



# 1500 Series B2 Class II, Type B2 Biological Safety Cabinet

## Operating Instructions

3848331 • Revision B • June 2019

**IMPORTANT** Read this instruction manual. Failure to follow the instructions in this manual can result in damage to the unit, injury to operating personnel and poor equipment performance.

**CAUTION** All internal adjustments and maintenance must be performed by qualified service personnel.

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# Preface

Read through the information given in these operating instructions manual before you begin installation and use of your “Biological Safety Cabinet”. Thermo Fisher Scientific does not assume any liability for damage due to incorrect operation or use of the system other than the intended use. In case of conflicting translations into foreign languages the English-language version of these operating instructions shall be binding.

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## Legal Information

**Note:** Specifications, terms and pricing are subject to change. Not all products are available in all countries. Consult your local sales representative for details.

## Warranty

Thermo Fisher Scientific warrants the operational safety and functions of the biosafety cabinet only under the condition that:

- The device is operated and serviced exclusively in accordance with its intended purpose and as described in these operating instructions
- The device is not modified

- Only original spare parts and accessories that have been approved by Thermo Fisher Scientific are used
- Inspections and maintenance are performed at the specified intervals
- An installation certification is performed prior to the initial operation of the device and that a repeat certification is performed on the occasion of all inspections and repairs.

The warranty is valid from the date of delivery of the device to the operator.

# Introduction

Thermo Fisher Scientific™ 1500 Series B2 Class II, Type B2 Biosafety Cabinet™ has been tested and certified in accordance to NSF/ANSI 49, and is designed to protect the user, the environment, and your research from harmful substances and cross-contamination. This user's manual provides instructions on how to use the 1500 Series B2 most effectively and safely.

The 1500 Series B2 offers a unique range of product features that will enhance your safety and improve overall operating efficiency. Should you have any questions on using this product or need further explanation of any of its features, contact Thermo Fisher Scientific technical support group at the phone numbers listed on the following pages.

## Postal address USA

Thermo Fisher Scientific Inc. (Asheville) LLC  
401 Millcreek Road, Box 649  
Marietta, OH 45750  
United States

## Enquiries from North America, Latin America and Asia Pacific

**Phone:** 1-740-373-4763

**Fax:** +1-877-213-8051

**Email:** [service.led.marietta@thermofisher.com](mailto:service.led.marietta@thermofisher.com)

## Intended Use

### Correct Use:

The biosafety cabinet is a laboratory device for installation and operation in microbiological and biotechnical laboratories of biosafety levels 1, 2, and 3. It has been designed as a Class II Biosafety Cabinet, Type B2, in accordance with NSF/ANSI 49.

Depending on the hazard level of the agents involved, the operator must prepare in writing appropriate decontamination procedures for the device and the accessories used in the sample chamber.

Prior to the initial operation of the cabinet, the operator must perform an installation test, or certification. According to the NSF, the test result must be documented by a test report. The cabinet must only be used after it is in compliance with the operating parameters as specified by Thermo Fisher Scientific.

After any changes to the installation conditions and after any modification to the technical system, the certification test must be repeated and the test result must be documented in

a way that demonstrates all operating parameters are in compliance with those specified by Thermo Fisher Scientific.

### Incorrect Use:

To ensure optimum safety to the user and the environment, the biosafety cabinet should not be used in laboratories that do not comply with the requirements of biosafety levels 1, 2 or 3.

The device must not be operated as a Class II, Type B2 Biosafety Cabinet if:

- No repeat test is performed after changes to the installation conditions or after modifications to the technical system,
- The alarm system of the device has issued a failure message and the cause for the failure has not been repaired.

The alarm system must not be tampered with or disabled. If alarm system components have been removed or disabled for service or repairs, the device must only be released for operation after all alarm system components are confirmed to be functioning properly.

The HEPA filters installed in the device are not capable of separating gaseous substances. Therefore, avoid storing or processing gases or gas-releasing substances in the device:

- Which in quantity or concentration are toxic,
- If a reduction with other substances may result in hazardous toxic concentrations or formation of toxic gases, that may form combustible or explosive mixtures in combination with air.

## Instruction of the Operating Personnel

The operating instructions describe the biosafety cabinet 1500 Series B2, and applies to the models:

- 4-foot models 1510 / 1511 / 1515 / 1516 / 1517 / 1518
- 6-foot models 1560 / 1561 / 1562 / 1563 / 1564 / 1565

This biosafety cabinet has been manufactured in keeping with the latest technological developments and has been tested before delivery for its correct function. It may, however, present potential hazards if it is not used according to the intended purpose or outside of operating parameters. Therefore, the following procedures must always be observed to prevent accidents:

- The biosafety cabinet should be operated by authorized personnel who have been trained on the use and maintenance of this product.
- For any operation of this device, it is recommended that the operator prepares clear and concise written instructions in the language of the operating and cleaning personnel based on these operating instructions, applicable safety data sheets, plant hygiene guidelines, and technical regulations. Most importantly:
  - which decontamination measures are to be applied for the cabinet and accessories
  - which protective measures apply while specific agents are used
  - which measures are to be taken in the case of an accident.
- To ensure safety during the repair of the cabinet, servicing of the equipment must be carried out by trained and authorized personnel.



# Safety Precautions

In this manual, the following symbols and conventions are used.



**CAUTION:** Do not position the unit so that it is difficult to operate the main disconnect device.



**CAUTION:** Electrical outlets in the cabinet are restricted to 5 amps (115 V models) or 2 amps (230 V models) maximum current.



**CAUTION:** Do not use any detachable power cord that is not adequately rated for the unit.



**WARNING:** Do not attempt to lift the Biosafety Cabinet by the side panels, damage will occur.

Below are important safety precautions that apply to this product.



**Note:** The Biosafety Cabinet should be certified by a certification technician before its initial use. The cabinet should be recertified whenever it is relocated, serviced or at least annually thereafter. Filter integrity and airflow performance should be verified before using the cabinet.



**WARNING:** The Total Exhaust Biosafety Cabinet is designed to be connected to an appropriate exhaust system. Without verified inflow velocity, the cabinet may NOT contain hazardous particulate or gases. Do not attempt to operate it when it is not connected to an appropriate exhaust system that has been inspected by a qualified certifier.



**WARNING:** Type B2 Biosafety Cabinets rely on external blowers (usually on the roof of a building) to exhaust 100% of the air entering the cabinet. If the building exhaust blower fails or is mistakenly turned OFF, the cabinet will not provide containment of hazardous materials.



**WARNING:** Do not use the cabinet until the problem has been corrected.



**CAUTION:** Only lift and support the cabinet at the stainless steel sides and back. Damage will occur if lifted or supported on the front edge.



**CAUTION:** Some internal components of the Biosafety Cabinet may become contaminated during operation of the unit. Only experienced personnel competent in decontamination procedures should decontaminate the cabinet before servicing these components. If you have any questions regarding certification agencies, or need assistance in locating one, contact Thermo Fisher Scientific.



**CAUTION:** DO NOT load more than 50 lbs. (23 Kg) in the work area. Exceeding this limit may damage the work surface and its supports. Excessive weight in the cabinet may increase the risk of it overturning, or failure of hydraulic lift stands, resulting in the cabinet and stand overturning. If your application requires loading more than 50 lbs., contact Thermo Fisher Scientific.



**CAUTION:** Ensure that the cabinet is connected to electrical service in accordance with local and national electrical codes. Failure to do so may create a fire or electrical hazard. Do not remove or service any electrical components without first disconnecting the Biosafety Cabinet from electrical service.



**CAUTION:** Avoid the use of flammable gases or solvents in the Biosafety Cabinet. Care must be taken to ensure against the concentration of flammable or explosive gases or vapors. An open flame should NOT be used in the Biosafety Cabinet. Open flames will disrupt airflow patterns, burn the HEPA filter and/or damage the filter's adhesive. Gases under high pressure should not be used in the Biosafety Cabinet, as they may disrupt its airflow patterns.



**CAUTION:** HEPA filters only remove particulate matter. Operations generating volatile toxic chemicals or radionuclides must be evaluated carefully.



**CAUTION:** The media of HEPA filters is fragile and should not be touched. Avoid puncturing either HEPA filter during installation or normal operation. If you suspect that a HEPA filter has been damaged, DO NOT use the cabinet; contact a local certification agency or Thermo Fisher Scientific.



**CAUTION:** The HEPA filters in the Biosafety Cabinet will gradually accumulate airborne particulate matter from the room and from work performed in the cabinet. The rate of accumulation will depend upon the cleanliness of the room air, operating time and the nature of work being done in the cabinet. The Filter Gauge accurately displays the amount of filter life remaining for the cabinet downflow filter.



**CAUTION:** Proper operation of the cabinet depends largely upon its location and the operator's work habits. Consult the Installation and Normal Operation sections of this manual for further details.



**CAUTION:** Avoid direct exposure of plastic or coated materials to ultraviolet (UV) radiation. Never bypass the UV safety interlock that only allows the UV light to work when the sash is closed. When surface disinfecting the Biosafety Cabinet:

Avoid splashing the disinfecting solution on skin or clothing.

Ensure adequate ventilation.

Carefully follow the disinfectant's safety instructions.

Always dispose of disinfecting solutions in accordance with local and national laws.



**CAUTION:** DO NOT allow disinfectants with high concentrations of free chlorine to contact the stainless steel components of the Biosafety Cabinet for a long period of time. Free chlorine will corrode stainless steel after extended contact.



**CAUTION:** Biosafety Cabinets should be decontaminated for any of the following reasons:

Before maintenance work requiring entry into contaminated areas.

Before HEPA filter changes.

Before performing certification tests requiring entry into contaminated areas.

Before relocating the cabinet.

Before changing research programs.

After the gross spill of biohazardous material or toxic chemicals.

# Prerequisites

Before you install the Biosafety Cabinet, you need to prepare the site for installation. Examine the location where you intend to install the cabinet. You must be certain that the area is level and of solid construction. In addition, a dedicated source of electrical power must be located near the installation site.

This section lists all requirements for:

- Space
- Clearance
- Location
- Exhaust
- Electrical
- Service Lines

Refer to **Appendix C: Specifications**, for complete Type B2 cabinet electrical and environmental conditions, specifications and requirements.

## Space Requirements

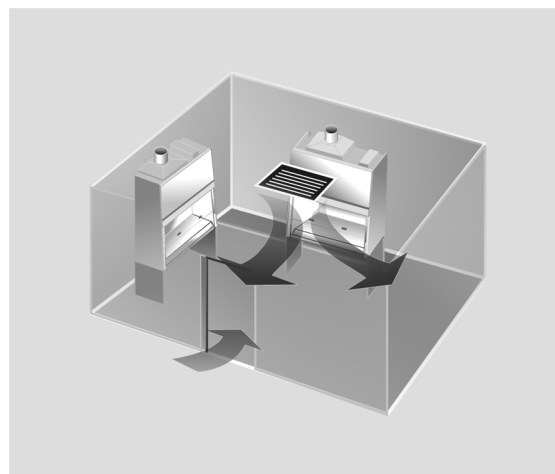
The dimensions for the different models are shown in **Appendix B: Dimensions**.

## Clearance Requirements

A minimum clearance of at least 6" (150 mm) is suggested on the top and both sides of the cabinet for service.

## Location Requirements

**Note:** The Biosafety Cabinet should be located away from traffic patterns, doors, fans, ventilation registers, fume hoods and any other air-handling devices that could disrupt its airflow patterns. All windows in the room should remain closed. **Figure 1** shows the preferred location for the Biosafety Cabinet.



**Figure 1. Location Requirements**



**CAUTION:** Do not position the unit so that it is difficult to operate the main disconnect device.

## Exhaust System Requirements

**Note:** The Exhaust Blower cannot run at its nominal flow rate with the sash completely closed. If you choose to close the sash completely to use the uv light for surface disinfection, then the Exhaust Blower must be **SHUT OFF**, or its flow rate reduced 90% or more for proper operation. The Biosafety Cabinet has an optional en/contact circuit board that has dry contacts that can be configured to signal the Exhaust Blower to turn on when the Biosafety Cabinet blower is on. For further information, contact Thermo Fisher Scientific product service department. As an alternative, a remote electrical switch for the Exhaust Blower can be installed near the Biosafety Cabinet.

Before deciding on a location, examine it carefully to ensure that it is compatible with the cabinet's exhaust duct. The area directly above the cabinet's exhaust port should be clear of structural elements, water and utility lines, or other fixed obstructions. There should be enough clearance to allow for the passage of a 10" PVC or stainless steel duct. Avoid cabinet locations that require either an elbow directly on top of the cabinet's exhaust connection or an excessive number of elbows to clear other items. For a further discussion of the cabinet's exhaust system requirements, go to **Getting Started**.

# Electrical Requirements

The use of air or gases under high pressure should be avoided as they may seriously disrupt the airflow patterns in the cabinet.

The Biosafety Cabinet models have the following electrical requirements:

**Table 1. Electrical Requirements**

Model	Requirements
1510, 1511	115 V AC, 60 Hz, 12 Amps
1515, 1516, 1517, 1518	230 V AC, 50/60 Hz, 6 Amps
1560, 1561	115 V AC, 60 Hz, 12 Amps
1562, 1563, 1564, 1565	230 V AC, 50 / 60 Hz, 6 Amps

A dedicated outlet with an appropriate circuit breaker should be located as close as possible to the right rear side of the cabinet, at a height even with, or higher than, the top of the bench or stand. Consult your local electrical codes for properly rated circuit breakers. For safe operation the dedicated outlet must provide the protective earthing ground connection to the cabinet.

On 100 and 115 V AC models, both electrical outlets are protected by a ground fault interrupter circuit (GFI). Thermo Scientific does not recommend plugging the Biosafety Cabinet into a GFI outlet.



**CAUTION:** Electrical outlets in the cabinet are restricted to 5 amps (115 Volt models) or 2 amps (230 Volt models) maximum current.



**CAUTION:** Do not use any detachable power cord that is not adequately rated for the unit.

## Service Line Requirements

All utility service lines should be ¼" O.D., brass, copper, or stainless steel, and equipped with an easily accessible shut-off valve. If the service line pressure exceeds 40 PSI, it must be equipped with a pressure regulator to reduce the line pressure.

