

1300 Series A2

Class II, Type A2 Biological Safety Cabinet

Operating Manual 7011355 Rev. 7



Dear User,

Congratulations on your purchase of a Thermo Scientific 1300 Series Class II, Type A2 bio-safety cabinet. Your 1300 Series A2 bio-safety 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 1300 Series A2 most effectively and safely.

The 1300 Series 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, please contact the Thermo Scientific technical support group at the phone numbers listed on Page iv, or your local distributor.

This manual covers the models shown below:

| | | |
|-------|------|------|
| 1355 | 4 ft | 120V |
| 1356 | 4 ft | 230V |
| 1357 | 6 ft | 120V |
| 1358 | 6 ft | 230V |
| 1385* | 4 ft | 120V |
| 1386* | 4 ft | 230V |
| 1387* | 6 ft | 120V |
| 1388* | 6 ft | 230V |

* Includes cabinet, 30 inch fixed-height stand, UV light and armrest.

MANUAL NUMBER 7011355

| | | | | |
|------------|----------------|-------------|---|-----------|
| 7 | 24886/HD-1528 | 9/5/08 | Added Certification Testing from service manual | CCS |
| 6 | 24783/HD-1528 | 7/15/08 | Added warranty | CCS |
| 5 | 24741/HD-1550 | 6/17/08 | Added universal piping access points (pg 2-7) | CCS |
| 4 | 24680 | 6/3/08 | Corrected model numbers in Specifications | CCS |
| 3 | 24386/HD-1527 | 5/29/08 | Updated valve artwork from Broen to Water Saver (Page 2-6) | CCS |
| 2 | 24608/HD-1548 | 5/1/08 | Clarified artwork and instructions for unit/stand assembly | CCS |
| 1 | 24300/HD-1527 | 11/7/07 | Updated electrical ratings, changed format, added transition and valve info | CCS |
| 0 | -- | 9/10/07 | Original (50111618) | CCS |
| REV | ECR/ECN | DATE | DESCRIPTION | By |



Important Read this instruction manual. Failure to read, understand and follow the instructions in this manual may 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. ▲

Material in this manual is for information purposes only. The contents and the product it describes are subject to change without notice. Thermo Scientific makes no representations or warranties with respect to this manual. In no event shall Thermo Scientific be held liable for any damages, direct or incidental, arising out of or related to the use of this manual.

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Important operating and/or maintenance instructions. Read the accompanying text carefully.



Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.



Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.



Hot surface(s) present which may cause burns to unprotected skin, or to materials which may be damaged by elevated temperatures.



Marking of electrical and electronic equipment, which applies to electrical and electronic equipment falling under the Directive 2002/96/EC (WEEE) and the equipment that has been put on the market after 13 August 2005.



This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the WEEE symbol. Thermo Scientific has contracted with one or more recycling/disposal companies in each EU Member State European Country, and this product should be disposed of or recycled through them. Further information on Thermo Scientific's compliance with this directive, the recyclers in your country and information on Thermo Scientific products will be available at www.thermo.com.

- ✓ Always use the proper protective equipment (clothing, gloves, goggles, etc.)
- ✓ Always dissipate extreme cold or heat and wear protective clothing.
- ✓ Always follow good hygiene practices.
- ✓ Each individual is responsible for his or her own safety.

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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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Section 1 Description

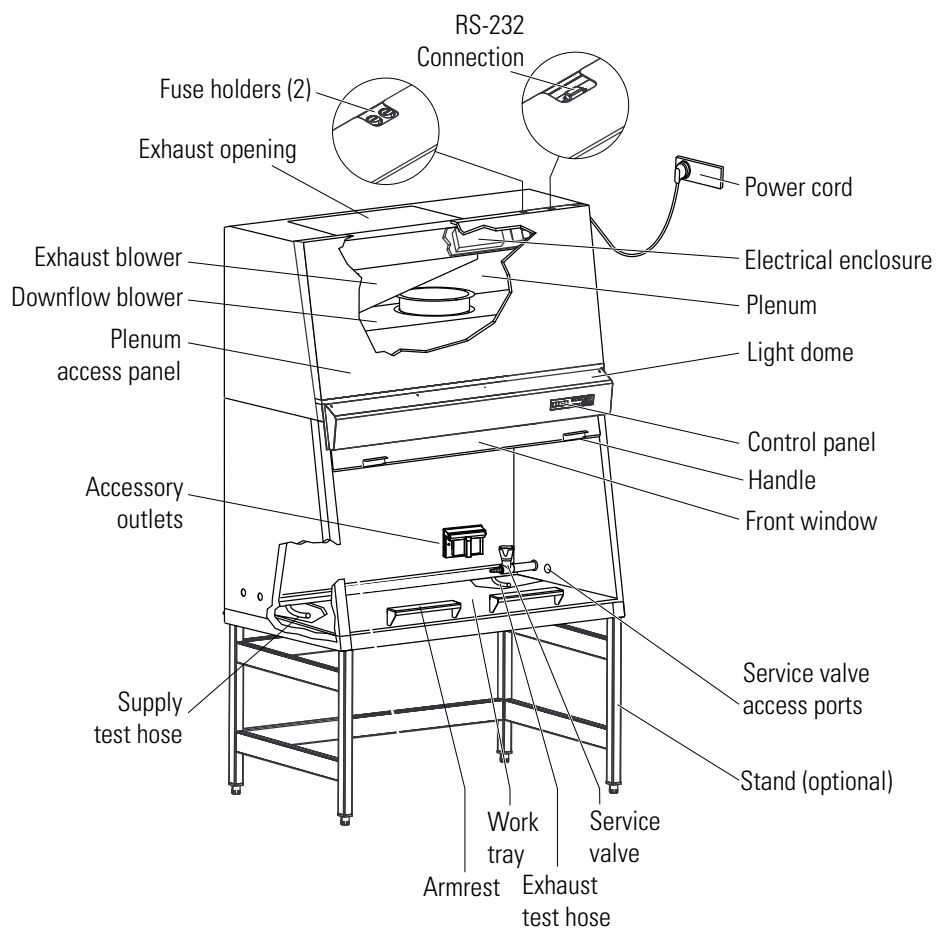


Figure 1-1. Unit Components

The plenum assembly consists of a plenum for the downflow blower and a plenum for the exhaust air blower. Each blower includes a filter. The exhaust air is discharged through an opening in the top of the cabinet.

