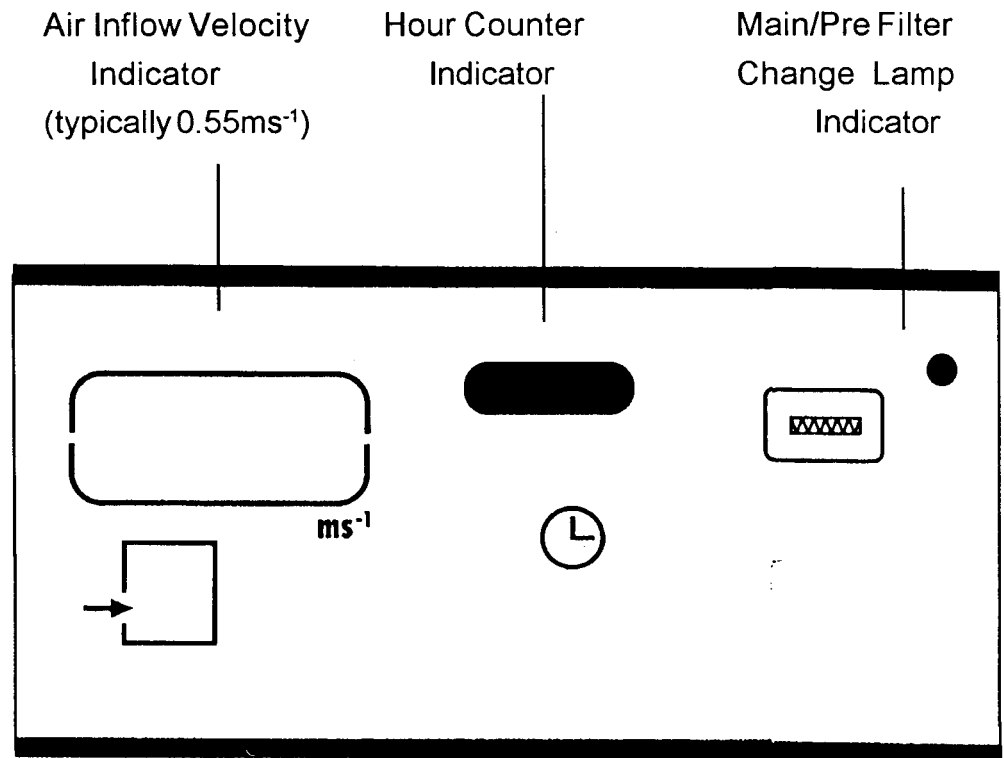




## Instrumentation Zone



### Air Inflow Velocity Indicator (Green)

This 3 digit LED displays the average air inflow velocity through the working aperture. The velocity sensor electronics are powered when the mains is on to the cabinet. When raising the visor the display is turned off (and visor raised indicator lamp and audible on).

This is done to warn the operator that inflow protection is reduced as the inflow area is now much greater.

The inflow metering electronics are pre-calibrated such that an accurate flow can be re-established on commissioning by adjusting the exhaust fan controller potentiometer. This procedure applies equally well for recirc and ducted units.



If the cabinet is operated with the visor and night door in place, the display will meter any leakage air. The seal of the night door on the cabinet can be self-tested in this way before fumigation. Note this is only possible with formalin vaporiser switched off, as an on condition will inhibit the exhaust fan leaving only the downflow fans to operate.

After a long period of operation, the meter will read progressively lower. This is caused by filter soiling and may be remedied by increasing the exhaust fan controller when switched in the manual mode.

Alternatively, if the cabinet is operated in the auto mode, the exhaust fan will automatically compensate for filter blockage over the life of the filters until such time that the fans are running at maximum voltage. It is however, very important to change the pre-filter on a regular basis.

### **Hour Counter Indicator**

This meter registers the time elapsed whilst the cabinet has been running and is not resettable. It may be found useful to gauge service intervals or filter change period after illumination of main/pre-filter change lamp.