The use of flammable gases or solvents should be avoided in the Biosafety Cabinet. Open flame in the cabinet will disrupt the laminar airflow in the cabinet and may damage the HEPA filters. Flammable gases or solvents may reach explosive concentrations in the cabinet or ductwork. If you feel that the procedure requires the use of an open flame or flammable materials, contact the institution's safety office.

# Getting Started

Now that the installation is properly prepared, you are ready to inspect, install, and certify the Biosafety Cabinet. This chapter covers how to:

- Unpack and move the Biosafety Cabinet
- Install the cabinet
- Connect the electrical supply source
- Connect the service lines
- Connect to an exhaust system
- Arrange certification of the Biosafety Cabinet

Tools required for installation the Biosafety Cabinet include two 1/2" wrenches, a flat-blade screwdriver, a #2 Phillips screwdriver, and a carpenter's level.

**Note:** The Biosafety Cabinet models weigh between 400–700 lbs. (182-318 kg). The shipping pallet allows for lifting with a mechanical lift truck or floor jack. If you must lift the product manually, use at least six (6) persons and follow safe-lifting guidelines.

## Unpacking the Biosafety Cabinet

1. Carefully remove the outer carton and inspect the cabinet for damage that may have occurred in transit. If the Biosafety Cabinet is damaged, notify the delivery carrier immediately and retain the entire shipment intact for inspection by the carrier.

**Note:** United States Interstate Commerce Commission rules require that claims be filed with the delivery carrier within fifteen (15) days of delivery.

Do not return goods without the prior authorization of Thermo Fisher Scientific. Unauthorized returns will not be accepted.

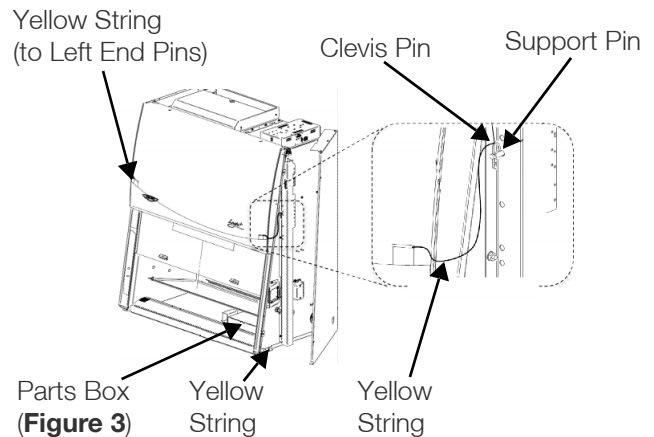
If the cabinet was damaged in transit, you must file a claim directly with the freight carrier. Thermo Fisher Scientific Corporation and its dealers are not responsible for shipping damages.

Do not discard the carton or packing material for the Biosafety Cabinet until all of the components have been checked, installed and tested.

2. The cabinet is secured to the pallet in two places on each side. To access the nuts and bolts, remove the side panels by removing and keeping the two Phillips screws on both panels. Swing the front of each panel away from

the cabinet, and lift it straight up to remove the panel from the cabinet.

3. While the side panels are off, the sash weight support pins must be removed. Follow the two yellow strings to the support pin and its clevis pin. Remove the clevis pins, and pull the support pins straight back. Discard the pins and yellow string. See **Figure 2** below.



**Figure 2. Unpacking the Biosafety Cabinet**

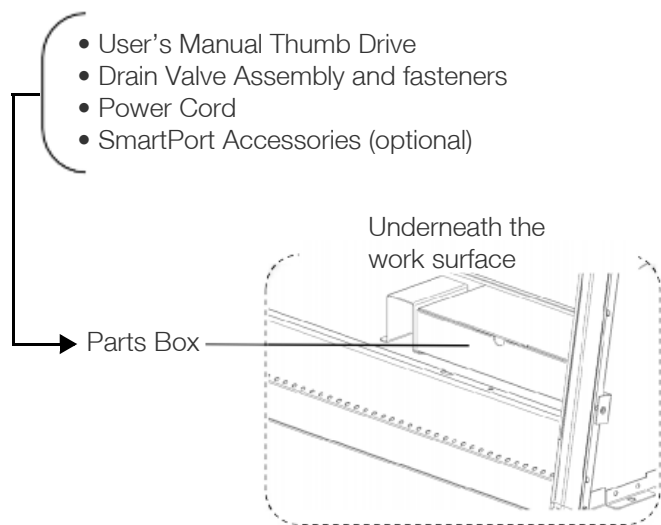
**Note:** The side panels must be removed to access the fasteners that secure the Biosafety Cabinet to the pallet.



**CAUTION:** Do not attempt to lift the Biosafety Cabinet by the side panels, damage will occur.

## Preparing the Biosafety Cabinet for Operation

Installation instructions for the cabinet are attached to the sash of the Biosafety Cabinet. If these instructions are missing or unclear, contact Product Service at 1-888-213-1790. The following are located in a box (see **Figure 2** on previous page and **Figure 4** below) underneath the work surface:



**Figure 3. Parts box**

If you did not receive one or more of the components listed for the cabinet, or if any of the components are damaged, contact Thermo Fisher Scientific immediately for further instructions.

## Moving and Lifting the Cabinet

Move the cabinet, attached to its pallet, by using a floor jack, or a furniture dolly underneath the unit. DO NOT move the cabinet by tilting it onto a hand truck.

When lifting the cabinet DO NOT lift the cabinet in the middle front area of the hull. Lifting here may bend or distort the bottom of the cabinet, causing damage to the unit.

## Installing the Biosafety Cabinet on an Existing Work Surface

**Note:** The Biosafety Cabinet is very top heavy. Use caution when lifting or moving it.

When installing the Biosafety Cabinet onto an existing work surface or bench top, ensure that the structure can safely support the combined weight of the cabinet and any related equipment. The work surface should be at least as wide as the cabinet and 31" (787 mm) deep to properly support the unit. A hole or notch may be cut in the supporting surface in the right front corner to accommodate the optional drain valve.

## Installing the Cabinet on a Thermo Fisher Scientific Base Stand

Thermo Scientific offers accessory Base Stands in a variety of configurations to suit your particular needs. Stands can be ordered with adjustable telescoping legs or with a manually or electrically adjustable hydraulic lift.

## Telescoping Base Stands

Adjust the leg height before installing the cabinet on top of the stand. The height can be set in 1" intervals between 27.5" to 34.5" (699 mm to 876 mm), providing a Cabinet work surface height from 30" to 37" (762 mm to 940 mm). The Base Stands for each width Cabinet are listed in **Table 2**.

**Table 2. Telescoping Base Stands**

Width	Base Stand w/Feet Model #
4'	3730402
6'	3730602

1. Before positioning the Telescoping Base Stand in its final location, adjust the height. A plastic bag containing the mounting bolts for the Biosafety Cabinet is shipped with the base stand. Remove and save it.
2. Select the height of the stand and slide four (4) leg extensions into base stand corner posts and attach with 2 1/4" long bolt, flat washer, lock washer and nut. Ensure that the same height hole is selected for each leg. Tighten the leg bolts securely. See **Figure 4**.

# Exhaust System Connections

The Total Exhaust Biosafety Cabinets are a “Type B2 cabinet,” meaning they direct their HEPA filtered exhaust air out of the laboratory.



**WARNING:** The Total Exhaust Biosafety Cabinet is designed to be connected to an appropriate exhaust system. Without verified inflow velocity, the cabinet may NOT contain hazardous particulate or gases. Do not attempt to operate it when it is not connected to an appropriate exhaust system that has been inspected by a qualified certifier.



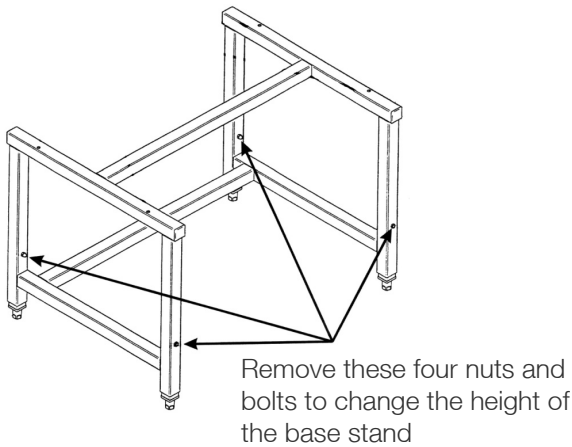
**WARNING:** Type B2 Biosafety Cabinets rely on external blowers (usually on the roof of a building) to exhaust 100% of the air entering the cabinet. If the building exhaust blower fails or is mistakenly turned OFF, the cabinet will be pressurized, resulting in a flow from the work area into the laboratory. It is imperative that the following be considered in a risk assessment:

- Justify the type of work is appropriate for the cabinet Type B2
- Exhaust system must be reliable, maintained, frequently inspected and preferably redundant
- Exhaust termination must be distant from other building air intake systems to prevent the re-entrainment of volatile chemicals

**Note:** The Exhaust Blower cannot run at its nominal flow rate with the sash completely closed. If you choose to close the sash completely to use the UV light for surface disinfection, then the Exhaust Blower must be **SHUT OFF**, or its flow rate reduced 90% or more for proper operation. The Biosafety Cabinet control board has dry contacts that can be configured to signal the Exhaust Blower to turn **ON** when the Biosafety Cabinet blower is **ON**. For further information, contact Thermo Fisher Scientific product service department. As an alternative, a remote electrical switch for the Exhaust Blower can be installed near the Biosafety Cabinet.

The exhaust connection is a sealed Exhaust System from the top of the cabinet to the remote blower. The Exhaust Systems should be dedicated to a single cabinet. The cabinet is equipped with an exhaust flow alarm, such that an alarm sounds, and the cabinet blower shuts off in the event of insufficient exhaust flow.

If your research involves the use of toxic compounds or volatile materials, contact your facility’s safety officer or Thermo Fisher Scientific to ensure that your cabinet and its

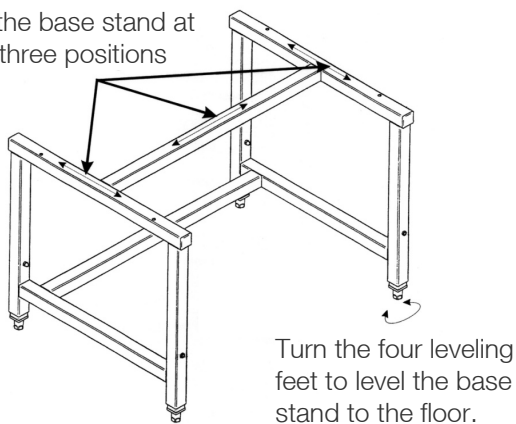


**Figure 4. Adjusting the height of Telescoping Base Stand**



**CAUTION:** Only lift and support the cabinet at the stainless steel sides and back. Damage will occur if lifted or supported on the front edge. Move the base stand into its final location. Using a carpenter’s level, adjust each leveling foot until the stand is level in both planes as shown in **Figure 5**. You are now ready to lift the Biosafety Cabinet onto its stand.

Level the base stand at these three positions



**Figure 5. Leveling the Telescoping Base Stand**

exhaust system are compatible with the materials you will be working with.

## Exhaust System Requirements

The cabinet exhaust stack is sized to accept 10" (254 mm) stainless steel ductwork. The exhaust system's blower should be sized to handle the exhaust volume of each cabinet, as shown in the **Appendix E: Quick Chart**. The exhaust system must maintain a static pressure equal to or greater than the system pressure, plus 1.5" (38 mm) of water for the Biosafety Cabinet. In order to get the maximum life out of the cabinet's exhaust filter, the system needs to be able to operate at an additional 2" (51 mm) of vacuum, compared to the initial total system pressure.

**Note:** The exhaust system may be fitted with a backdraft damper (Part #3858800) to prevent the reversing of airflow in the system.

## Connecting the Biosafety Cabinet to Utility Service Lines

**Note:** Some models have a solenoid valve connected to the service valve on the right side, rear position. The solenoid prevents gas from flowing to the service valve when the unit blower is off. It is the only service valve position that can be fitted with a solenoid valve. Connect the gas service to the solenoid valve.

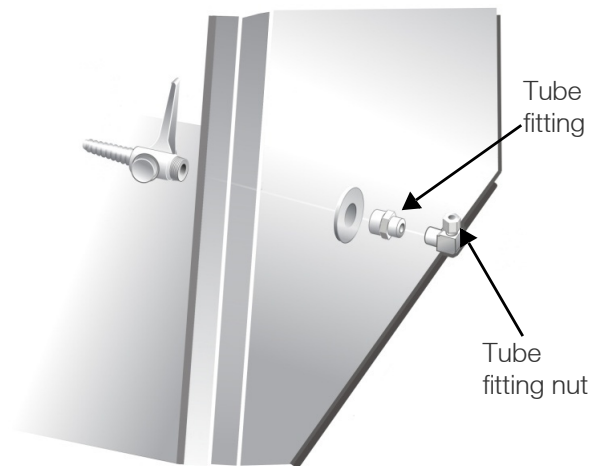
The service lines (if any) should be connected to the tube fitting(s) on the outside of the liner wall as shown in **Figure 6**. To install the tubing, follow these steps:

1. Ensure that the tubing is ¼" O.D., soft metal, and that the end has been completely deburred.
2. Route the tubing from the rear of the cabinet, ensuring that it will line up with the slot in the back of the side panel. The slot is located from 8 ¾" to 11 ¼" (222 mm to 288 mm) from the bottom of the cabinet.

**Note:** Make sure that the tube routing will not contact any electrical wires. DO NOT loop service line tubing within the side panels of the cabinet.

3. Make sure that the nut on the tube fitting is loose, but do not remove it. Make sure the tube ferrule is in the fitting.
4. Push the tube into the fitting until it is properly seated. The tube will go approximately ¾" (19 mm) into the fitting.

5. Tighten the tube fitting nut hand tight and then, using a 7/16" wrench, tighten it at least ¼ turn more.
6. Close the service valve in the Biosafety Cabinet and then slowly open the shutoff valve on the service valve. Test all fittings for leakage. Tighten the tube nut slightly if needed.