Chamber lighting includes one fluorescent bulb for 4 foot models and two for 6 foot models.

The optional, factory-installed UV light is installed in the ceiling at the front of the sample chamber.

Two service valve access ports are located on each side panel. When installing service valves, remove the center of the port plugs at the perforations.

The optional stand may be ordered in three configurations; a fixed 30” working height, a manually adjustable 30” to 38” working height, and a fixed 34” working height with attached casters.

A stainless steel one-piece work surface is standard. Optional armrests ensure a comfortable working position for the user and minimize blockage of airflow at the front grille.

Internal outlets, provided as the power source for accessories, are provided standard in the following configuration:

1355, 1385: one duplex right side

1357, 1387: two duplex left and right side

1356, 1386: one single right side

1358, 1388: two single right and left side

Test hoses (aerosol challenge ports) are located under the work tray. The supply plenum hose is located on the left and the exhaust plenum hose on the right.

Note Do not remove the caps of the two test hoses to check for supply and exhaust airflow. ▲

Safety Systems

Negative pressure air system

A negative pressure air system combines with HEPA filters in the supply and exhaust airflow for personal and product protection.

Personnel protection

Inflow air along the entire working opening at a constant high velocity prevents leakage from the work opening of the chamber.

Exterior air pressure being higher than the internal air pressure creates negative pressure, ensuring containment in case of cabinet leakage.

Product protection

Steady airflow within the air system ensures constant downflow, allowing the HEPA filters to remove contaminants so that the samples are always surrounded by ultra-pure air. Harmful particles are not carried over the sample chamber (protection from cross-contamination).

HEPA filters

The downflow air within the chamber and the exhaust air are cleaned by HEPA filters.

Safety Systems (continued)

Safety lockout

To protect from UV radiation, the optional UV light will not turn on if the front window is open. While the UV light is on, the front window is closed and locked. The closed window blocks out the UV rays.

Airflow monitoring

Airflow monitoring determines the velocity of the airflow in the sample chamber as well as the inflow velocity of air through the exhaust opening. As soon as airflow velocities rise above or fall below a specified safety value, an audible and a visual alarm is activated.

Window position monitoring

The position sensors detect the size of the front window opening and indicate whether the window is open to the specified work position, closed (energy saving) or in an unsafe intermediate position.

Thermo Performance Factor

The Thermo Performance Factor (PER) is a value that indicates the safety status of the cabinet. This value is calculated from data determined by HEPA filter loading, airflow status and values captured during certification. This data is entered into a parameter list of the control software and interconnected. The result is indicated on the display by LEDs.

On certification by qualified personnel with a new HEPA filter, the performance factor of the unit is indicated by green-green LEDs. As the unit ages with use, the colors change. Red-red is unacceptable and the unit should not be used. Any questions as to the safety of the unit should be resolved before use.

HEPA Filters

The filter system consists of two HEPA filters for downflow (supply) and exhaust air.

Room air is drawn into the sample chamber through the work position window opening. The room air is drawn into the negative pressure drain pan air duct, then pulled into the air plenum in the top portion of the cabinet.

The room air is mixed with recirculating HEPA filtered air from the chamber, and filtered proportionally by the downflow and exhaust filters. The filtered air is then supplied as ultra-pure air into the sample chamber of the unit, and exhausted as ultra-pure air into the room environment, or into an external exhaust system via an exhaust transition.

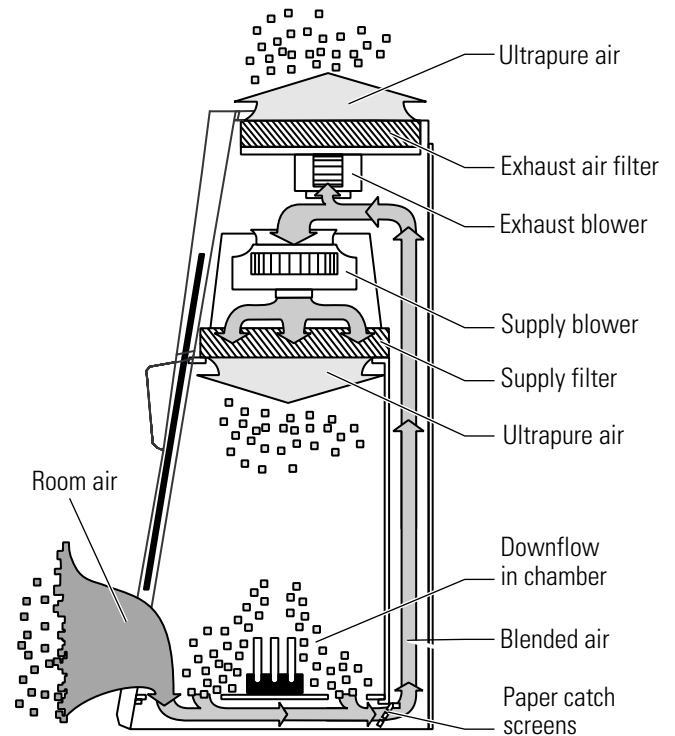


Figure 1-2. Airflow Filtering System

Paper Catch Grids

Sectional paper catch grids are installed beneath the work tray in the air duct between the inner and outer back wall of the unit. These grids prevent large items such as paper towels and tissues from entering the plenum where they may impair the function of the blowers or the filters. The grids can be easily removed for cleaning.