### **Main/Pre-Filter Change Lamp Indicator (red)**

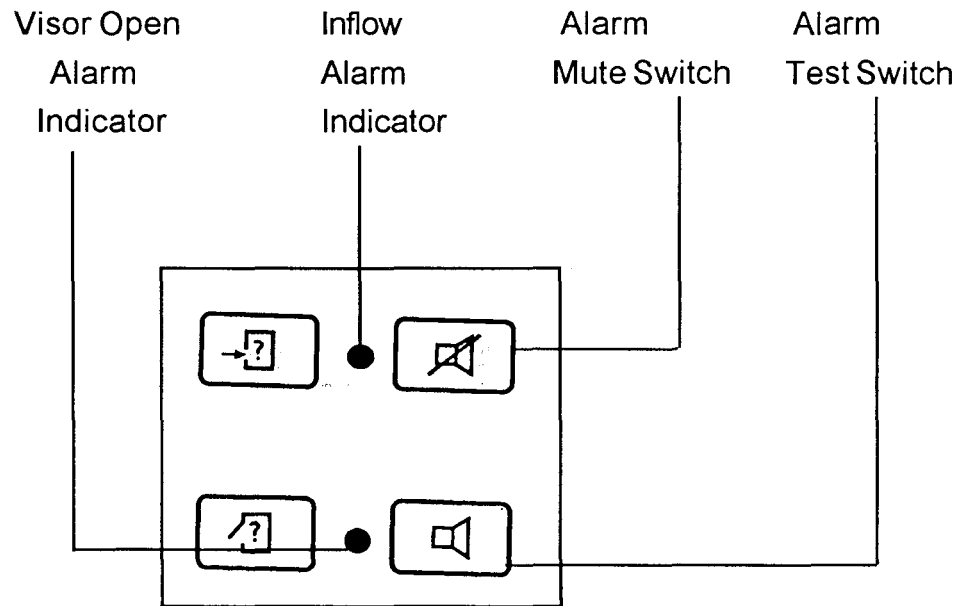
The filter change lamp is connected to an electronic system that measures the pressure drop across both pre-filter and main hepa filter. Should the indicator light, the user is advised to check the condition of the pre-filter and change if necessary. This is located above the main hepa filter and should only be accessed after thoroughly fumigating the cabinet. Changing the pre-filter should turn the indicator lamp off and reinstate the airflows. After a long period of use (several years) during which the pre-filter has been changed several times, the lamp may not extinguish after changing the pre-filter. This indicates that the main hepa filter now requires changing and is a condition that may be checked by briefly running the unit without a pre-filter in place. A continued on indication will confirm main filter replacement.



No harm will result to the unit in continuing to operate it whilst the filter change lamp is on, as operator safety is constantly monitored by the metering and alarm system. It would be considered sensible, however, to replace soiled filters within 100 hours of indication, such that design condition airflows can be restored.



## Alarm Zone



### Visor Open Alarm Indicator (red)

This lamp will light when the visor is raised (inflow velocity indicator will also be turned off). This alarm is also accompanied by an intermittent audible tone. With downflow and exhaust fans running, product protection may be reduced and operator protection significantly reduced with the visor open. This alarm system is totally independent from the other alarms in this zone.

### Inflow Alarm Indicator (red)

This alarm will illuminate to indicate high or low air inflow conditions (many MSC 2 cabinets alarm on low inflow only - this is regarded as basic, as operator protection can reduce due to turbulence if inflow is too high).



The illumination is intermittent and accompanied by an audible tone. Once alarm conditions is initiated, it will remain even if the inflow is reinstated. This warns the operator that an alarm has occurred during a period of absence and can only be cancelled with the mute switch. Once muted, the alarm indicator will show constant illumination and the audible tone will cease. If the alarm condition is removed by reinstating correct air inflow, the alarm lamp will go out. If the alarm condition is allowed to persist, the system will re-arm itself within a pre-set period. This is set at the factory to be about 15 minutes. The initial arm period is user selectable, either instant or 5 secs delay on start up only - see section H4. Please note that the cabinet will alarm on start up as the fans will require several seconds to build up correct air flows if set to instant. If this is undesirable, the DIP switch should be set to delay.

**The cabinet should not be used when in alarm condition as operator protection may be reduced.**

### **Inflow Alarm Mute Switch**

This switch when pressed will silence the audible inflow tone alarm and change the indication from intermittent to constant. If the alarm condition is allowed to persist, the system will be re-armed within a pre-set period. The inflow alarm can only be silenced with the mute switch and this will be necessary even if the inflow has been reinstated to design condition. The mute switch will need to be pressed to silence the alarm on start up, if instant arm is selected.

