glove port covers.
- Reinstall the Ezee Sleeves™ (see section 7.2.2, page 36 for more details).
- Reconnect the Bugbox Plus to the mains power supply and switch the Bugbox Plus on.
- Allow the Bugbox Plus to reach an anoxic environment in the workstation chamber by leaving the Bugbox Plus for a period of approximately 1 hour.
- Check that the environment in the workstation is anoxic using the anaerobic indicator strips (see section 5.2, page 22 for more details).
- If the environment in the workstation chamber is anoxic, samples/ cultures may be reintroduced to the workstation chamber via the interlock. See section 6.1.4 (page 24) for more details.

7.2.4 Replacing the mains plug fuse – UK users only

To replace the mains plug fuse;

- Switch off Bugbox Plus and disconnect from the mains power supply.
- Remove the plug from the mains socket.
- Using a small flat bladed screw driver, remove the fuse cover from the mains plug. Fig.28 shows the fuse removal;

Fig.28 Mains plug fuse removal



- Replace the fuse with a BS 1362 13A fuse.
- Replace the plug in the mains socket.
- Reconnect Bugbox Plus to the mains power supply and switch the Bugbox Plus on.

7.2.5 Replacing the mains fuses

To replace the mains fuses;

- Switch off the Bugbox Plus.
- Remove the plug from the mains socket.
- Remove the mains fuse drawer using a small flat bladed screwdriver. Fig.29 shows the removal of the mains fuse holder;

Fig.29 mains fuse holder removal



- Replace the mains fuses. The fuse ratings are ;
 - 240V 50Hz – F3.15A H250V
 - 110V 60Hz – F5A H250V
 - 100V 50/60Hz – F5A H250V

Fuses should be fast blow, for example Cooper Bussmann S501. For more information, contact your local distributor.

- Replace the mains fuse holder. The fuse holder will click when it is fully inserted.
- Replace the plug in the mains socket.
- Switch the Bugbox Plus on.

7.3 Service requirements

To maintain the best performance from your Bugbox Plus workstation, it must be serviced at regular intervals. Fig.30 lists the servicing requirements, intervals and persons capable of performing the service;

Fig.30 Bugbox Plus servicing requirements

Action	Frequency	By
Clean workstation	After each use	End User
Fill humidifier tank	Weekly	End User
Deep clean workstation	3-6 months depending on usage	End User
Replace detox sachet	Annually	End User
Replace catalyst sachet	Annually	End User
Annual service	Annually	Qualified service engineer
Biennial service	Biennially (2 yearly)	Qualified service engineer

To arrange an annual or biennial service, contact your local distributor. Note that the biennial service includes an annual service. Note that the annual service includes the replacement of the detox and the catalyst sachet.

Service contracts are available for all Ruskinn Technology Limited workstations. Please contact your local distributor for more information.

7.4 Spare parts and accessories

A range of spare parts and accessories are available for your Bugbox Plus workstation. Note that only Ruskinn Technology Limited spare parts should be used. The use of unapproved spare parts will invalidate the warranty of your workstation and may cause damage to your workstation.

7.4.1 Overview

To order spare parts and accessories, please contact your local distributor for the latest pricing and availability.

7.4.2 Spare parts and cleaning agents

Fig.31 lists the spare parts and cleaning agents available for your Bugbox Plus workstation. To order spare parts, please contact your local distributor for the latest pricing and availability. All items are sold individually except where stated.

Fig.31 Bugbox Plus end user spare parts and cleaning agents list

Part	Part number	Where used
Small Ezee Sleeve™ (Pair)	260-688	Ezee Sleeve™
Medium Ezee Sleeve™ (Pair)	260-684	Ezee Sleeve™
Large Ezee Sleeve™ (Pair)	260-686	Ezee Sleeve™
Glove port seal plate assembly	262-029	Glove ports
Sleeve to port O-ring	260-295	Ezee Sleeve™
Port Lube Talc	262-089	Ezee Sleeve™
Mains lead	260-730	Mains lead
Anti static cleaner (600ml)	260-655	Cleaning
Tristel Duo Foamer	260-1275	Cleaning
Tristel Fuse Sachet	260-1276	Cleaning
Small Detox Sachet	260-670	VOC filtration
Small Catalyst Sachet	260-680	Anoxic operation
Anaerobic Indicator Strips	260-272	Anoxic operation

7.4.3 Accessories

A range of accessories are available to enhance the functionality of your Bugbox Plus workstation. Fig.32 is the list of accessories for the Bugbox Plus workstation. Please contact your local distributor for the latest pricing and availability.