**Figure 6. Service lines connectivity**

## Using the SmartPort™ Cord & Cable Portal

There must be enough clearance to pass the cord or cable between the Thermo Fisher Scientific exterior dress panel and any obstruction.

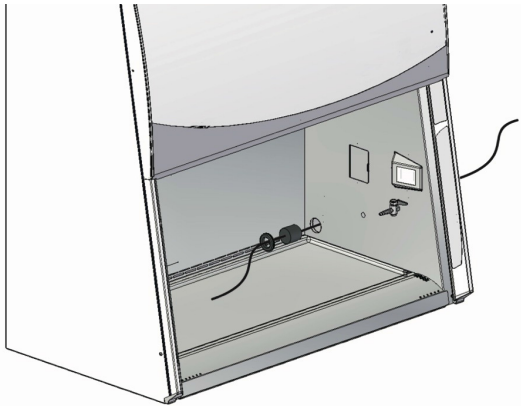
**Note:** Some SmartPort B2 components and the cord or cable passing through it may become contaminated during use of the cabinet. Ensure all potentially contaminated components are surface decontaminated before handling or removal from the cabinet.

1. Remove the grommet from the liner side wall. Remove the solid sealing plug from the body of the portal by either pressing it through from the outside, or by carefully inserting a spatula or similar device between the sealing plug and the body of the portal, and prying the plug out.
2. Locate the pass-thru universal sealing plug, which is included in the parts box located underneath the work surface during shipment.
3. Pass the cord or cable through the body of the portal, and then through one of the plugs that has been cut for cord or cable use, then through the grommet, as shown in **Figure 7**.

**Note:** Select a hole in the sealing plug that is slightly smaller than the cord or cable, to create a proper seal. This will also



help minimize movement of the cord or cable if it is accidentally pulled during use.



**Figure 7. Pass the cord or cable through the body of the portal**

4. Position the cord or cable as it will be used in the cabinet, and then push the plug back into the body of the portal until it seats in the portal. Reinstall the grommet.

## Installing the Drain Valve

In order to prevent damage during shipping, the drain valve assembly has not been installed. If desired, the valve should be installed after the cabinet is in its final location.

To install the valve assembly, follow these steps:

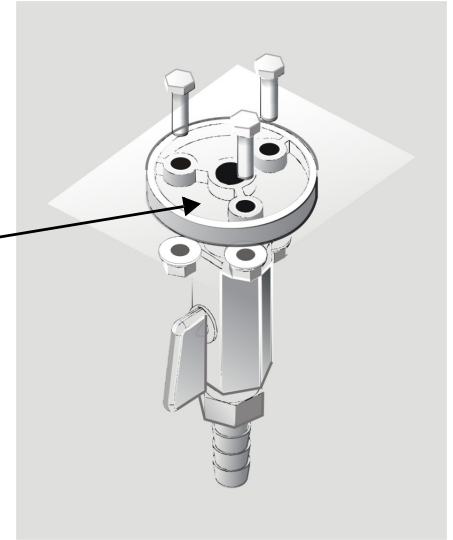
**Note:** The work surface is heavy. Use caution when handling it.

1. Locate the Drain Valve components and installation hardware. The components and hardware are shipped in a single bag inside the parts box, underneath the work surface.
2. Lift the work surface out of the Biosafety Cabinet by lifting on the knobs at the front of the work surface. Steady the work surface while pulling it straight out the front of the cabinet.
3. Using a putty knife, remove and discard the stainless steel cover that is sealed over the drain mounting holes. Scrape out remaining sealant that is around the holes.
4. Apply a light coating of silicone sealant (user supplied) to the mounting surface of the drain assembly. Attach the drain assembly under the bottom of the cabinet as shown in **Figure 8**. Wipe off any excess sealant from the cabinet bottom. Ensure that the center drain hole is unobstructed.
5. Make sure the drain valve is in the closed position.
6. Reinstall the work surface.

7. Allow the silicone sealant to cure for at least eight hours before exposing it to liquid.

**Note:** The drain valve assembly attaches to the underside of the cabinet bottom.

Apply a light coat of silicone sealant to this surface of the connector, aligning the three holes in the connector with the three holes in the Biosafety Cabinet liner.



**Figure 8. Drain valve assembly**

## Initial Certification

Prior to use, a qualified certifier should certify all Biosafety Cabinets. Under normal operating conditions, the Biosafety Cabinet should be re-certified at least annually and when relocated or serviced. The certifier should perform the following tests, as recommended in ANSI/NSF Standard Number 49 in effect when the cabinet was manufactured:

- Downflow Velocity Profile Test
- Inflow Velocity Test
- Airflow Smoke Patterns
- HEPA Filter Leak Test
- Site Installation Assessment Tests
- Vibration Test\*
- Noise Level Test\*
- Lighting Intensity Test\*

\*These tests are user comfort related tests and may be omitted at the user's or certifier's discretion.

If you have any questions regarding certification agencies or need assistance in locating one, contact Thermo Scientific at 1-800-438-4851.

**Note: Service with costs:** Unless certification was expressly called for in the specification, quotes and/or purchase order, the cost for this on-site testing is to be paid by the customer.

# Performance Features

All 1500 Series B2 Biosafety Cabinets operate using the following principles:

- Filtration and retention of particulates by High Efficiency Particulate Air (HEPA) filter(s)
- Laminar airflow
- Directional airflow

The major components in a Biosafety Cabinet are:

- The HEPA filter(s) or optional ULPA filters
- The motor/blower to force air through the cabinet
- Cabinet air intakes (grilles), ductwork and air balance controls

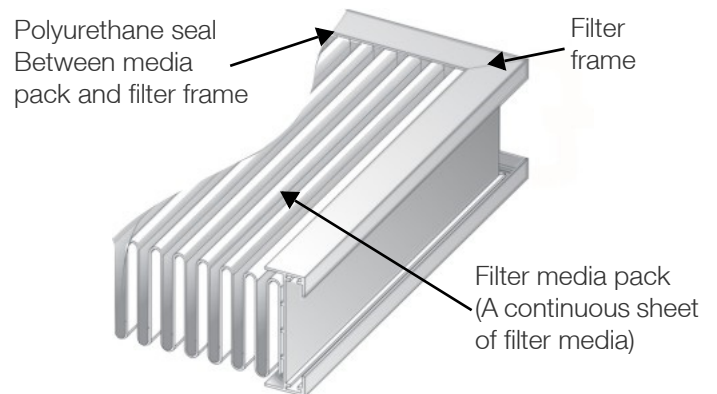
## HEPA Filters

HEPA filters are disposable, dry-type particulate filters. The filter material or media is typically made of borosilicate microfibers formed into a thin sheet, in a process similar to the production of paper. This sheet is folded, or pleated to increase its surface area. The pleats are typically held in place by beads of glue that add rigidity to the media pack. The pack is then set into a frame, and sealed as shown in **Figure 9**.

The HEPA filter manufacturer establishes the efficiency of the filter by challenging it with an aerosol of known particle size. The number of particles that penetrate the filter are quantified, and this establishes the efficiency of the filter. Thus, the filters used in the Biosafety Cabinet cabinets are at least 99.99% efficient in removing particles 0.3 micron.

**Note:** The HEPA filter media is very fragile. DO NOT touch the media. If you think the media of a HEPA filter is damaged, DO NOT USE THE CABINET. Have the HEPA filter integrity tested by a certifier before using the cabinet.

**Note:** HEPA Filters are only effective against particulate material. Gases will pass through the filter.



**Figure 9. HEPA Filter**

## ULPA Filters

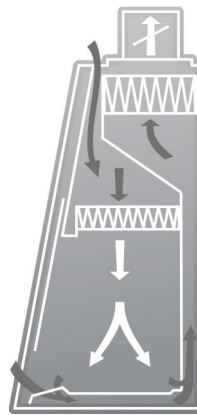
Optional ULPA filters may be used to replace the standard HEPA filters in the Thermo Fisher Scientific Biosafety Cabinets. ULPA filters have the same properties as described above except they are rated at least 99.999% efficient in removing particles 0.1-0.2 or 0.2-0.3 micron.

## Laminar Airflow

Laminar airflow is defined as the movement of a body of air in a single direction, with a uniform velocity. In practice, the laminar downflow of air in the cabinet captures any aerosol generated in the work area of the cabinet, and directs it to the HEPA filters. In order to be true laminar downflow, a number of individual downflow velocity test points (The Downflow Velocity Profile) must be +/- 16 feet per minute (0.08 m/s) of the average of all the test points. This is illustrated in **Figure 10**.

## Motor/Blower

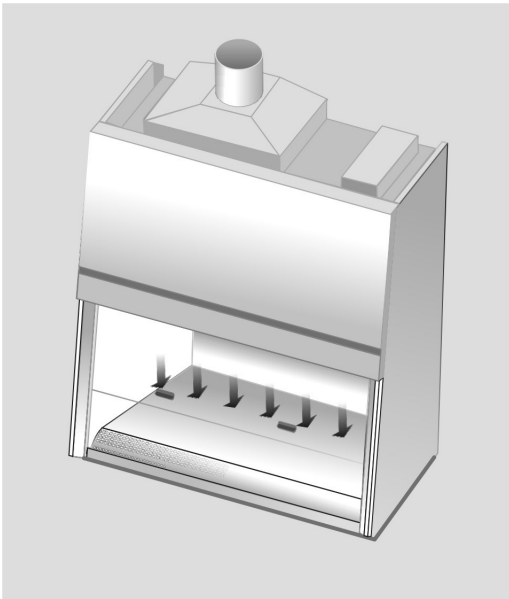
The supply motor/blower assembly pulls room air into the top of the cabinet, and circulates it internally as downflow. The downflow air is split into two separate streams. One path flows into the front intake grille, where it joins the inflow air, as the inflow air and front portion of the downflow pass under the work surface toward the rear of the cabinet. The other downflow path flows to the rear intake grille. As the rear portion of the downflow passes through the rear intake grille, it joins the mixed inflow and front portion of the downflow and all of the inflow and all of the downflow passes up inside the rear wall as shown in **Figure 12**. The combined inflow and downflow is drawn through the exhaust filter, through the external exhaust duct and out of the building. The downflow motor in the cabinet is an electronically commutated motor (ECM). The ECM is a brushless DC motor that includes its own power supply to convert the incoming alternating current to direct current, as well as its own microprocessor to control and measure the motor's operation. The motor utilizes SmartFlow to deliver a consistent volume of downflow air, throughout the life of the cabinet.



**Figure 12. Motor/Blower Assembly**

## Airflow Sensor

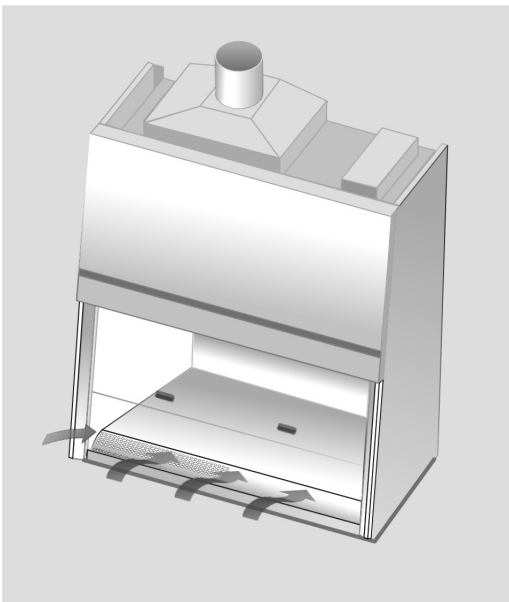
An airflow sensor, located above the Exhaust HEPA filter, constantly monitors the flow of exhaust air out of the cabinet. If the exhaust falls below a safe level, the control board turns off the cabinet blower, and sounds an audible and visual alarm. This prevents the escape of hazardous material from the front of the cabinet, in the event of an exhaust system failure. The airflow sensor reading is shown on the display as Inflow in feet per minute (FPM) or meters per second (M/S).



**Figure 10. Laminar Airflow**

## Directional Airflow

Directional airflow also plays a key role in Biosafety Cabinet performance. Air is drawn into the front of the cabinet at the front grille. This “curtain” of air makes it more difficult for aerosols to escape out of the work area of the cabinet and into the outside environment. This airflow is often calculated and referred to as the **Inflow Volume** or **Average Inflow Velocity**. This is illustrated in **Figure 11**.



**Figure 11. Directional Airflow**

# Cabinet Grilles, Ductwork and Air Balance Controls

The location, size, and pattern of the grilles at the front and rear of the work area affect cabinet containment and performance.

**Note:** Do not block or obstruct the grilles of the Biosafety Cabinet.

The supply intake of the Biosafety Cabinet conveys the air to the downflow blower and then from the blower through the work area as downflow. The positive pressure rigid downflow plenum of the Biosafety Cabinet is designed to deliver a more uniform airflow, optimizing filter loading and operational life.

## Ultraviolet (UV) Lamp

The optional UV lamp generates a primary wavelength of light of 254 nm. A secondary emission is in the visible (blue) wavelength, resulting in the characteristic blue color while operating. UV light at this wavelength is biocidal, primarily by creating thymine dimers in DNA. These dimers prevent the correct transcription of the DNA into RNA, resulting in cellular death or viral inactivation. In order to be effective, the UV light must directly strike the nucleic acid, and its effectiveness can be diminished or negated by dissolved proteins or metals, or by other UV-opaque substances protecting the target nucleic acid.

Because of its limitations, UV light should be used as an adjunct to good surface disinfection practices. In order to get optimum performance from the UV light, it should be replaced after 6,000 hours of operation or less, and the exterior surface of the lamp should be kept clean and free of dust.

**Note:** The Biosafety Cabinet records the number of hours of operation of the UV light. You can program in the number of hours (in 100-hour increments) it will operate before a replacement message is displayed.