Control Panel

The control panel is located on the front of the cabinet and consists of keys, status indicators and a numerical display.

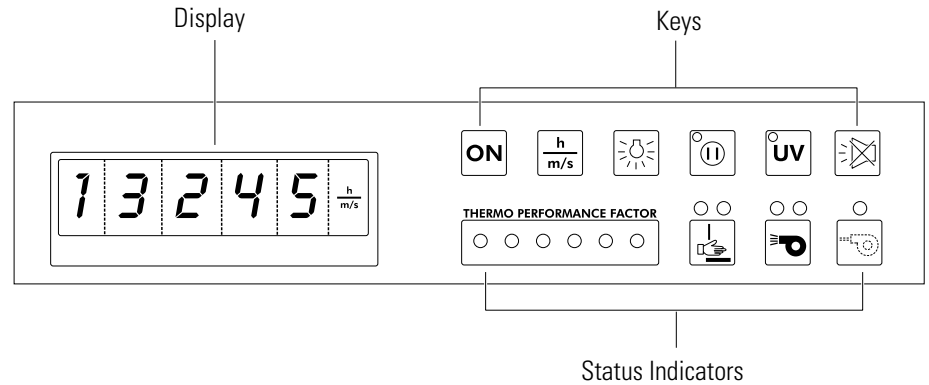


Figure 1-3. Control Panel

The display with its 5-digit panel shows the following information, regardless of the activated operating function:

- operating hours of the device
- downflow and inflow air velocities
- remaining time of the UV disinfection routine

The keys turn functions on or off.

Status indicators show:

- window work position
- airflow
- reduced blower speed
- Thermo Performance Factor

Use of the Window

The sample chamber is accessible through various positions of the front window. The working position of the window is a 10 inch opening. For loading the chamber, the window opens fully. For decontamination and energy saving, the window can be fully closed, during which time the blower speed is reduced.

Note The working and loading window positions are indicated on the user interface, as controlled by micro switches and displayed by status indicators on the control panel. ▲

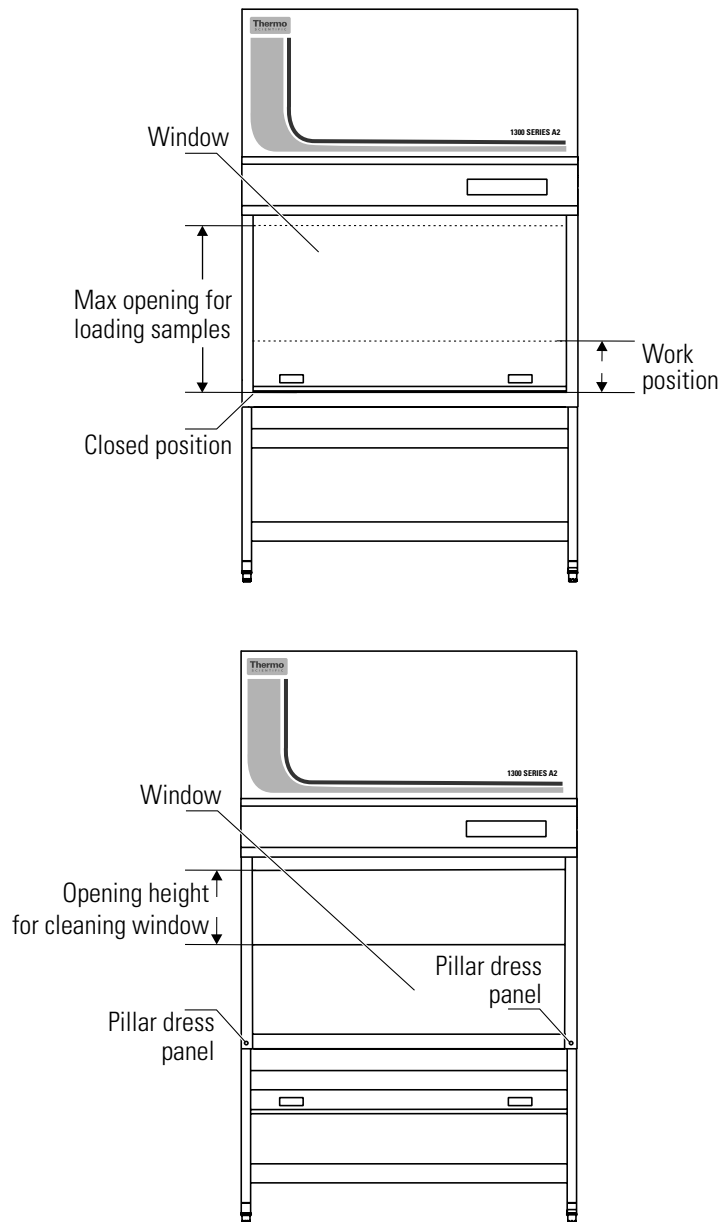


Figure 1-4. Window Openings

Use of the Window (continued)

To clean the window, the glass can be lowered beyond the closed position for access to the upper portion.

1. Lower the window to the cleaning position.
2. Upon completion of the cleaning/service work, push the front window back in place.

Note This position can be also used for replacing the sample chamber light bulbs. ▲

Caution If the front window jams or is sluggish to move, do not use force! Contact Technical Services immediately. Do not attempt to repair this problem. ▲

Unit Interface

The standard unit includes accessory outlets, service valve access ports, an RS-232 connection and a remote alarm connection.

The power cord to be connected to the power source is located on the upper back of the cabinet.

The accessory outlets (max 5A) are located on the interior chamber back wall. There are two outlets on 4 foot units and four outlets on 6 foot units.