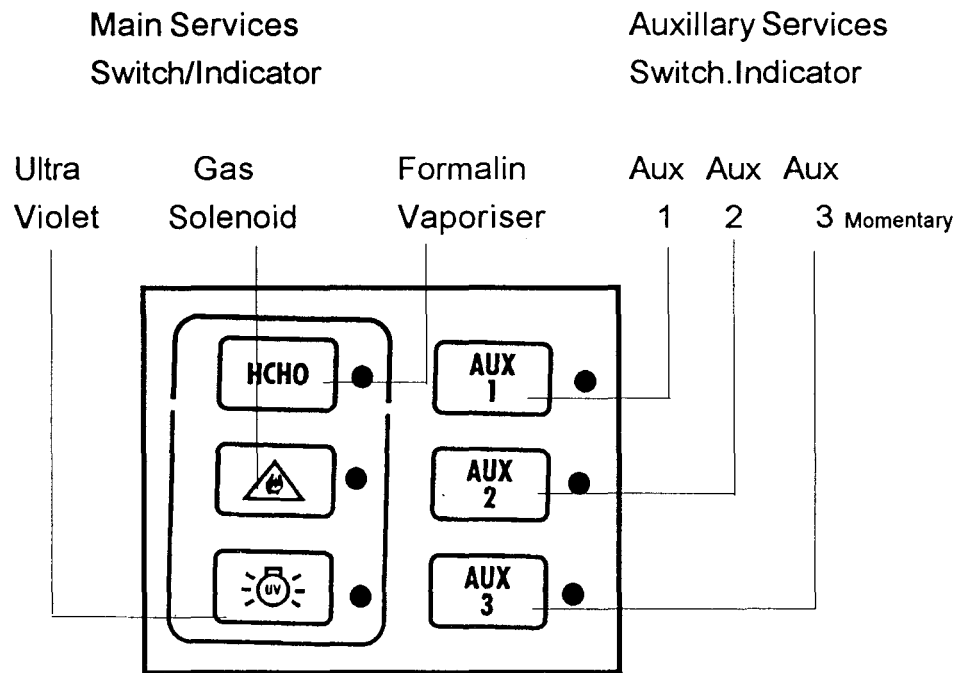
### **Inflow Alarm Test Switch**

This switch simulates a low air inflow condition to test the alarm system. This switch may be useful if the arm period has been adjusted to prevent the alarm sounding during start up.



Pressing the alarm test switch will simulate a reduced air inflow but will not actually affect it. Operator protection should therefore remain constant throughout alarm test.

### Services Zone



### Ultra Violet Tube Switch/Indicator (green)

This switch/indicator is used to illuminate a UV tube if fitted. A safety interlock is provided to ensure this switch cannot be operated until the visor and night door are both in place and the front of the cabinet sealed. Should the night door or visor be inadvertently removed whilst the UV tube is on, it will automatically be turned off. This safety feature reduces the risks of direct UV exposure to the operator (UV tube when fitted is located within the cabinet on the visor hinge line).

**The high velocity inlet bung is not interlocked as this will normally remain in position.**



### **Gas Solenoid Switch/Indicator (green)**

This switch/indicator is used to open a gas solenoid valve if fitted. The switch will only function when the exhaust fan is running and the downflow fan interlock pressure switch has detected sufficient airflow. Should the exhaust fan or power supply fail, the solenoid valve will close and require manual resetting. This will also occur if the night door is inadvertently fitted.

### **Formalin Vaporiser Switch/Indicator (green)**

This switch/indicator is used to activate a formalin vaporiser if fitted. There is an in-built safety interlock to ensure the vaporiser cannot be energised until both the visor and night door are in place and the front of the cabinet is sealed. Should either of these components be removed during fumigation, the formalin generator will again be switched off. A two minute auto purge cycle (if selected) will also be started on removal of the night door to ensure no formaldehyde can escape. Whilst the formalin generator is active, pressing the fan switch will run the downflow fans only with DIP switch manual selected. With auto selected, the downflow fans will cycle automatically for 30 seconds, every 30 minutes, for 2 hours. It is not necessary to press the fan switch to activate this. This will ensure a uniform spread of formaldehyde throughout the cabinet, filters and plenum. To indicate this mode of operation, the fan indicator lamp will illuminate but the inflow velocity indicator will not, thus signifying no exhaust. As soon as the formalin switch is turned off, normal fan running will resume although the interlock will prevent downflow running until the high velocity bung is removed.