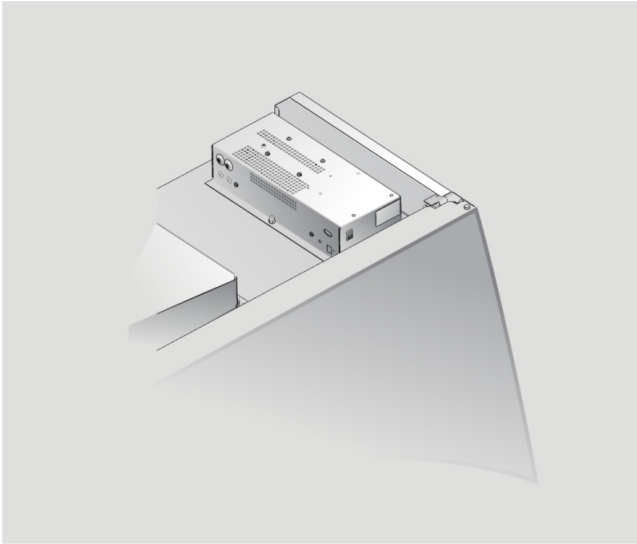
**Note:** UV irradiation is absorbed by the tempered safety glass of the sash. Independent research has shown that the level of UV irradiation on the outside of the cabinet's sash is equal to background radiation levels.

**Note:** The UV sensitivity of a target organism varies, depending on the UV output of the lamp, the genus and species of the organism, the medium the agent is suspended in, etc. Contact the Health and Safety Officer at your facility for UV light use and recommendations.

# Using the Cabinet

## System Reset Switch

The Biosafety Cabinet has a system reset switch for resetting its microprocessors. The switch is located on the front of the electronics module, on top of the cabinet, as shown in **Figure 13**. Ensure that the switch is in the “ON” (up) position before attempting to operate the cabinet.



**Figure 13. System reset switch**

## Information Center

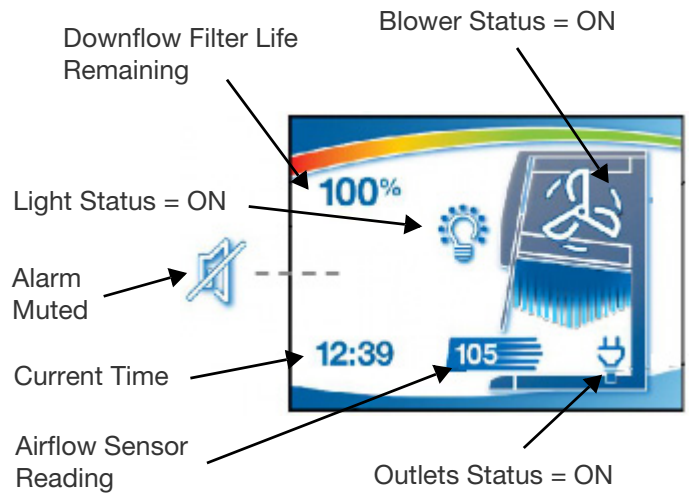
The Information Center is an LCD display located on the right side wall at eye level. When the blower is started, the “Blower Starting” screen will be displayed, as shown in **Figure 14**. After approximately 30 seconds, the display will switch to normal operation.

The display provides a clock, the remaining downflow filter life, the cabinet’s current status, and inflow velocity, as shown in **Figure 14**. In the event of an alarm, the Information Center will immediately display a context sensitive message indicating the cause of the alarm, and possible solutions, as shown in **Figure 16**.

The display will enter sleep mode, turning itself off, five minutes after the blower is turned off.



**Figure 14. Blower Starting**



Blower Status = Reduced Speed  
(NightSmart Enabled)



Light Status = UV Light ON

27 → UV Countdown Timer (minutes)

**Figure 15. Clock, Filter Life and Cabinet's current status**

# Alarm Screens

## Power Loss Alarm

The cabinet has lost power. If sash is open after power restored (**Figure 16**), close the sash. Once sash is closed (**Figure 16**) press **[OK]** on the Keypad to acknowledge that a power loss occurred.



Figure 16. Power loss alarm

## Sash Height Alarm

The sash is not in the proper operating height. Return sash to proper working height.



Figure 17. Sash height alarm

## Airflow Alert

The airflow patterns in the cabinet have changed, resulting in a sudden change in the motor speed. This is most likely due to a blockage of the grille or the exhaust filter outlet. It may also be caused by removal of the work surface while the cabinet is in operation. Remove or replace objects as necessary.



Figure 18. Airflow

## Blower Failure Alarm

Either the motor has failed, or the motor and display circuit board are not communicating properly.



**CAUTION:** Do not use the cabinet until the problem has been corrected.

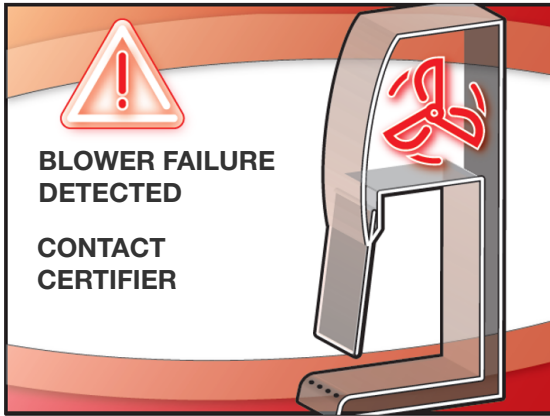


Figure 19. Blower failure alarm

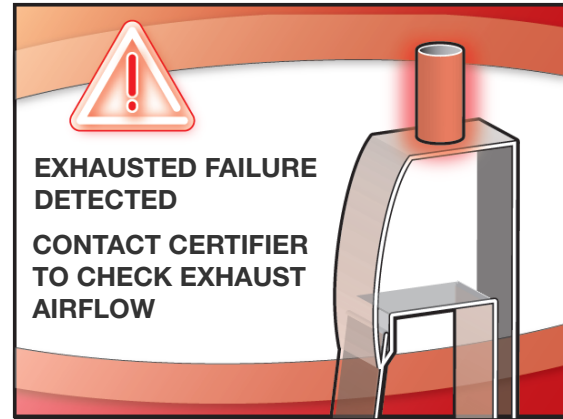


Figure 21. Exhaust alarm

## Exhaust Airflow Check

If there is insufficient exhaust system airflow for a proper startup, this alarm will be displayed for 30 seconds to allow the exhaust system to begin operation. If there is insufficient airflow after 30 seconds, the exhaust alarm will be activated.

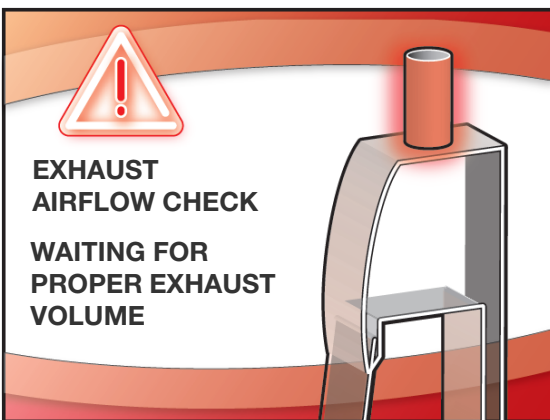


Figure 20. Exhaust airflow check

## Exhaust Alarm

If there is insufficient exhaust system airflow, this alarm will be displayed. If this alarm is displayed, the cabinet blower will need to be turned off, and then back on again to reset the alarm.

## Operating the Sliding Sash

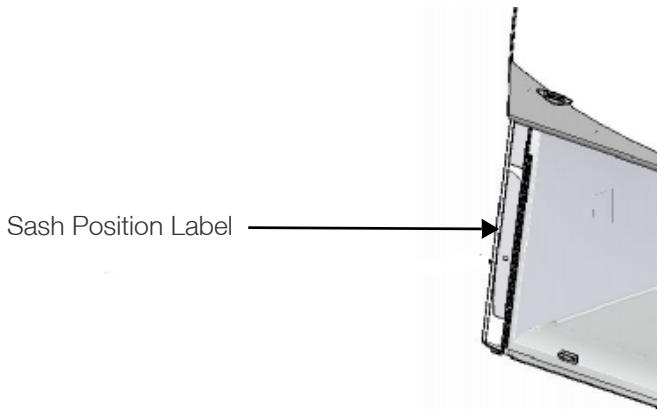
The counterbalanced, anti-racking sash mechanism requires only a few pounds of force to move the sash up or down. You can open or close the sash smoothly with one or two hands positioned on either handle.

The sash position alarm and safety interlock system senses the sash position and acts appropriately. The cabinet has been programmed to operate at an 8" (203 mm) sash opening, depending on the model. Raising the sash above or below its operating height will activate the audible and visual alarms. The audible alarm can be temporarily muted for approximately five minutes by pressing the **[OK/MUTE]** button on the Keypad. Moving the sash back to its operating position will reset the alarm. The safety interlock system senses when the sash is closed and allows the optional ultraviolet (UV) lamp to operate only when the sash is closed, to protect the operator from irradiation.

## Starting the Biosafety Cabinet

1. To start the Biosafety Cabinet, raise the sash until its bottom edge aligns with the sash position label on the left corner post. The decal is shown in **Figure 22**.
2. Press **[BLOWER]** on the Keypad (see Fig. 5-6 on the following page) to start the cabinet. The unit will display a standby screen for approximately 30 seconds to allow the cabinet to reach proper operating conditions. If the alarm sounds, recheck the sash position. If the sash is too high or low, the sash audible alarm and the LCD display will indicate the sash is in an incorrect position.
3. To turn the UV light on, the sash must be completely closed to prevent the escape of any UV radiation. Press **[UV LIGHT]** on the Keypad to activate the UV light.

**Note:** The sash must be completely closed for the UV light to activate.



**Figure 22. Sash position label**

## Using the Cabinet Keypad

The keypad of the cabinet is shown in **Figure 23**. Take a moment to familiarize yourself with the buttons, their locations and functions. Also familiarize yourself with the display located on the right side wall. The display will report system functions, such as filter capacity, timer displays, alarm or error messages, as well as icons that illuminate when cabinet functions such as the light and blower are operational.

**[BLOWER]** – Starts or stops the cabinet blower. When the blower is in automatic (SmartStart) mode, opening the sash from the closed position turns the blower on automatically. When the sash is reopened, the blower resumes normal operation. Pressing the blower button at any time overrides the automatic operation.

**[LIGHT]** – Turns the LED lamps on or off. Closing the sash automatically turns the lights off. When the lights are in automatic (SmartStart) mode, raising the sash turns the lights on automatically. Pressing the light button at any time overrides the automatic operation.

**[OUTLETS]** – Turns on/off electrical outlets in the work area.

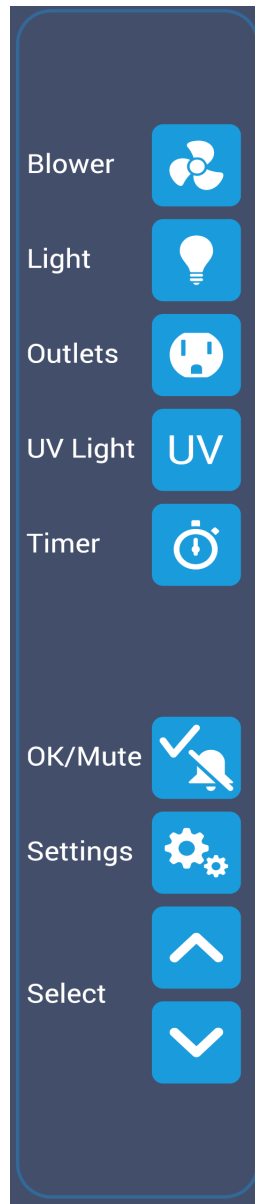
**[UV LIGHT]** – Turns on/off the UV lamp (when installed). When the UV lamp is in automatic mode, closing the sash turns the UV light on automatically. When the sash is raised, the UV light turns off automatically.

**[TIMER]** – Allows you to select either a repeating interval timer, or an elapsed timer (stopwatch).

**[OK/MUTE]** – Mutes all audible alarms for approximately 5 minutes, unless there is a system error alarm. When in any Menu, this button is used to select an option.

**[MENU]** – From the Home Screen, this button accesses the Main Menu. When in any menu screen, pressing this button returns you to the previous menu level.

**[UP] and [DOWN]** – Moves between selectable options or change numerical fields in menu screens.



**Figure 23. Biosafety Cabinet keyboard**

## Navigating the Biosafety Cabinet Menu Screens

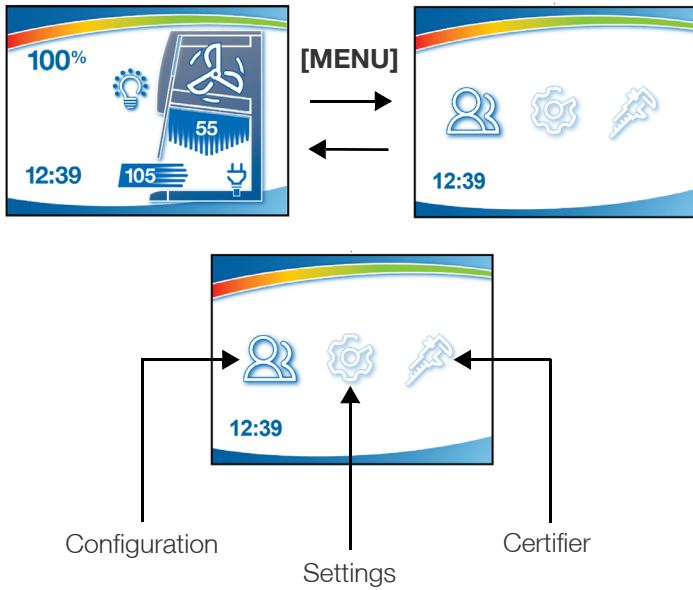
Keypad button presses are shown as **[blue with brackets]**. Menu screen selections are shown as **green italics**.