On top of the cabinet are the two fuseholders for the 5A circuit breaker fuses and an RS-232 connection.

Two service valve access ports are located on each side of the cabinet. To use these ports, remove the center perforation. Service valves are available as optional accessories.

The remote alarm accessory can be used for external exhaust air system controls, or a failure reporting system.

Warning If a gas burner is to be operated in the sample chamber, an appropriate shut-off valve for the gas supply must be installed. Use only laboratory safe burners in the sample chamber. ▲

Unit Interface (continued)

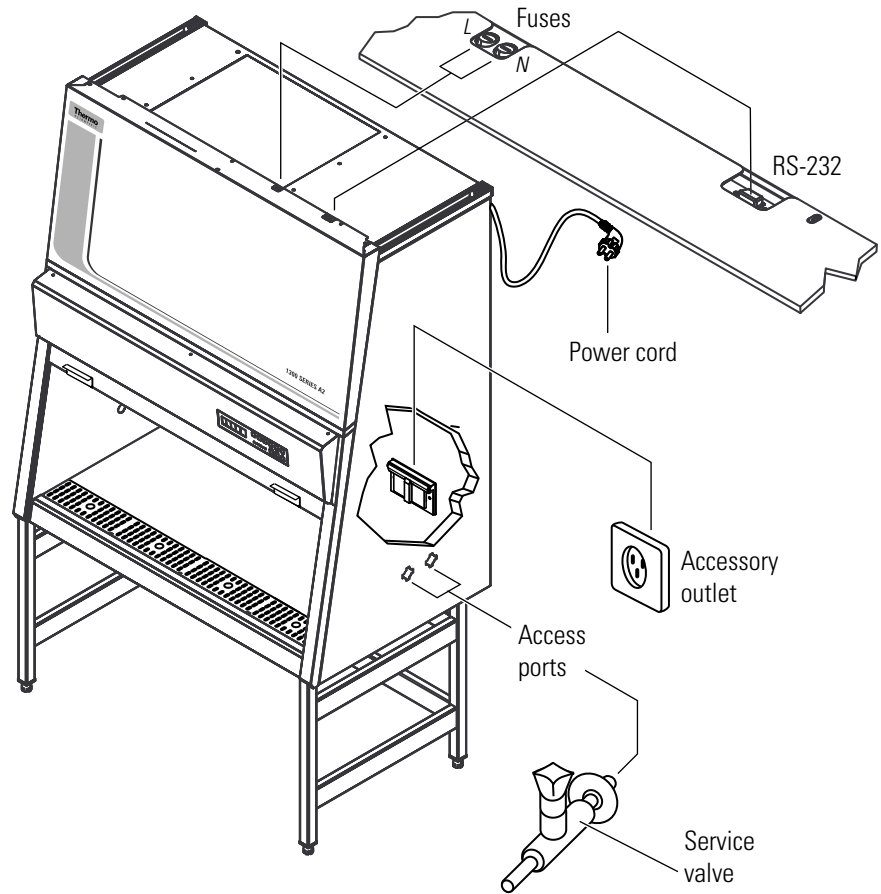


Figure 1-5. Interfaces

Chamber Lighting

Lighting for the sample chamber includes one fluorescent bulb for 4 foot units, and two bulbs for 6 foot. The bulb(s) are installed behind the light canopy.

UV Lights

The optional, factory-installed UV light is installed at the top of the front section of the sample chamber.

The operating time of the UV light is preset for 1 hour. The UV disinfection procedure can be started by pressing and holding the “UV” key on the control panel for 5 seconds with the window in the closed position. If the window is opened, the procedure is immediately cancelled.

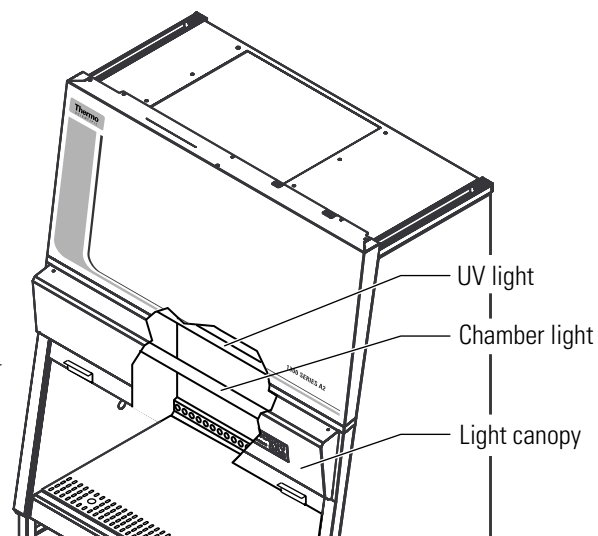


Figure 1-6. Lights

Note To protect from UV radiation, the UV light can only be turned on when the window is completely closed. ▲

Work Area

The single piece work tray is provided with the cabinet. It is placed onto the frame above the sample chamber drain pan. It can be removed by lifting up, using the large holes in the work tray.

The working area for optimal product protection extends over the entire width and depth of the work tray. The two optional armrests are positioned in the center of the working area 8 inches (20cm) from each other. To attach the armrests, insert into the first perforated track of the work tray.

Warning Work safety is assured only if the armrests are used correctly! ▲

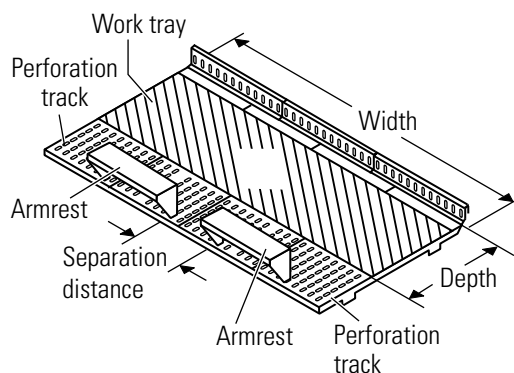


Figure 1-7. Work tray

Section 2 Installation

The operational safety and proper function of the unit depend on the location where it is to be operated. The cabinet should be operated only in the ambient conditions listed below.