Fig.32 Bugbox Plus accessories

Item	Description	Part number
G100/1 G100 Geotech CO ₂ Analyser	Independent meter for measuring the Carbon Dioxide concentration in the workstation chamber	260-1168
G100/2 G100 Geotech CO ₂ and O ₂ Analyser	Independent meter for measuring the Carbon Dioxide and Oxygen concentration in the workstation chamber	260-1073
Small Petri dish holder	Holds up to 7 9cm Petri dishes for easier storage inside the workstation chamber. 3 colours available;	
	White	261-012W
	Yellow	261-012Y
	Blue	261-012B

Item	Description	Part number
Small stand	The workstation can be located on the stand where bench space is not available. 2 models are available, either with fixed feet or mounted on castors. Stand height approximately 800mm	
	Stand with fixed feet	WS-300
	Stand with castors	WS-300C

7.5 Workstation malfunction

In the event of a workstation malfunction, please check section 7.6.1 for a list of common problems and solutions. If you cannot find a solution to your problem, please contact your local distributor, quoting the serial number of your workstation.

7.6 Common problems and solutions

7.6.1 Workstation general problems

Fig.33 gives a list of common problems and solutions. Please consult this list as a first reference in the event of a malfunction of your workstation.

Fig.33 Common problems and solutions

Problem	Cause	Solution
The workstation will not switch on	The workstation is not plugged in	Plug the workstation into the mains
	The mains socket is not switched on	Switch the mains power on
	The mains plug fuse has blown	UK users: Replace the mains plug fuse (see section 7.2.4, page 38 for more details)
	The mains fuse has blown	Replace the mains fuses. See section 7.2.5, page 39 for more details.
The LED indicators are not illuminating	24V power supply fuse has blown	Contact your local distributor

Problem	Cause	Solution
Devices plugged into the internal socket (if fitted) are not powering up	The power switch on the device is not switched on	Turn the power switch on the device on
	The plug for the device is not fully inserted into the socket	Check that the plug is correctly inserted into the socket
	The fuse in the device has blown and/ or the device has failed	Plug the device into another socket. If the device fails to power up, the fuse has blown and/ or the device has failed. Refer to the owner's manual for the device.
	The internal socket fuse has blown	Contact your local distributor

7.6.2 Interlock problems

Fig.34 gives a list of common interlock problems and solutions;

Fig.34 Interlock problems and solutions

Problem	Cause	Solution
The interlock inner door will not close	The interlock inner door is blocked	Check for obstructions to closing the interlock inner door and remove them
The interlock outer door will not close	The interlock outer door is obstructed	Check for obstructions to closing the interlock outer door and remove them
	The interlock outer door catch has broken	Contact your local distributor

7.6.3 Gas consumption/ environmental control problems

Bugbox Plus is fitted with a gas demand indicator (item.7 in fig.9, section 3.3.1, page 16). The indicator illuminates when gas is injected into the workstation chamber. When the workstation is at rest, the gas demand indicator should illuminate once every 20 minutes. At rest is defined as the workstation chamber is in an anaerobic condition with no access to the interlock chamber, i.e. the glove ports are closed, the interlock is closed and, if fitted, the SPES is closed. Fig.35 gives some common gas consumption and environmental control problems and solutions;

Fig.35 Gas consumption/ environmental control problems and solutions

Problem	Cause	Solution
The workstation is failing to reach an anaerobic condition.	The catalyst sachet has not been installed.	Install a catalyst sachet. See section 7.2.3, page 37 for more details.
	The catalyst sachet needs replacing.	Replace the catalyst sachet. See section 7.2.3, page 37 for more details.
	The anoxic mixed gas supply has run out.	Replace the anoxic mixed gas cylinder.
High gas consumption when at rest.	The glove port cover has been left open.	Close the glove port cover.
	The SPES has been left open.	Close the SPES. See section 6.5.1.2, page 30 for more details.
	The interlock inner and outer doors are both open.	Close the interlock inner and/or outer door.
High gas consumption when in use.	The Ezee Sleeves™ have not been correctly fitted.	Refit the Ezee Sleeves™. See section 7.2.2, page 36 for more details.
	The Ezee Sleeves™ are not sealing around the users wrists.	Ensure that the Ezee Sleeves™ are the correct size for the user. Ensure that any clothing and/or jewellery that may foul the Ezee Sleeves™ is removed/rolled back. Ensure that the Ezee Sleeves™ are pulled tight around the user's wrists.