**Note:** Pressing the appropriate keypad button will override Automatic Operation mode functions (such as SmartStart).

To access the main menu, press the **[MENU]** button. The display panel will change to the main menu. To select from the various menu options press the **[UP]** or **[DOWN]** buttons



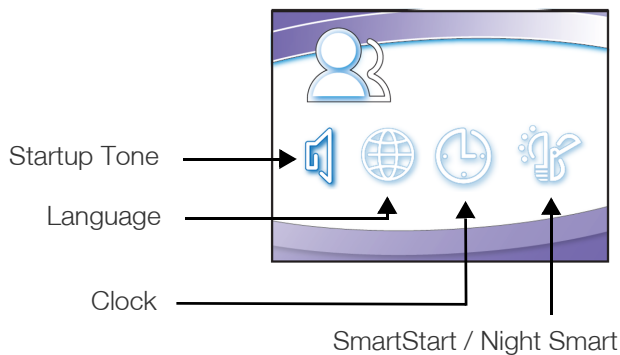
until the selected option is highlighted. Press **[OK/MUTE]** to accept that option, or press **[MENU]** to return to the previous menu level.



**Figure 24. Menu screens**

## Navigating the Configuration Submenu

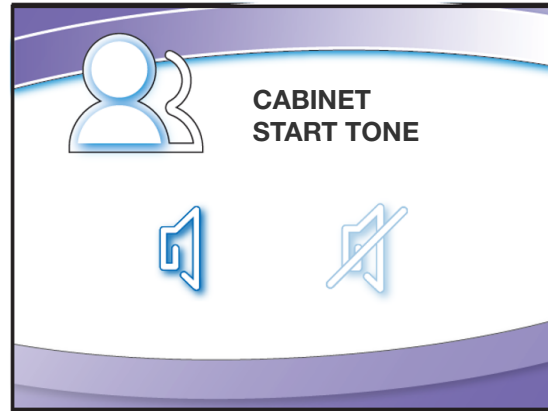
This submenu allows you to activate the cabinet startup tone, set the language, set the clock, and configures how the unit operates when the sash is opened or closed.



**Figure 25. Configuration submenu**

## Activating a Startup Tone

When enabled, an audible beep will sound during the first 30 seconds of blower operation to caution the user that the unit is not yet ready for use.

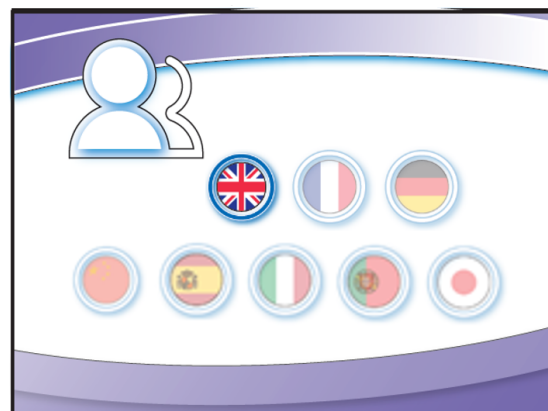


**Figure 26. Startup tone**

## Selecting a Language

**[UP]** and **[DOWN]** will move among the selectable language options. When the desired language is highlighted, press **[OK/MUTE]**. Language options:

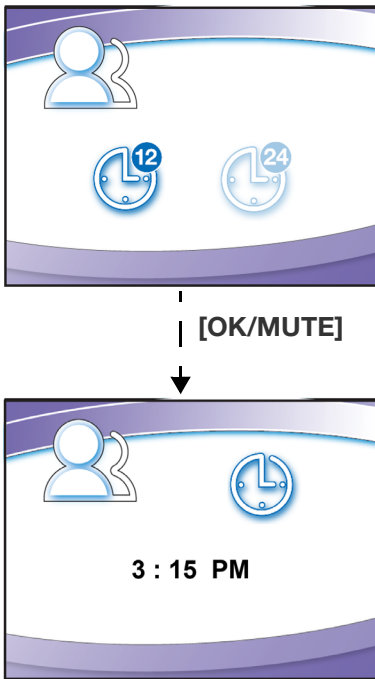
- |                |                   |
|----------------|-------------------|
| <b>English</b> | <b>Spanish</b>    |
| <b>French</b>  | <b>Italian</b>    |
| <b>German</b>  | <b>Portuguese</b> |
| <b>Chinese</b> | <b>Japanese</b>   |



**Figure 27. Language selection**

# Setting the Clock

Select either **12 Hour** (AM/PM) format or **24 Hour** format.



**Figure 28. Setting the clock**

The selected field (**Hours or Minutes**) will flash, set the current time using **[UP]** and **[DOWN]**. Hours will flash first, once correct, use **[OK/MUTE]** to switch to Minutes.

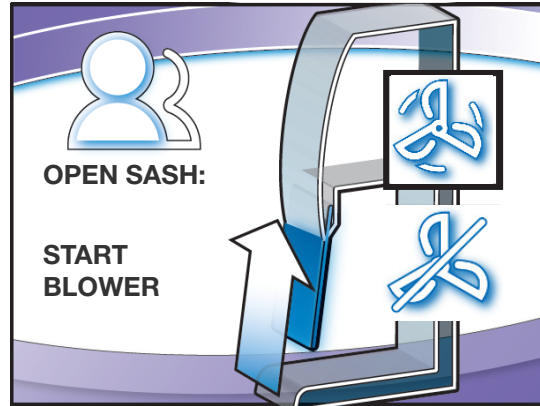
**Note:** AM or PM will not show if **24 Hour** format selected.

# Setting Automatic Operation Options

The cabinet allows you to configure it to activate functions automatically when the sash is opened or closed.

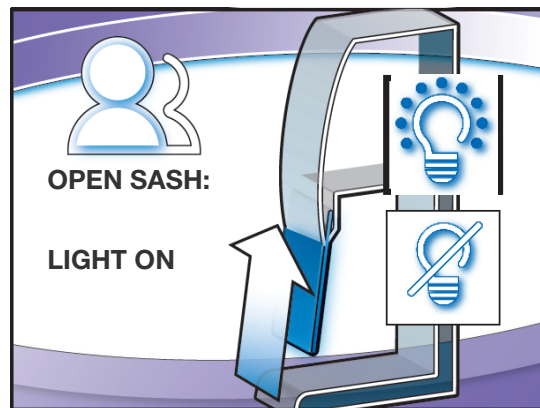
The first screen gives you the option of activating the blower; if you want the cabinet blower to start every time you raise the sash, select **Blower ON**, and then **[OK/Mute]**. If **Blower OFF** is selected, the blower must be manually started from

the keypad. When **[OK/Mute]** is pressed, the next configuration screen will appear.



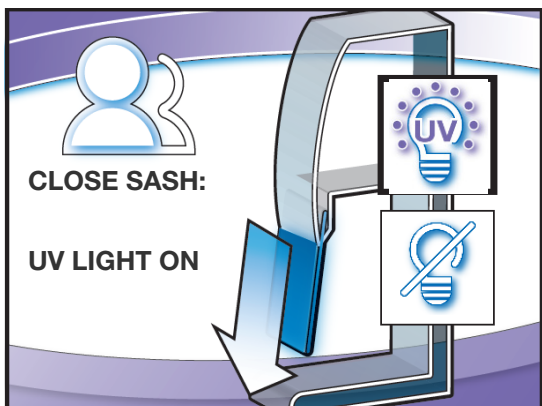
**Figure 29. Activating the cabinet blower**

If you want the cabinet lights to turn on every time you raise the sash, select **Light ON**, and then **[OK/Mute]**. If **Light OFF** is selected, the lights must be manually turned on from the keypad. When **[OK/Mute]** is pressed, the next configuration screen will appear if your cabinet is configured for a UV lamp.



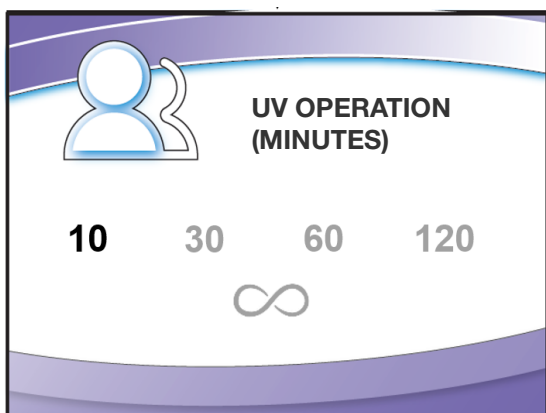
**Figure 30. Cabinet light setting**

If your Cabinet is configured for a UV light, you will see **Figure 30** and **Figure 31**. If you want the UV lamp to turn **ON** every time the sash is closed, select **UV Light ON**, and press **[OK/Mute]**. If **UV Light OFF** is selected, the UV light will not turn on when the sash is closed. When **[OK/Mute]** is pressed, the final configuration screen will appear.



**Figure 31. Cabinet UV light setting**

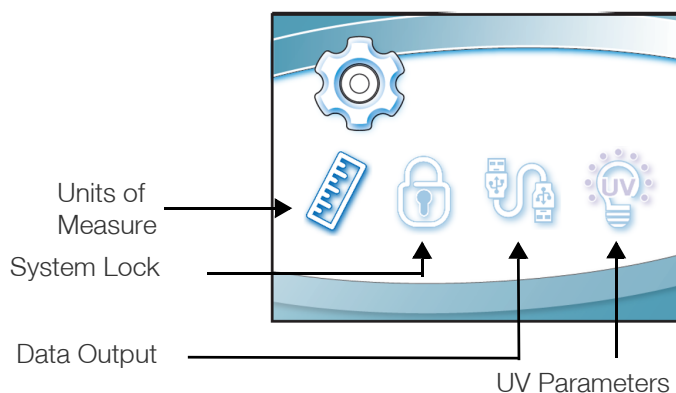
Whether the UV Light is initiated from the **[UV Light]** button on the keypad, or automatically initiated upon closing of the sash, this screen controls the time the UV lamp will remain on. Select the length of time desired, press **[OK/Mute]**.



**Figure 32. UV Operation**

## Navigating the Settings Submenu

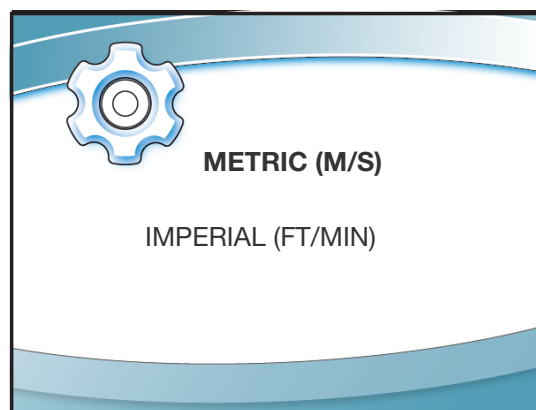
This submenu allows you to select: Units of Measure, System Lock, Data Output, or UV Parameters.



**Figure 33. Submenu settings**

## Selecting the Units of Measure

If your cabinet is equipped with an airflow sensor, the units of measure can be set for FT/MIN (feet per minute) or M/S (meters per second). Select the appropriate units of measure, then **[OK/Mute]**.



**Figure 34. Units of measure**

## Activating the Security Lock

The Security Lock “locks” the keypad to prevent unauthorized use of the cabinet. To enable / disable select Protected / Unprotected, then **[OK/MUTE]**. When enabled, the keypad is locked immediately after the blower is turned off. The security lock is deactivated by holding **[DOWN]** for three seconds. If blower is not turned on within 5 minutes of unlocking, the

keypad will relock. The feature remains enabled until it is disabled in this screen.



Figure 35. Security lock

## Setting the USB Output Rate

This menu option selects the rate that cabinet status data is exported out of the mini USB port on the side of the top electrical box. Data can output at a rate of once per second, once per 10 seconds, once per 30 seconds, or once per 60 seconds. Make the appropriate selection, then [OK/MUTE].

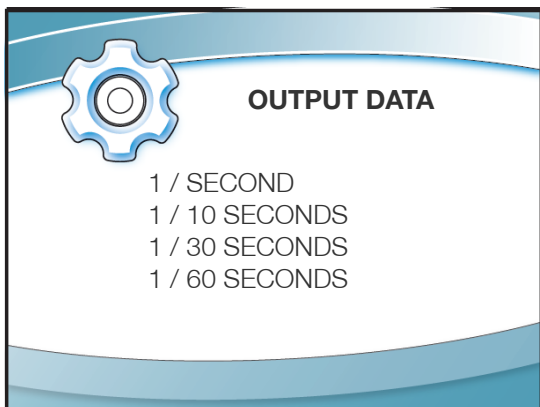


Figure 36. USB Output data

## Navigating UV Parameters

For models equipped with the optional UV light, the cabinet has an integral UV light maintenance system. It allows you to monitor how many hours the lamp has been on, to reset the UV lamp hour meter, and to define how many hours you want the UV lamp to operate before receiving a reminder to replace it.

This screen displays the hours of UV lamp operation (Runtime), and how many hours remain (Remaining) until you

receive a warning to replace the lamp. To reset the Runtime hour meter to zero (after replacing the UV lamp), select Reset, then [OK/MUTE]. The hour text will begin to flash, if you entered this condition by mistake, press [MENU]. If you want to reset the hour meter, hold [OK/MUTE] for 3 seconds.

To change the desired UV lamp lifetime, select Lifetime as seen in Figure 37, then [OK/MUTE]. The screen shown in Figure 37 will display. To change the UV lamp lifetime (number of operating hours before receiving the warning), change the Hour field accordingly using [UP] or [DOWN], then [OK/MUTE].

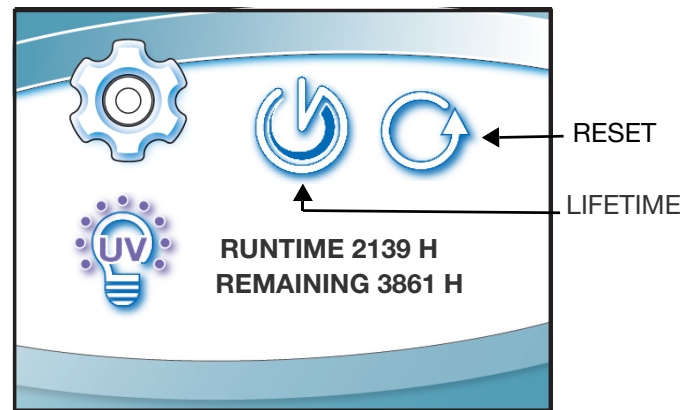


Figure 37. UV Lamp parameters

For most UV lamps, the output of UV light decreases at a constant rate. Typically, after 6,000 hours of operation the lamp's output intensity will reduce to 80% of when it was new. This option allows you to set operational life of the UV lamp, in 100 hours increments. 6,000 hours is the default.