- Up to 6562 ft. (2000m) above sea level.
- Power outlet accessible to authorized personnel only. Ideally, the outlet should be installed above the bio-safety cabinet. The power cord is the mains disconnect.
- Location capable of supporting the weight of the device and non-flammable.
- If the factory-approved stand is not purchased, the holding device must be rated for twice the cabinet weight.
- Adequate room height. For devices that are not connected to an exhaust system, the distance between the exhaust air opening at the device and the room ceiling must be at least 8 inches (200mm).
- Equipped with an appropriate ventilation system.
- Room temperature between 10°C and 40°C (50°F and 104°F).
- Relative humidity must not exceed 80%, up to 31°C and decreasing linearly to 50% at 40°C.
- For indoor use only.

Room ventilation should preferably be a ventilation system that complies with the national requirements for the application.

The inlet air and exhaust air openings of the room ventilation must be located so that drafts do not impair the function of the bio-safety cabinet air system.

Optional Exhaust Transition

The part numbers for the optional thimble exhaust connection are 1911316 for four foot, and 1911317 for six foot units.

The test conditions according to NSF 49/2004 were performed with the standard version of the safety cabinet, without exhaust system accessories.

An available accessory for the bio-safety cabinet exhaust system is an exhaust thimble connection for the connection to an on-site exhaust system with blower.

Exhaust System Accessories

The exhaust system components are installed to the exhaust opening on top of the cabinet. The threaded inserts for the retaining screws are pre-installed in the unit.

Installation on a 4 ft. model:

1. Turn the unit off and disconnect it from the power source.
2. Thoroughly clean the surfaces around the exhaust opening and of the accessory to be installed, to ensure that they are free of debris.
3. Apply sealant onto the contact surfaces.
4. Secure the accessory by tightening the supplied retaining screws (M 5) wrench-tight.
5. Remove any excess sealant.

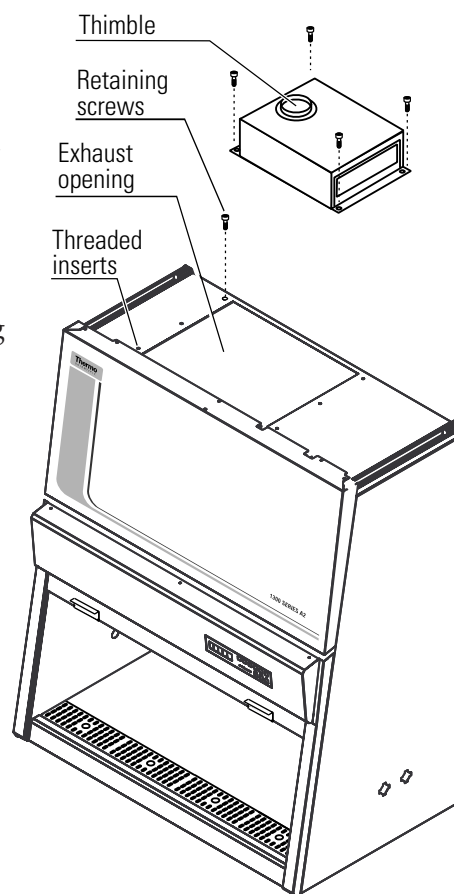


Figure 2-1. 4 ft Thimble

Exhaust System Accessories (continued)

The exhaust thimble connection is installed to the top of the cabinet using an additional adapter. The threaded inserts for the retaining screws of the adapter are pre-installed to the top of the cabinet.

Installation on a 6 ft. model:

1. Turn the unit off and disconnect it from the power source.
2. Clean the contact surfaces around the exhaust opening, and the upper and lower contact surfaces of the adapter thoroughly to ensure that all grease and dust residue are removed.
3. Secure the adapter to the pre-installed threaded inserts on top of the cabinet using the supplied four retaining screws. Tighten the screws hand-tight.
4. Secure the accessory by tightening the supplied retaining screws (M 5) wrench-tight.

Connecting Sleeve

1. Place the connecting sleeve onto the connecting opening of the accessory and secure it with the screws.
2. Fit the connecting pipe (200mm / 8 in) of the on-site exhaust air system to the connecting sleeve and seal it with sealant.
3. Seal the unused connecting opening with the cover. Apply sealant to the cover, place the cover onto the connecting opening at the housing and secure it with the screws.

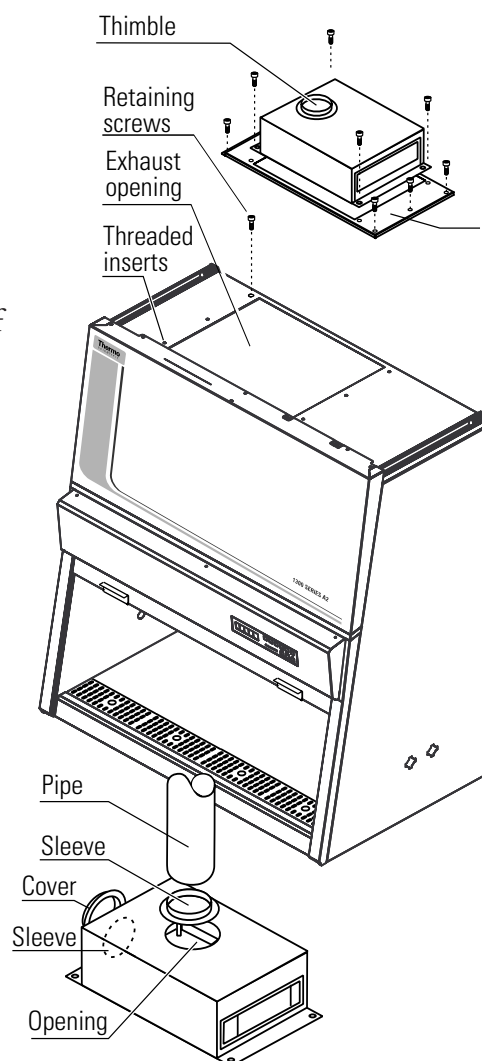


Figure 2-2. 6 ft Thimble and Sleeve

Moving the Unit

To prevent tilting, always transport the cabinet separate from the stand, using equipment capable of supporting the weight, even for a move within a building.