**Note:** If a free-standing formalin vaporiser inside the cabinet is used, these safety interlocks will not be present.

### **AUX1 Switch/Indicator (green)**

This switch/indicator may provide electrical power to any other service where fitted. It is latching in operation (press on, press off) and can supply up to 5 amps, voltages up to main/240V ac. Power supply can be from main cabinet supply or independent. This switch is non-interlocked. Typical use could be to control 5A mains socket in cabinet.



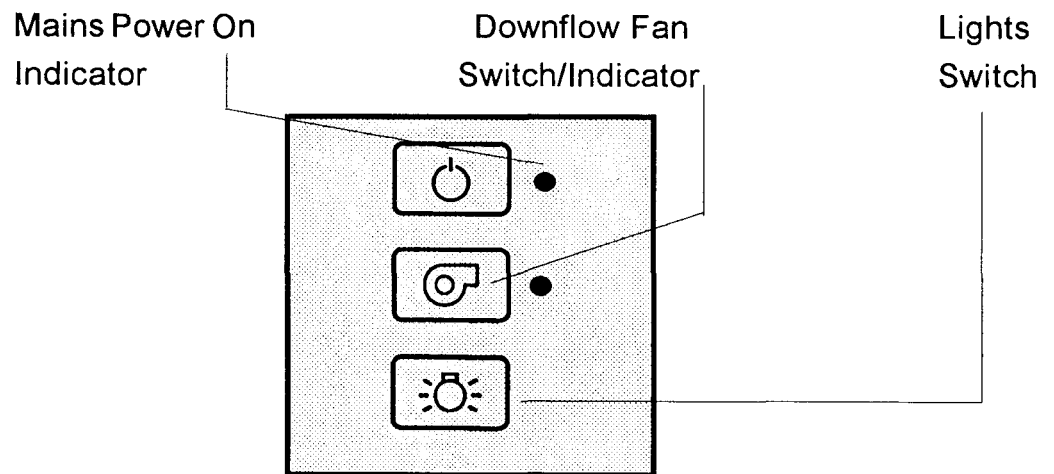
### AUX2 Switch/Indicator (green)

Identical to AUX1.

### AUX3 Switch/Indicator (green)

Identical to AUX1 but momentary in action (press on, release off). Typical use could be to any equipment requiring short duration operation only.

## Main Controls Zone



### Mains Power On Indicator

This indicator shows mains power connected to cabinet and will illuminate as soon as mains is supplied via the appliance coupler socket in the top of the cabinet. The cabinet is not fitted with a mains on/off switch for safety reasons.





## Downflow Fan Switch/Indicator (green)

This switch turns on the exhaust fan. As soon as the low air flow alarm limit is reached ( $0.40 \text{ ms}^{-1}$ ) the circuit turns on the downflow fans. The downflow fans are monitored by a pressure switch, when the downflow is established the Pressure Switch will operate and the green LED will be illuminated.

It should be noted that this indicator lamp will take 1 or 2 seconds to illuminate on starting the cabinet, as it detects air flows which are in turn dependent on fan spool up transients.

Should the fan indicator not illuminate, the cabinet should not be used as product protection may not be present.

**Note:** Should power to the cabinet be interrupted, the cabinet will require re-starting after power returns. If automatic fan re-starts after power failure is required (as in DIN standard), please advise as this option is already included in the main PCB and takes only seconds to switch on.