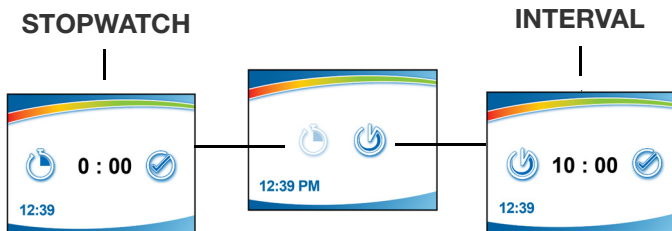
## The Certifier Submenu

This submenu is reserved for use by certifiers, during certification or service procedures. It is password protected for safety.

# Timer Operation

The timer button allows activation of an interval (countdown) or elapsed (stopwatch) timer. The timers cannot be operated simultaneously.

To access the timer menu, press **[Timer]** anytime during normal operation (from the Home Screen). The main timer menu is displayed **Figure 38**. Select Interval or Stopwatch Timer, then **[OK/MUTE]**.



**Figure 38. Timer menu**

## Interval Timer Operation

1. The interval timer defaults to 05:00 (minutes:seconds).
2. Press **[UP]** or **[DOWN]** to increase or decrease the timer interval.
3. When the proper interval is selected, press **[OK/Mute]** to start the timer.
4. When the timer reaches 00:00, an audible alarm will sound, and the timer will reset itself and repeat the countdown.
5. Press **[OK/Mute]** to pause the timer. Press **[OK/Mute]** while paused, and the timer will reset to the previously selected interval.
6. Press **[Menu]** to clear the interval timer and return to the main timer menu.

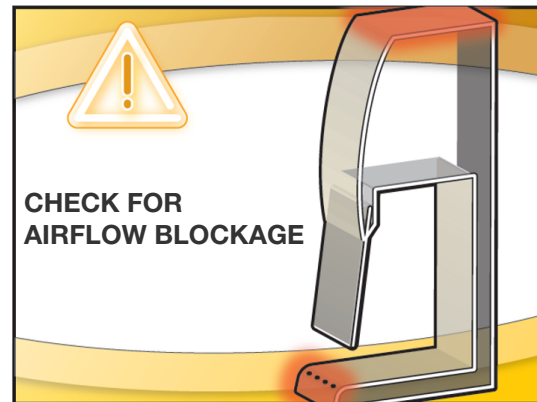
## Stopwatch Timer Operation

1. The stopwatch timer defaults to 00:00.
2. Press **[OK/Mute]** to start the timer.
3. Press **[OK/Mute]** again to pause the timer. Press **[OK/Mute]** while paused, and the timer will reset to 00:00.
4. Press **[Menu]** to return to the main timer menu.

## If An Airflow Alert Activates

The most common causes of an Airflow Alert are:

- Blockage of the inlet grilles or exhaust outlet
- Removal of the work surface or grille during operation



**Figure 39. Airflow Alert**

## Resetting the Airflow Alert System

The Airflow Alert automatically resets to normal operation once the motor speed has stabilized.

## Working In the Biosafety Cabinet

A more thorough review of using the BSC can be found in: Biosafety in Microbiological and Biomedical Laboratories (BMBL), Published by the Centers for Disease Control and Prevention ([www.cdc.gov/biosafety/publications](http://www.cdc.gov/biosafety/publications)).

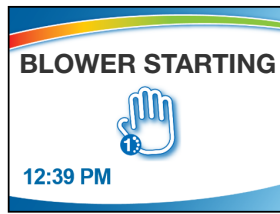
### Planning

- Thoroughly understand procedures and equipment required before beginning work
- Arrange for minimal disruptions, such as room traffic or entry into the room while the cabinet is in use

### Start-up

- Turn off UV light (if included on your cabinet)
- Slowly raise the sash until the bottom of the sash aligns with the sash indicator decal located on the left side of the work area (**Figure 22**)
- Turn on the light and cabinet blower if the automatic features have not been enabled
- Check the air grilles for obstructions

- Allow the cabinet to operate until the Home Screen is shown



Warm up Screen



Home Screen

#### Figure 40. Start-up

- Wash hands and arms thoroughly with germicidal soap
- Wear appropriate personnel protective equipment (PPE)

#### Wipe-Down

- Raise the sash to its full open position (approximately 21.75" or 552 mm). Mute the alarm by pressing **[OK/MUTE]**
- Wipe down the interior surfaces of the cabinet with 70% ethanol, or a suitable disinfectant, and allowed to dry

#### Loading Materials and Equipment

- Only load the materials required for the procedure. Do not overload the cabinet
- Do not obstruct the front, side, or rear return air grilles
- Large objects should not be placed close together
- Slowly close the sash until it is in the correct operating position
- After loading the cabinet, wait two to three minutes to purge airborne contaminants from the work area

#### Work Techniques

- Keep all materials at least 4" (100 mm) inside from the sash, and perform all contaminated operations as far to the rear of the work area as possible
- Segregate all clean and contaminated materials in the work area
- Arrange materials to minimize the movement of contaminated materials into clean areas
- Keep all discarded contaminated material to the rear of the work area
- Avoid moving materials or the operator's hands and arms through the front access opening during use
- Avoid the use of an open flame. Use disposable labware or an electric incinerator as alternatives
- Use proper aseptic technique
- Avoid using techniques or procedures that disrupt the airflow patterns of the cabinet

- If there is a spill or splatter during use, all objects in the cabinet should be surface decontaminated before removal. Thoroughly disinfect the working area of the cabinet WHILE IT IS STILL IN OPERATION, to prevent the release of contaminants from the cabinet

#### Final Purging

- Upon completion of work, the cabinet should be allowed to operate for two to three minutes undisturbed, to purge airborne contaminants from the work area

#### Unloading Materials and Equipment

- Objects in contact with contaminated material should be surface decontaminated before removal from the cabinet
- All open trays or containers should be covered before being removed from the cabinet

#### Wipe-Down

- Wipe down the interior surfaces of the cabinet with a suitable disinfectant, or 70% ethanol, and allow to dry
- Periodically lift the work surface and wipe down the area beneath it
- Inspect and clean the towel catch located at the rear of the work area, beneath the work pan
- Dispose of rubber gloves appropriately, and have lab coat laundered properly
- Wash hands and arms thoroughly with germicidal soap

#### Shutdown

- Lower the sash to turn off the LED light and cabinet blower and activate the UV light if appropriate

# Maintaining the Cabinet

The common service operations necessary to maintain the Biosafety Cabinet for peak performance are listed below.

This manual covers operation and maintenance operations for the owners/users of the Class II Type B2 Biosafety Cabinets. Complete certification procedures, service operations and specifications are published in a separate publication Technical Manual. This manual is available from Thermo Fisher Scientific's website: [www.thermofisher.com](http://www.thermofisher.com).



**CAUTION:** Do not contact blower wheel while still in motion.

**Table 3. Suggested Maintenance Schedule**

Activity	Weekly	Monthly	Annually
Disinfect interior surfaces (with suitable chemical disinfectant)	✓	✓	✓
Wipe down interior surfaces after contact time elapsed with 70% alcohol solution	✓	✓	✓
Clean sash glass and UV lamp with suitable glass cleaner	✓	✓	✓
Operate cabinet blower, noting Filter Life percentage in log	✓	✓	✓
Using 70% alcohol solution, wipe down cabinet exterior		✓	✓
Disinfect and lift work surface. Surface disinfect the area beneath with suitable chemical disinfectant		✓	✓
Wipe down area beneath work surface after contact time elapsed with 70% alcohol solution		✓	✓
Check all service valves (if equipped) for proper operation		✓	✓
Check the UV Lamp Hourmeter, noting in log		✓	✓
Have the cabinet re-certified by a qualified technician			✓

## Service Operations

### Work Surface Removal:

**Note:** The work surface must be thoroughly decontaminated before removing it from the cabinet.

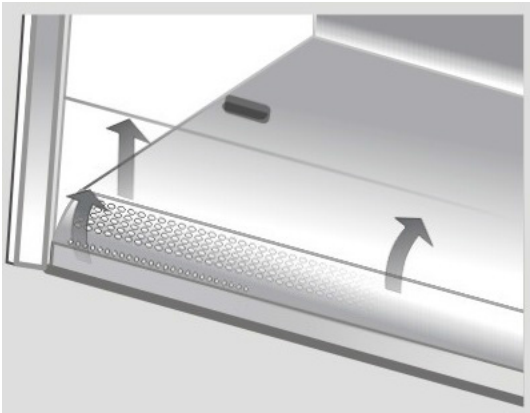
1. Lift the front edge of the work surface straight up by grasping the knob handles at either front corner.

2. Pull the work surface straight out, letting its rear edge rest on the center support underneath.
3. Reinstall the work surface by resting the bottom on the center rail while pushing it back into the cabinet. Be sure to engage the tabs on the back corners of the work surface with the slots on the rear wall of the work area.

### Front Grille Removal:

**Note:** The grille must be thoroughly decontaminated before removing it.

1. Remove the work surface as described earlier.
2. At one end of the grille, grip the front of grille with one hand, and the back with the other hand. Pivot that end of the grille upward and inward, paralleling the angle of the sash, as shown in **Figure 41**.
3. Pull the other end of the grille up and away from the bottom edge of the cabinet.
4. Reinstall the grille by reversing the above sequence, ensuring that the grille properly engages the bottom edge of the cabinet.



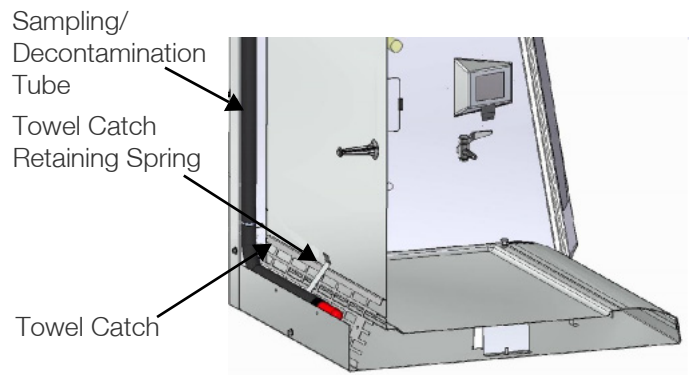
**Figure 41. Front Grille Removal**

## Towel Catch Removal:

Although not normally required, the towel catch can be removed for cleaning, inspection, etc.

**Note:** The work surface of the cabinet and the towel catch must be thoroughly decontaminated before removing either.

1. Remove the work surface as described above.
2. Remove the towel catch by pivoting the bottom out toward you, as shown in **Figure 42**; it is spring loaded, and you will feel some resistance. Note the orientation of the towel catch.
3. Surface decontaminate the towel catch before removing it.
4. Reinstall the towel catch by sliding it back into position, in the correct orientation. Also ensure that the Sampling/Decontamination Tube (the black tube with an orange cap) rests behind the towel catch, allowing the catch to contact the rear wall of the cabinet.



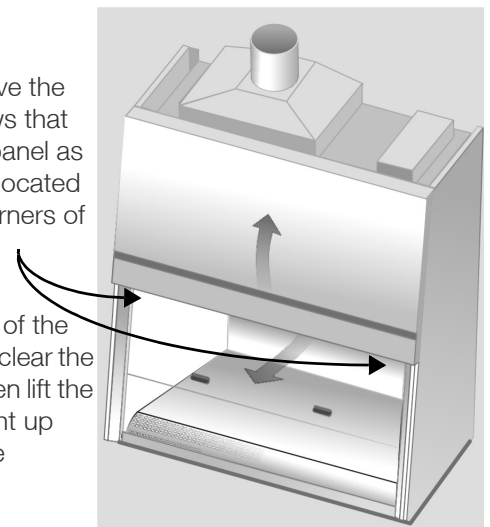
**Figure 42. Towel Catch Removal**

**Note:** Upper and lower towel catch flanges point to the front of the cabinet, and the bottom of the towel catch rests against the back wall.

## Front Panel Removal and Installation:

Locate and remove the two Phillips screws that secure the front panel as shown. They are located on the bottom corners of the dress panel.

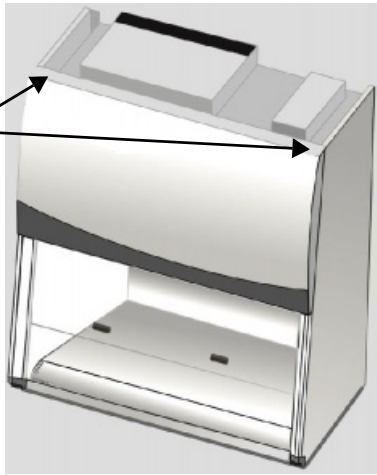
Swing the bottom of the dress panel out to clear the LED lamps and then lift the dress panel straight up and away from the cabinet.



**Figure 43. Front panel removal**



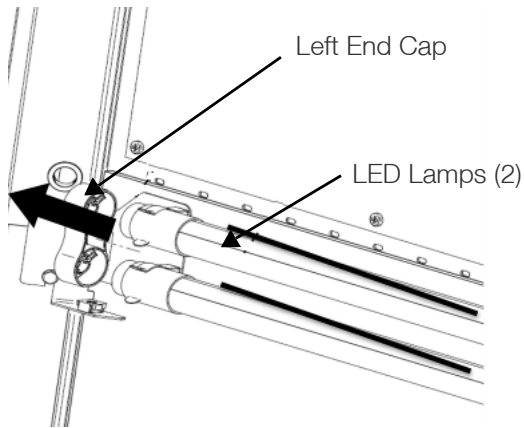
To reinstall the panel, reverse these steps, ensuring that the plastic pin in the top corners of the dress panel properly engage the corner posts.