Caution When moving the unit, lift only at the lift points shown in Figure 2-1.

Caution Do not allow the weight of the cabinet to rest on the drain pan! ▲

Warning The weight of the window is balanced by the counterweight on the back of the cabinet. Do not move the unit unless the counterweight has been locked in place with the thumbscrews (see Figure 3-2). ▲

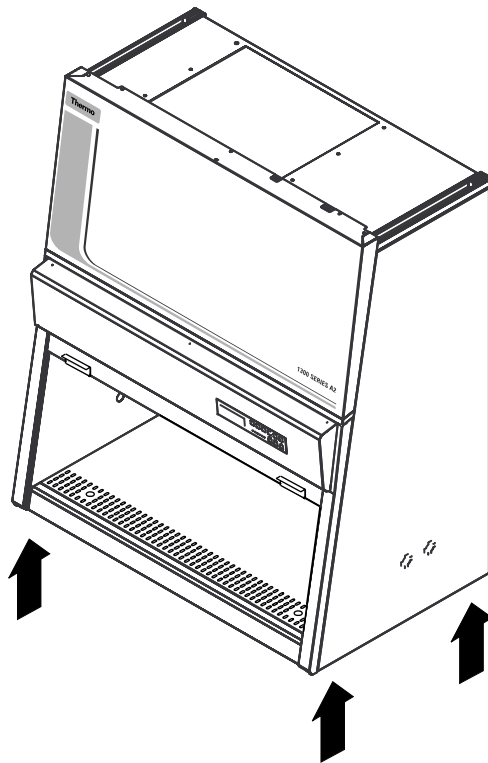


Figure 2-1. Lift points

Service Valve Connections

Install the service valve(s) by removing the centers of the plug (brass) or piercing it at the pre-determined location (plastic).

Installation spacing on side of unit:

| | |
|----|---------------------|
| A1 | = 8.9 in. (225 mm) |
| S1 | = 10.8 in. (275 mm) |
| S2 | = 3.9 in. (100 mm) |

Note The plugs must only be used for the installation of service valves in accordance with the applicable national regulations. s

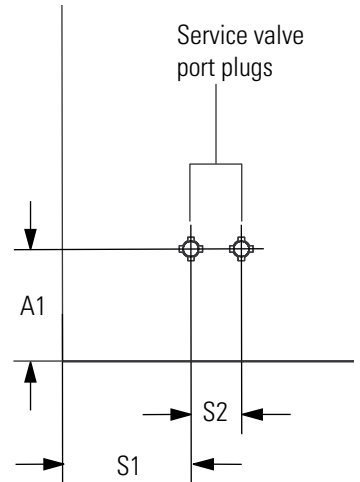


Figure 2-3. Valve Location

At each side panel, service valves can be installed through the two service valve port plugs (P/N 24909-exterior port plug, 249096-interior port plug).

1. Move the front window to the fully open position.
2. Turn the unit off and disconnect it from the power source.
3. Score the plug circularly at the pre-determined point (inside and outside). Remove the centers.
4. Referring to Figure 2-4 on the following page, slide the gasket and the bezel onto the threaded pipe of the service valve. Apply a thin bead of silicon to the inner flange of the service valve.
5. From inside the sample chamber, slide the service valve through the desired plug.
6. From the outside, slide the other gasket and the washer onto the service valve threaded pipe and apply a thin bead of silicon to the outer flange of the service valve.
7. Secure the service valve to the side panel using the nut.
8. Establish the connection to the supply line using a union nut.

Note If a service valve is removed, the service valve port plug should be re-installed. s

Valve Connections (continued)

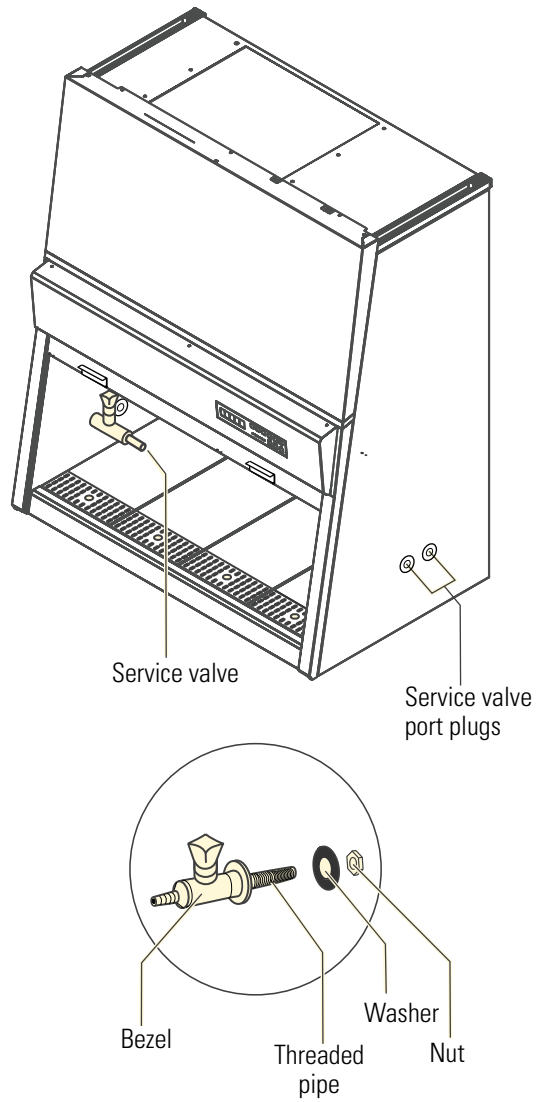


Figure 2-4. Valve Assembly and Installation

Universal Piping Connections

Universal piping is a factory-installed option. The piping can be installed on either, or both, sides. Access points, depending on selected installation, are available on the top, side or bottom of the cabinet. Pipe threads are 1/4" FPT. Refer to illustration below.