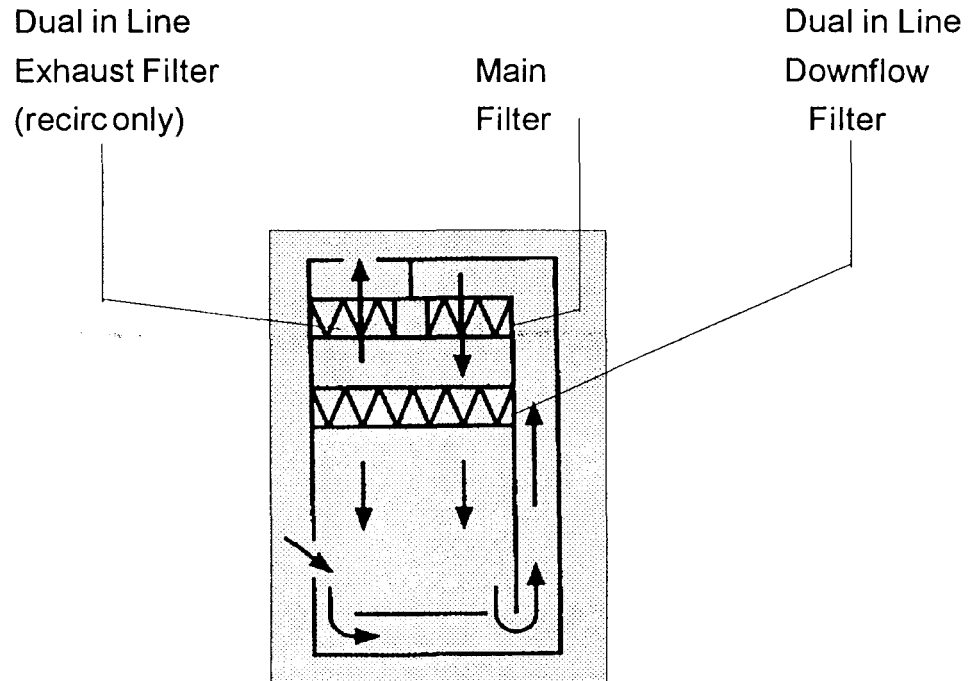
Also note that the indicator will light immediately when fan switch is pressed, if formalin cycle is active - downflow fans only will run in this mode.

## Lights Switch

This switch is used for turning the main fluorescent lighting tubes on and off. Lighting levels will generally be about 600 to 700 lux in the work zone. Please advise if this is considered too high as one tube can be inhibited.



## Air-Flow Diagram Zone



This diagram shows the main air flows and principal design features such as hepa filters. All air passes through the main filter before returning to the work zone via the downflow filter or returning to the laboratory via the dual in line exhaust filter. In exhaust ducted variants the exhaust filter is omitted (but may be retained if required).

### B.2 VISOR

The design of the visor is unique to the BIO 2+ in that it allows a fully sealing night door to be locked in place, without the use of taping round.



The visor is kept closed with 2 cam action clamps (one either side) and is released by moving their levers upwards. Care should be taken in doing this as the gas struts which support the visor open may raise the visor with some force. It is recommended therefore to hold the lower frame of the visor whilst releasing the clamps to control its upward movement.

Care should also be taken in avoiding the visor lower corners when raised. The fully open position is horizontal plus 45 degrees but the additional depth may not take this above head height in certain installations. To close the visor the reverse process is used, with gentle closing pressure on both sides to aid correct action of cam action clamps.

The work surface is designed to be removed with the visor up or down and the visor designed to be raised with the work surface in position or out.

The visor cannot be raised with the night door in place as it is mechanically interlocked. Please note that when open, the small micro switch behind the right lower corner of the visor frame sends a signal to the electronics to light the visor open alarm. Should this cease to function, difficulty may also be experienced with formalin generator interlocking, so a service call may be required.

### **B.3 NIGHT DOOR**

The night door is designed to seal without the use of taping. To install it, first switch cabinet fans off and check visor is secured down in position. Hold night door by the outside T-handled latches at an angle of about 45 degrees to vertical and engage both bullet hinges along the lower edge by moving door from left to right. Ensure that both bullet hinges are engaged. Hinge night door upwards and seal by rotating T-handles 180 degrees clockwise. Make sure the right hand side of the night door clears the visor frame and aligns with the micro switch. Rotate centre latch to complete sealing process.



**NB: If too great a force seems to be required to close catches, examine night door position and pawl positions etc. The force required to seal is minimal and if catches are incorrectly adjusted or forced into position, undue stress on the toughened glass visor may result. If a leak self-test is required, start fan switch and note velocity display with night door purge facility closed. This should read near to zero**

**(say 0.05ms<sup>-1</sup> at most). With night door in place it will be possible to energise formalin vaporiser where fitted. If this proves difficult remove and replace night door.**

To remove night door, start fans whilst turning the air inlet valve in the night door (ensure Formalin Vaporiser is switched off). After sufficient purge time the night door may be removed by reversing the process.

Should the user forget to start the fans, the cabinet will initiate a 2 minute auto purge cycle on removal of the night door if this configuration has been set at the factory

The night door seal should be periodically checked for wear and tear and security. On models with table frames a night door storage rack is provided. The night door is lowered into this at an angle, hinges, first, with 'T' handles to underside, and pushed easily into place.