**Figure 44. Front panel installation**

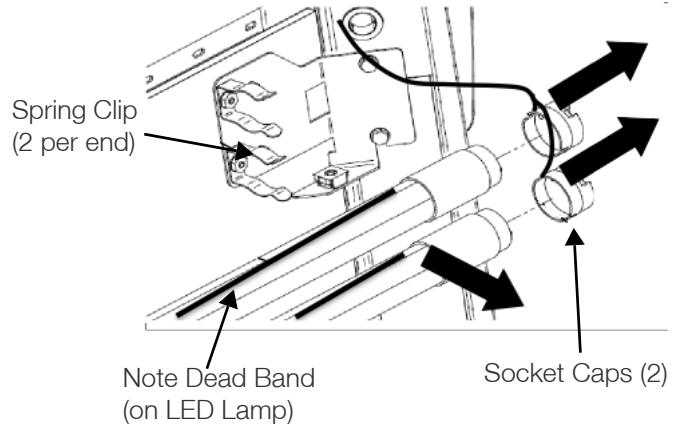
## Changing the LED Lamps:

1. Unplug the cabinet or turn off the System Reset Switch located on the top of the cabinet.
2. Remove the front dress panel as noted in **Figure 43**.
3. Locate the Left End Cap that aligns both LED lamps (**Figure 45**), remove the Left End Cap by pulling it away from the lamp ends.



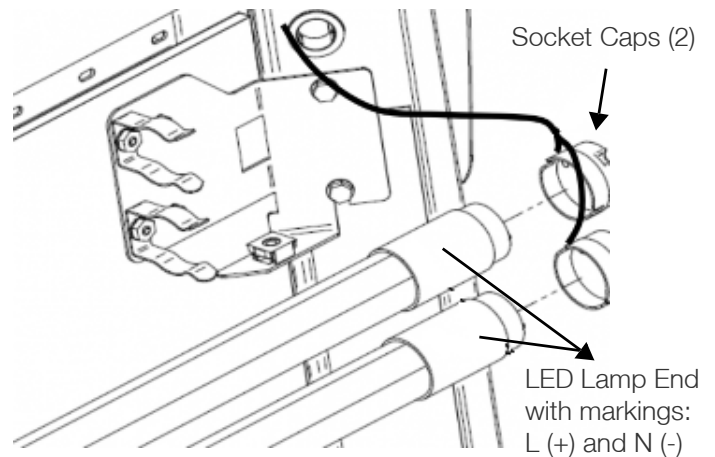
**Figure 45. Changing the LED Lamps**

4. Remove both Socket Caps (on the right end of each LED lamp) by pulling each Socket Cap straight off the right end of the lamp one at a time (**Figure 46**).



**Figure 46. Removing Socket Caps**

5. Pull each LED Lamp straight toward you to release the lamp from the two Spring Clips holding it in place (**Figure 46**). Note the rotational position of the old LED lamps (there is a dead band stripe that will need to be oriented the same when reinstalling the new LED Lamps).
6. Install the new LED Lamps by reversing the removal procedure. Take care to look at both ends of the new LED Lamps. One end is labeled with a '+' and '-' and 'L' and 'N' (**Figure 47**). This end of the new LED Lamp must go to the right, and is inserted into the Socket Cap.



**Figure 47. Installing the new LED Lamps**

7. When reinstalling the Left End Cap, the pins on each LED Lamp must align rotationally with the Left End Cap. This ensures the dead band stripe is positioned correctly for maximum cabinet lighting.

# Changing the Optional UV Lamp:

**Note:** For optimum performance, the UV lamp should be changed on an annual basis, or as indicated by the UV lamp hour meter.

**The UV lamp and the work area of the cabinet must be thoroughly decontaminated before removing the lamp.**

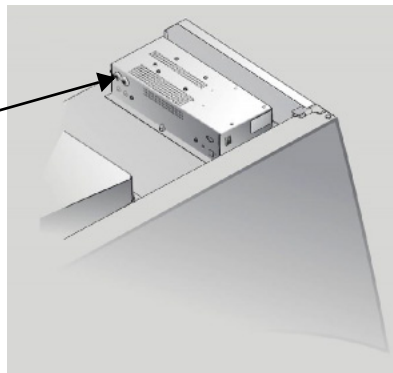
1. Start the cabinet's blower and let it operate for 5 minutes.
2. Raise the sash to its full open position.
3. Thoroughly surface decontaminate the UV lamp and the work area of the cabinet.
4. Unplug the cabinet or turn off the System Reset Switch, located on the top of the cabinet.
5. Remove the UV lamp by rotating it 90 degrees and lifting it straight up and out of its sockets.
6. Install new lamp by reversing the removal procedure.

4. Ensure that the cabinet will not be moved or disturbed while being stored.

# Resetting a Circuit Breaker:

To reset any of the circuit breakers located on the left side of the electronics module, depress the white button until it sets.

Circuit Breakers - The front breaker protects the electrical outlets, the rear breaker protects the motor and lights.



**Figure 48. Resetting a Circuit Breaker**

# Storage

If the cabinet is to be left unused for more than one month, it should be prepared for storage.

**Note:** The cabinet should not be stored in areas of excess humidity or temperature extremes. If the cabinet is moved during storage, it must be recertified before use.

1. Close the sash completely and seal the bottom edge with plastic sheeting.
2. Seal the exhaust outlet with plastic sheeting.
3. Unplug the cabinet.

# Troubleshooting

Refer to the following table if the Biosafety Cabinet fails to operate properly. If the suggested corrective actions do not solve the problem, contact Thermo Fisher Scientific for additional assistance.

**Table 4. Troubleshooting**

<b>PROBLEM</b>	<b>CAUSE</b>	<b>CORRECTIVE ACTION</b>
<b>Cabinet blower and lights will not start</b>	Unit not plugged into outlet	Plug the Biosafety Cabinet into appropriate electrical service
		Check connection to control box on top of cabinet
	System Reset Switch is Off	Turn on the System Reset Switch
	Circuit breaker(s) tripped	Reset circuit breakers
	Keypad disconnected or defective	Run keypad diagnostics and check connections
<b>Blower will not start</b>	Sash closed	Raise sash
	Keypad disconnected or defective	Run keypad diagnostics and check connections
	Blower wiring is disconnected	Inspect blower wiring.
	Blower motor is defective	Replace blower motor
<b>Light not working</b>	Sash is closed	Open sash – Lights will not work with the sash closed
	Lamp(s) are defective	Replace defective lamp(s)
	Lamp wiring is disconnected	Inspect lamp wiring
	Keypad disconnected or defective	Run keypad diagnostics and check connections
<b>Light is dim or flickering</b>	Fluorescent Lamps installed by mistake	Install LED Lamps
	Lamp(s) are defective	Replace defective lamp(s)
	Lamp wiring is disconnected	Inspect lamp wiring
<b>UV light not working</b>	Sash is open	Close sash – UV light will not work with the sash open
	Lamp is defective	Replace defective lamp
	Lamp wiring is disconnected	Inspect lamp wiring
	Defective lamp ballast	Replace lamp ballast
	Keypad disconnected or defective	Run keypad diagnostics and check connections

**Table 4. Troubleshooting**

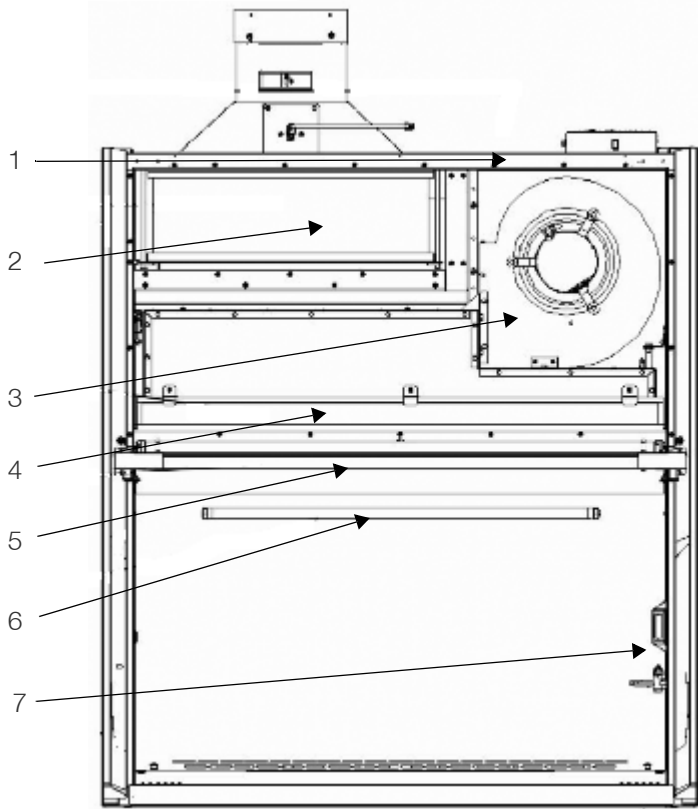
<b>PROBLEM</b>	<b>CAUSE</b>	<b>CORRECTIVE ACTION</b>
<b>UV light is dim or flickering</b>	Lamp is defective or is at end of operating lifetime	Replace defective or worn out lamp
	Lamp wiring is disconnected	Inspect lamp wiring
	Defective lamp ballast	Replace lamp ballast
<b>Airflow Alert goes off and/or there is a slight decrease in filter life remaining gauge</b>	HEPA filter loading	The gauge reading steadily decreases as the cabinet is used. A very slow decrease (over months) is normal
	Blockage of the supply air intake	Check supply air intake and supply prefilter to ensure that they are not blocked or restricted
	Blockage of the exhaust outlet	Ensure that the exhaust outlet is not blocked or restricted
<b>Exhaust Airflow Check goes off and alarm sounds 30 seconds after the blower is started</b>	Blockage or restriction under the work surface	Ensure that the towel catch and plenum beneath the work surface are unobstructed
	Roof blower is off	Ensure that roof blower is working
	Exhaust damper is improperly set	Ensure that the exhaust damper is properly set by a qualified certifier
<b>Contamination of work in the cabinet</b>	Remote blower is improperly sized	Confirm that the roof mounted blower meets the volume and pressure requirements of the cabinet
	Mechanical failure of the exhaust system	Inspect the exhaust system
	Obstruction in the exhaust system	Inspect the exhaust system
	Leak or additional 'load' on the exhaust system	Inspect the exhaust system
	Loading of the exhaust HEPA filter	Replace the Exhaust HEPA filter
	Airflow Sensor out of calibration	Have qualified certifier recertify airflows and recalibrate the sensor
	<b>Contamination of work in the cabinet</b>	Improper technique or procedure for the Biosafety Cabinet
Restriction of the return air slots or grille – blockage of the exhaust outlet		Ensure that all return air slots, grilles and the exhaust outlet are unobstructed
External factors are disrupting the cabinet airflow patterns or acting as a source of contamination		Refer to <b>Working In the Biosafety Cabinet</b> section of this manual
Cabinet is out of adjustment / HEPA filter(s) are defective		Have cabinet recertified. If HEPA filters are defective or damaged, replace them

# Appendix A: Components

Illustration **Figure 49** indicates the location of the following service parts, and replacement accessory parts:

**Table 5. Biosafety Cabinet Replacement Parts**

Item	Quantity	Part No.	Description
1	1	3850500	Prefilter for 4-foot models
1A	1	3850501	Prefilter for 6-foot models
2	1	3838501	Exhaust HEPA Filter 4-ft (s/n less than 1304-)
2A	1	3838503	Exhaust HEPA Filter 6-ft (s/n less than 1304-)
2B	1	3438501	Exhaust HEPA Filter 4-ft (s/n 1304- and higher)
2C	1	3438503	Exhaust HEPA Filter 6-ft (s/n 1304- and higher)
3	1	1327208	Motor / Blower Assy, 4 Ft. TE (s/n less than 1304-)
3A	1	1327201	Motor / Blower Assy, 6 Ft. TE (s/n less than 1304-)
3B	1	1327209	Motor / Blower Assy, 4 Ft. TE (s/n 1304- and higher)
3C	1	1327204	Motor / Blower Assy, 6 Ft. TE (s/n 1304- and higher)
4	1	3838401	Supply HEPA Filter 4-ft
4A	1	3838403	Supply HEPA Filter 6-ft
5	2	1297504	Lamp, LED, 4-ft Model
5A	2	1297506	Lamp, LED, 6-ft Model
6	1	1271300	Lamp, UV (models with UV light only)
7	2	1287900	Receptacle Cover



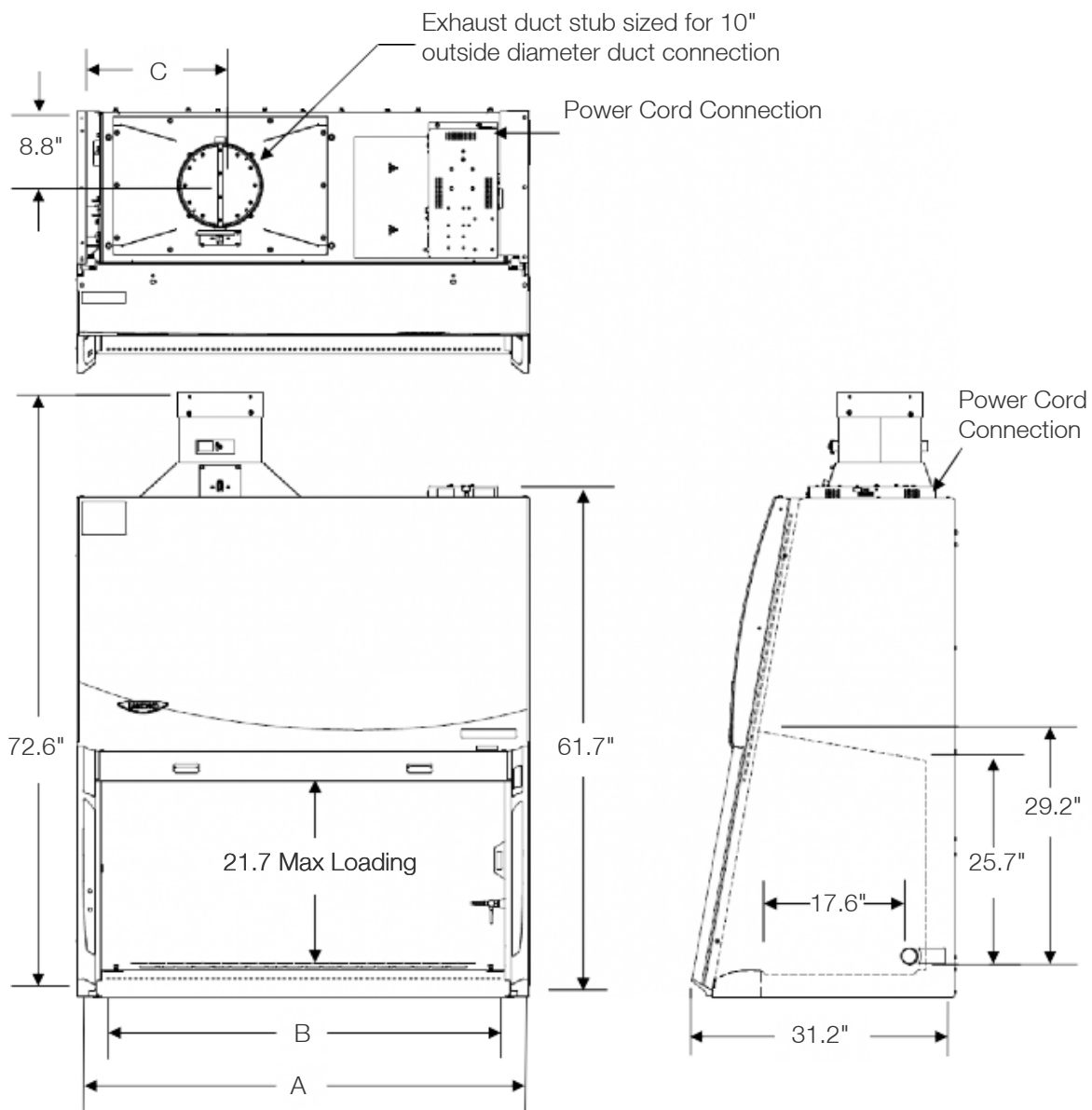
**Figure 49. Location of the service parts**

# Appendix B: Dimensions

All dimensions are shown in inches.