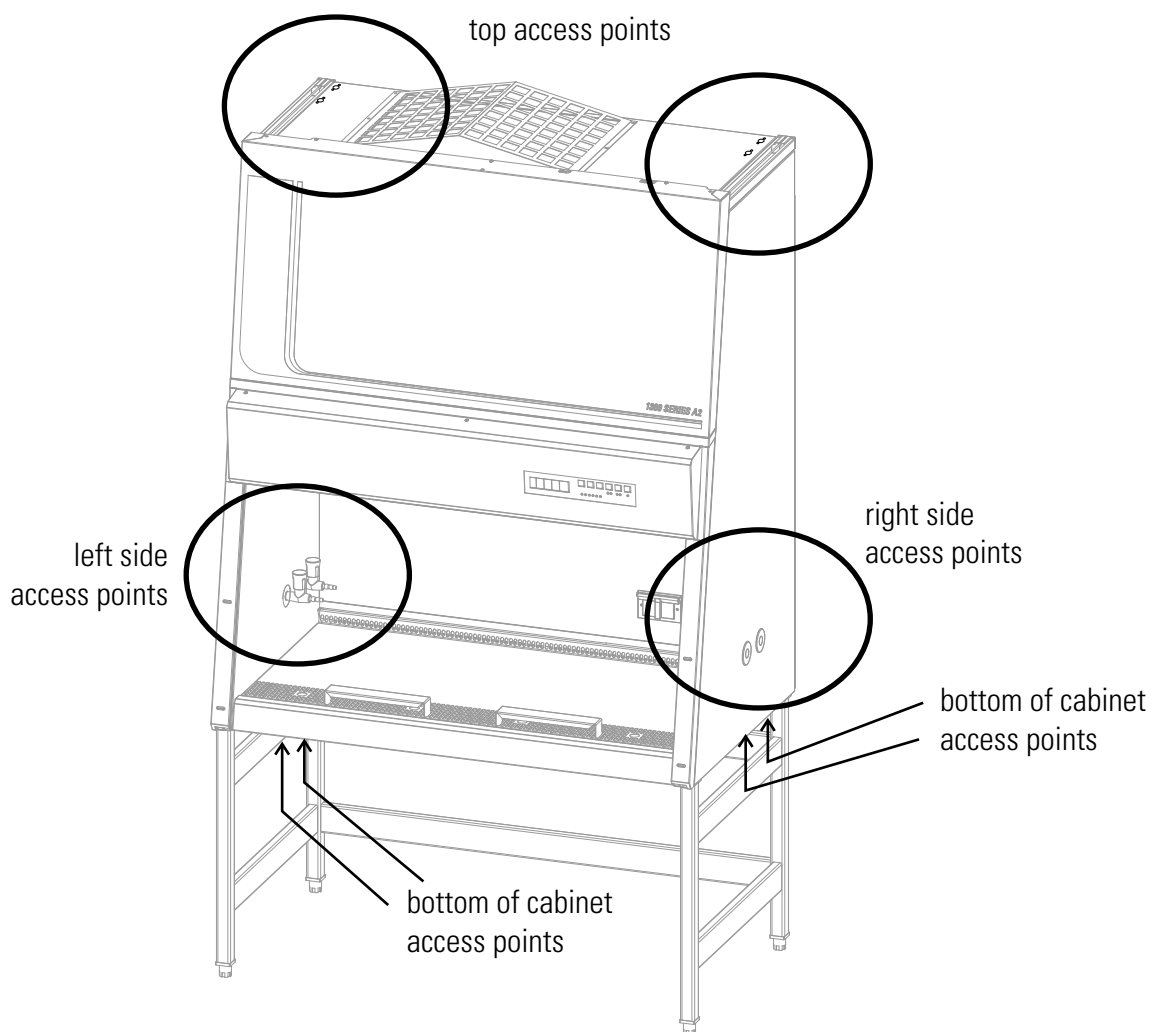


Figure 2-5. Possible Universal Piping Access Points

Section 3 Start-Up

Caution Correct assembly and installation is essential for proper start-up and operation. ▲

Assemble the Stand

For a unit without a stand, place the cabinet onto a stable structure capable of supporting two times the unit weight. Make sure the weight is not resting on the drain pan. Then remove the protective covering from the drain pan. See Figure 3-1 on the following page.

For a unit with a stand, first assemble the stand per the instructions included with the stand. Then fit the cabinet onto the stand. See steps below.

Caution Make sure each leveler is turned all the way in, to avoid bending an edge during installation. ▲

1. Locate both end frames. Turn upside down and install the levelers into the ends of the legs. Tap the ends of the levelers until they are fully installed.
2. Slide the two crossmembers (label on crossmember to outside [Figure 1]) onto the retaining tabs of the side panels, then secure the crossmembers to the side panels using the screws provided.
3. To install the cabinet frame to the stand, insert four Allen screws loosely into the threaded holes at the bottom of the cabinet.
4. Place the safety cabinet onto the stand so that the Allen screws are routed through the holes of the keyhole tabs.
5. Slide the cabinet frame to the keyhole stop (Figure 3-1).
6. Tighten the four Allen screws.
7. Level the cabinet (instructions follow in this section).