Problem	Cause	Solution
The N ₂ low indicator is illuminated.	Low pressure in the nitrogen supply caused by an empty nitrogen cylinder.	Replace the nitrogen cylinder.
The ANO ₂ low indicator is illuminated.	Low pressure in the anoxic mixed gas supply caused by an empty nitrogen cylinder.	Replace the nitrogen cylinder.
An audible alarm can be heard.	Low pressure in the gas supply, caused by an empty gas cylinder.	Replace the empty gas cylinder. The alarm can be muted by pressing the gas alarm switch (item 3 in fig.9, section 3.3.1, page 16).

8. Warranty information

Ruskinn Technology Limited warrants for the applicable time period that the Bugbox Plus will substantially perform in accordance with the user documentation. The terms of this Agreement do not affect or prejudice the statutory rights of a consumer acquiring the Ruskinn Technology Limited Bugbox Plus otherwise than in the normal course of a business.

THIS WARRANTY DOES NOT APPLY IN THE FOLLOWING CIRCUMSTANCES:

- (A) IF THE Ruskinn Technology Limited Bugbox Plus HAS BEEN REPAIRED BY PERSONS NOT AUTHORIZED BY Ruskinn Technology Limited; OR
- (B) THE Ruskinn Technology Limited Bugbox Plus and associated accessories/peripherals HAVE BEEN ALTERED, MODIFIED, OR MISUSED; OR
- (C) THE Ruskinn Technology Limited Bugbox Plus IS USED WITH NON- Ruskinn Technology Limited COMPONENTS; OR
- (D) THE Ruskinn Technology Limited Bugbox Plus OR A COMPONENT IS USED FOR OTHER USES (FOR EXAMPLE USE WITH OTHER CIRCUIT BOARDS OR SOFTWARE) OR
- (E) THE Ruskinn Technology Limited Bugbox Plus HAS NOT BEEN MAINTAINED OR USED IN ACCORDANCE WITH THE INSTALLATION AND USER GUIDE. UNLESS PROHIBITED BY LAW, THIS WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THE IMPLIED WARRANTY OF MERCHANTABILITY, OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM OR USAGE OF TRADE. Ruskinn Technology Limited DOES NOT WARRANT THAT THE Ruskinn Technology Limited Bugbox Plus WILL FUNCTION ERROR FREE.

If within the Warranty Period, the Ruskinn Technology Limited Gas Mixing Station does not conform to the express warranty set forth above, Ruskinn Technology Limited's sole obligation and User's sole remedy shall be, at Ruskinn Technology Limited's option: 1. to repair or replace the non-conforming component; or, 2. refund the purchase price.

LIMITATION OF LIABILITY.

UNLESS PROHIBITED BY LAW, Ruskinn Technology Limited WILL NOT BE LIABLE TO USER OR OTHERS FOR ANY OTHER DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES INCLUDING, FOR EXAMPLE, LOST PROFITS, BUSINESS, INVESTMENTS, OR OPPORTUNITIES EVEN IF Ruskinn Technology Limited HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

The parties agree that Ruskinn Technology Limited total cumulative liability to User for direct damages for all causes under this Agreement shall not exceed £5,000,000 (FIVE MILLION UK STERLING POUNDS), or the price paid for the Ruskinn Technology Limited Bugbox Plus, whichever is higher. Some states or countries may have laws which require liability rights different from those stated above. In such states or countries, the minimum required liability terms shall apply.

9. Disposal information

Bugbox Plus contains hazardous components and must not be disposed of at a household waste site. Instead it should be taken to the appropriate collection point for the recycling of electrical and electronic equipment. Alternatively please contact your local distributor for disposal instructions.

Bugbox Plus contains recyclable parts. Please contact your local distributor for more advice.

10. Contact details

Ruskinn Technology Limited

Address:	Pencoed Technology Park Pencoed Bridgend CF35 5HZ United Kingdom
Phone:	+44 (0)1656 864 286
Fax:	+44 (0)1656 863 646
Email: Sales:	sales@ruskinn.com
Technical support	ralphs@ruskinn.com or lyndon@ruskinn.com
General enquiries	ruskinnooffice@ruskinn.com
Website:	www.ruskinn.com
YouTube channel	http://www.youtube.com/ruskinntechnology

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