**Table 6. Biosafety Cabinet Dimensions**

Width	A	B	C
4	54.3	48.5	17.2
6	78.3	72.5	28.9



**Figure 50. Dimensions of the Biosafety Cabinet**

# Appendix C: Specifications

**Table 7. Motor Specifications**

Cabinet Model	Electrical Requirements
All Cabinets, all Voltages	½ H.P. Electronically Commutated Motor (ECM) 120-277 V AC – 50/60 Hz, Full Torque – 42 Oz.-Ft (3.56 N-M) 7.7 Full Load Amps @115 V AC 4.3 Full Load Amps @230 V AC Automatic Thermal Protection

## Environmental Conditions

- Indoor use only
- Ambient temperature range: 41 °F to 104 °F (5 °C to 40 °C)
- Maximum relative humidity: 80% for temperatures up to 88 °F (31 °C), decreasing linearly to 50% relative humidity at 104 °F (40 °C)
- Main supply voltage fluctuations not to exceed ±10% of the nominal voltage
- Transient over voltages according to Installation Categories II (Over voltage Categories per IEC 1010). Temporary voltage spikes on the AC input line that may be as high as 1500 V for 115 V models and 2500 V for 230 V models are allowed
- Used in an environment of Pollution degrees 2 (i.e., where normally only non-conductive atmospheres are present). Occasionally, however, a temporary conductivity caused by condensation must be expected, in accordance with IEC 664



# Appendix D: Accessories

**Note:** Accessories marked with an asterisk (\*) require a qualified certifier to install and/or calibrate before use.

## Telescoping Base Stands

The user sets the height of these stands before installation. The height can be set from 27.5" to 33.5" in 1" intervals, providing a cabinet work surface height of 30" to 36".

**Table 8. Telescoping Base Stands**

Catalog#	For use with	Base Stand and w/Feet#
1510, 1511, 1515, 1516, 1517, 1518	4-foot Thermo 1500 Series B2 BSC	3730402
1560, 1561, 1562, 1563, 1564, 1565	6-foot Thermo 1500 Series B2 BSC	3730602

### \*Seismic Bracket Kit (# 3857001)

Stainless steel brackets and attaching hardware to secure Telescoping Base Stands in areas of seismic activity (does not include fasteners to attach to floor).

### \*Service Valve Kit (# 3747502)

Includes serrated hose tip ball valve with quarter turn handle, hardware and instructions for plumbing to services mounts on left or right side interior. All cabinets are factory prepared to accept up to 4 fixtures. Shipping weight 4 lbs. (2 kg).

### \*Ultraviolet Lamp Kits (field-installed)

Includes a 254 nm UV lamp and ballast.

**Table 9. UV Lamp Kit**

Catalog#	For use with	Shipping Weight
3858510	All 115 V AC models	5 lbs. (2.3 kg)
3858512	All 230 V AC models	5 lbs. (2.3 kg)

## IV Bar Kits

Bar supports intravenous solution bottles and bags. Kits include IV bar, mounting hardware, and four hangers.

**Table 10. Bar kit**

<b>Catalog#</b>	<b>For use with</b>	<b>Shipping Weight</b>
3858611	4-foot Thermo 1500 Series B2 BSC	4 lbs. ( 1.8 kg)
3858613	6-foot Thermo 1500 Series B2 BSC	6 lbs. (2.7 kg)

## \*Backdraft Damper (# 3858800)

The backdraft damper mounts in a vertical run of duct to prevent the reverse pressurization of the exhaust system. Sized for 10" diameter ductwork. Shipping weight 5.0 lbs. (2.3 kg).

## \*ULPA Supply Filters

Rated at 99.999% efficiency with particles 0.12 microns.

**Table 11. ULPA filters**

<b>Catalog#</b>	<b>For use with</b>
3859501	All 4-foot Thermo 1500 Series B2 BSC
3859503	All 6-foot Thermo 1500 Series B2 BSC

# Appendix E: Quick Chart

Table 12. QuickChart – 1500 Series Type B2

Model (Series)	Part Numbers	
	1510, 1511, 1515, 1516, 1517, 1518	1560, 1561, 1562, 1563, 1564, 1564
Cabinet Size (in feet)	4	6
Sash Opening (inches)	8"	8"
Starting Serial #	1905_	1905_
<b>Downflow Data</b>		
Nominal Avg. Downflow (FPM)	55+/-5	55+/-5
Grid # of points (rows x columns)	24 (3x8)	36 (3x12)
Grid distance from back & sides	6"	6"
Distance between rows	5.75"	5.75"
Distance between columns	5.21"	5.50"
<b>Inflow Data</b>		
Nominal Average Inflow (FPM)	105+/-5	105+/-5
Sash Open Area (Sq. Ft)	2.69	4.03
Nominal Inflow Vol. (CFM)	283	423
Inflow Vol. Range (CFM)	269-296	403-443
<b>Secondary Inflow Data</b>		
# of Test points	8	12
Test point location (see notes)	*	*
Avg. Inflow Vel. Range (FPM)	269-296	220-242
Correction Factor (CF)	1	1.83
Corrected Inflow Volume (CFM) (Avg. velocity x CF)	269-296	403-443
Sash Open Area (Sq. Ft)	2.69	4.03
Inflow Velocity Range	100-110	100-110
<b>Supply HEPA Leak Test Data</b>		
Air Displacement (CFM)	445	665
Laskin Nozzles needed	1	1
Theoretical aerosol conc. (ug/l) <sup>1</sup>	30	20
Actual aerosol conc. (ug/l) <sup>2</sup>	15	12

**Table 12. QuickChart – 1500 Series Type B2**

Model (Series)	Part Numbers	
	1510, 1511, 1515, 1516, 1517, 1518	1560, 1561, 1562, 1563, 1564, 1564
<b>Exhaust HEPA Leak Test Data</b>		
Air Displacement (CFM)	723	1083
Laskin Nozzles needed	2	2
Theoretical aerosol conc. (ug/l) <sup>1</sup>	38	25
Actual aerosol conc. (ug/l) <sup>2</sup>	21	17
<b>Exhaust Data</b>		
DIM Exhaust Volume (CFM) <sup>3</sup>	723	1083
Traverse Exhaust Volume (CFM) <sup>4</sup>	852	1265
Differential Pressure (in. H <sub>2</sub> O) <sup>5</sup>	1.8	2.2
<b>Exhaust (Inflow) Alarm Data</b>		
Alarm Setpoint (CFM Inflow)	210 +/- 5	315 +/- 5
<b>Supply HEPA Data</b>		
Thermo P/N	3838401	3838403
Width x Depth x Height (in.) <sup>6</sup>	48" x 18" x 3.06"	72" x 18" x 3.06"
Performance (CFM)	445	665
Performance (Pressure in. H <sub>2</sub> O)	.5+/- .1	.38-.5
<b>Exhaust HEPA Data</b>		
Thermo P/N	3438501	3438503
Width x Depth x Height (in.) <sup>6</sup>	26" x 18" x 8.08"	48" x 18" x 8.08"
Performance (CFM)	720	1100
Performance (Pressure in. H <sub>2</sub> O)	.48+/- .07	.37+/- .07
<b>Motor/Blower Data</b>		
Thermo P/N <sup>7</sup>	3331104	3331105
Motor HP	½	½
<b>LED Lamp Data (2 each)<sup>8</sup></b>		
Thermo P/N	1297505	1297506
Color (°K)	4000	4000
Lumens	1850	3200
Glass Type	Frosted	Frosted

### 1500 Model Identification

- The first two digits of the serial number are the year of production; the next two are the month. The next 5 digits are the sequence of production, and the letter following the serial number is the revision level of the cabinet.

### Downflow Test Specifications

- All models are classified as uniform downflow.
- All tests performed as described in NSF/ANSI Standard 49:2016.
- UV Lamp, IV bar and all other accessories must be removed before measuring downflow.

### Inflow Test Specifications

- All tests performed as described in NSF/ANSI Standard 49:2016.

### Secondary Inflow Test Specifications

- Must use Thermo Scientific holder P/N 3836405 to perform this test properly.

\* - Locate the single row of holes at the front of the grille. Mark the 6th hole from the side wall and subsequent test points every 9 holes until the number of test points marked equals the width of the cabinet in feet (3-foot cabinet, mark the first 3 points). Repeat for the opposite side.

### HEPA Filter Leak Test Specifications

1. Based on mineral oil.
  2. The actual aerosol concentration is what was observed during testing.
- Aerosol generator should be placed in the left rear corner of the work area, pointing at the rear grille.
  - For uncontaminated units, the upstream concentration can be sampled from the tube located under the work surface.

### Exhaust Data

3. Total Exhaust Volume. Cabinet air intake sealed shut and cabinet blower off.
4. Measured as per ASHRAE methodology for measuring air volume in round ducts.
5. Measured at the exhaust transition sampling point, relative to atmosphere.

### Supply and Exhaust HEPA Filter Specifications

6. Without gasket

### Motor / Blower Specifications

7. Each motor must be programmed by Thermo Scientific for the appropriate width cabinet. The speed control settings will fluctuate depending on local temperature and pressure.

### LED Lamp Specifications

8. This product uses direct drive T8 Led lamps instead of fluorescent lamps. There is no ballast; line voltage is supplied to the lamp sockets.



**CAUTION:** Do not install fluorescent lamps, for replacement of led lamps, contact the product service department.

### UV lamp Specifications

- For all models, the UV lamp number is G30T8. The Thermo Scientific part number is 1271300.
- For all 115 / 230 V AC models, the ballast assembly is Thermo Scientific part number 3829901. The ballast is Robertson part number PSM2GPH18MWW.
- For all 100 V AC models, the ballast assembly is Thermo Scientific part number 3830600. The ballast is Robertson part number RSO1GPH30100.

# Evaluation and Restriction of Chemicals - Regulations and Directives

## WEEE Compliance

**WEEE Compliance.** This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol. Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them.

### Great Britain



**WEEE Konformität.** Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2012/19/EU erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet. Thermo Fisher Scientific hat Vereinbarungen getroffen mit Verwertungs-/Entsorgungsanlagen in allen EU-Mitgliedstaaten und dieses Produkt muss durch diese Firmen wiederverwertet oder entsorgt werden.

### Deutschland



**Conformità WEEE.** Questo prodotto deve rispondere alla direttiva dell'Unione Europea 2012/19/EU in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). È marcato col seguente simbolo. Thermo Fisher Scientific ha stipulato contratti con una o diverse società di riciclaggio/smaltimento in ognuno degli Stati Membri Europei. Questo prodotto verrà smaltito o riciclato tramite queste medesime.

### Italia



**Conformité WEEE.** Ce produit doit être conforme à la directive euro-péenne (2012/19/EU) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant. Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci.

### France



## IF YOU NEED ASSISTANCE:

Direct	1-740-373-4763
Toll Free, U.S. and Canada	1-800-438-4851
FAX	1-877-213-8051
Internet Worldwide Web Home Page	<a href="http://www.thermofisher.com">http://www.thermofisher.com</a>
Tech Support Email Address	<a href="mailto:service.led.marietta@thermofisher.com">service.led.marietta@thermofisher.com</a>
Certified Service Web Page	<a href="http://www.unitylabservices.com">www.unitylabservices.com</a>

Our Sales Support staff can provide information on pricing and give you quotations. We can take your order and provide delivery information on major equipment items or make arrangements to have your local sales representative contact you. Our products are listed on the Internet and we can be contacted through our Internet home page.

Our Service Support staff can supply technical information about proper setup, operation or troubleshooting of your equipment. We can fill your needs for spare or replacement parts or provide you with on-site service. We can also provide you with a quotation on our Extended Warranty for your Thermo Scientific products.

Whatever Thermo Scientific products you need or use, we will be happy to discuss your applications. If you are experiencing technical problems, working together, we will help you locate the problem and, chances are, correct it yourself...over the telephone without a service call.

When more extensive service is necessary, we will assist you with direct factory trained technicians or a qualified service organization for on-the-spot repair. If your service need is covered by the warranty, we will arrange for the unit to be repaired at our expense and to your satisfaction.

Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 6:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

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Find out more at [thermofisher.com/BSC](http://thermofisher.com/BSC)

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