#### **B.4 LIGHTING**

The 2 fluorescent lighting tubes are located behind the front hinged panel along the lower edge. Replacement should only be carried out by a qualified electrician once the cabinet has been isolated from the mains supply. This procedure is as follows:-

1. Release front panel locks (either side).
2. Raise front panel on gas struts.
3. Remove caps from the tube ends (2 per tube).
4. Ease spent tube out of terry clips - one end at a time - and remove tube carefully.
5. Replace by reverse procedure.





## C. CABINET OPERATION

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### C.1 START UP

1. Ensure that the mains power indicator is on. This indicates that the mains electrical supply is connected.
2. Press the fan switch to start the fans whilst turning the air inlet valve in the night door. The inflow alarm may trigger during this process and can be muted. Allow the cabinet to run for about 10 seconds to purge the internal work area from contaminants, then remove the night door.

**Note: If the night door is released without starting the fans, the auto purge cycle will start the exhaust fan and run it automatically for 2 minutes.**

3. After removing the night door, the digital air inflow velocity indicator should read  $0.55 \text{ ms}^{-1} \pm 10\%$  (depending on local commissioning levels) and alarms should not re-arm. This confirms the correct inflow has been established and unit is safe to use. Operation of the downflow fans is confirmed by the fan indicator illuminating.
4. For table frame mounted units, store the night door in the rack provided taking care not to disturb seals or the sensor actuation bracket.
5. Press the light switch on the membrane panel before starting work inside the cabinet.

**Note: On ducted units, movement of the anti-blowback damper valve on top of the cabinet, visible through the top panel cut-out is an additional indication of exhaust flow running.**



## **C.2 SHUTDOWN**

**Note:** When work is completed any further materials or apparatus that are required for other work, should only be removed from the cabinet after thorough cleaning. Any spillage should be wiped up and soiled wipes disposed of correctly.

1. Re-fit the night door (full description in B3) with inlet valve open. Due to system airflow changes this may cause, the downflow fans to cease and velocity sensor to go into alarm. These effects may be disregarded.
2. Depress the fan switch to switch off the cabinet and rotate the inlet valve in the night door.
3. Finally depress the light switch.

Omit



## E. USEFUL TIPS ON CABINET USE

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1. The cabinet must never be used for any microbiological or other potentially hazardous work unless:-
  - a. The fans are running.
  - b. The visor is clamped in the closed position.
  - c. The airflow indicator shows a safe reading with no alarms.
2. When the cabinet is not in use the night door should always be fitted.
3. Try to keep the amount of equipment required for work inside the cabinet to a minimum. Any apparatus can easily disturb the airflow patterns in the working zone and in large quantities can seriously impair the performance of the cabinet.
4. Where possible avoid the use of bunsen gas burners inside the cabinet. They are potentially both a fire and an explosion hazard and convection currents caused by the burner can carry material around the workspace reducing the cross-contamination protection normally afforded.
5. Do not use a centrifuge inside the cabinet.
6. When using shakers or homogenizers inside cabinets, all containers should have screw caps to reduce the violent expulsion of particles. For operator safety all glass containers should be suitably shrouded. The 'Whirlmixer' type of mixer has been shown to produce virtually no aerosol.
7. Even with the best techniques, it is possible for the operators hands and arms to become contaminated as a result of the work being undertaken. For this reason, movement of hands and arms into and out of the working area during work in the cabinet should be kept to a minimum. Any protective clothing should have close fitting cuffs.



8. Always use a seat of the correct height. This should allow the operator when sitting comfortably in front of the cabinet, an uninterrupted view of the work area through the viewing screen.

Never sit so as to look under the lower edge of the screen, or attempt to peer underneath during the course of the work.





## F. CLEANING

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- a. The cabinet interior workspace should ideally be cleaned after each occasion when it is used. The purpose of such cleaning is to remove and render harmless any small amounts of dirt and debris that may have accumulated.

Dilute disinfectants may be used but warm water with a mild detergent is usually quite adequate. The use of large quantities of alcohol is not recommended and the use of Hypochlorite, even in dilute solutions may corrode the metal surfaces. If drip trays are fitted, these should be cleaned very regularly.

- b. The visor is made of toughened glass. Either clean with the detergent solution or use a proprietary glass cleaner. To facilitate cleaning on the inside of the visor, the screen can be raised open.
- c. Pay attention to beneath the worksurface tray and the surface of the cabinet interior beneath this tray.
- d. The external finish is textured epoxy paint and will respond well to cleaning with mild detergent.