Assemble the Stand (continued)

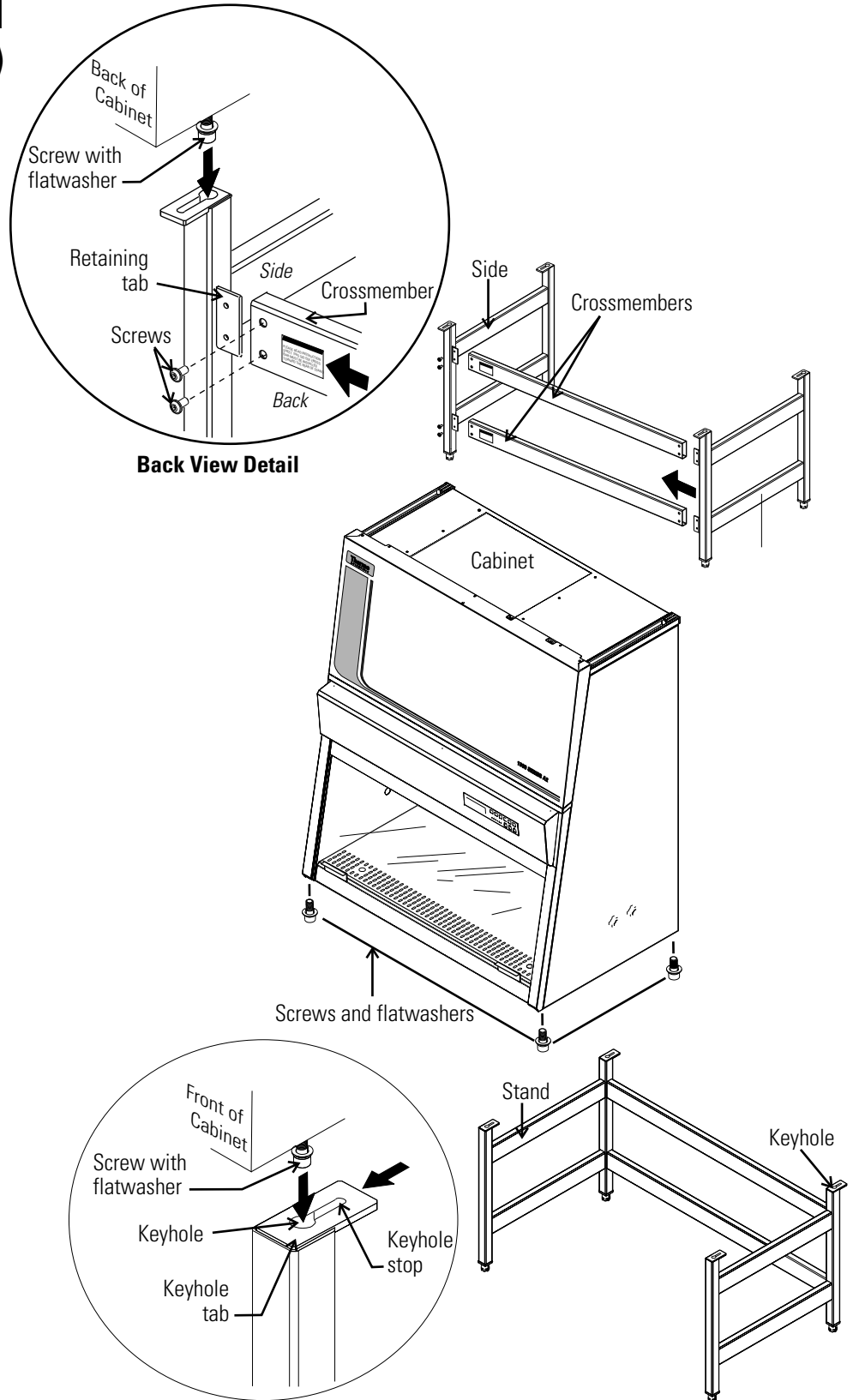


Figure 3-1. Stand Assembly

Unlock Counterweight

The window counterweight is secured to the back of the cabinet to protect it from damage during shipping.

Caution The counterweight on the back of the cabinet compensates for the weight of the front window. Do not try to move the front window before the counterweight has been unlocked. ▲

Warning After unlocking, keep hands and fingers away from the motion range of the counterweight! ▲

To unlock the counterweight, remove the thumbscrews (see location arrows in Figure 3-2) and retain them for future shipping needs.

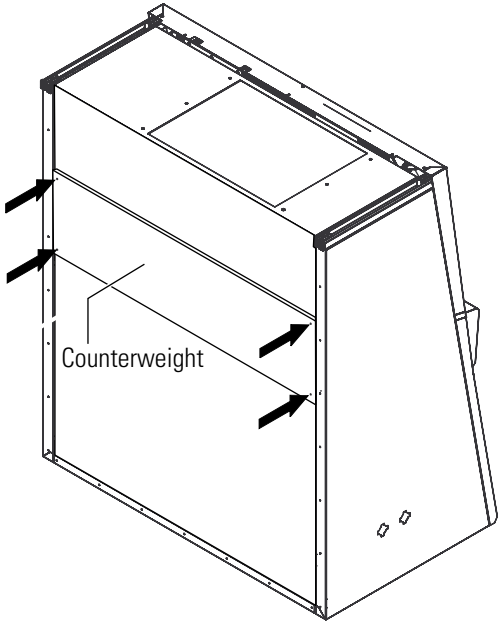


Figure 3-2. Unlocking the Counterweight

Level the Cabinet

Note The cabinet should be leveled only after it has been located in the desired working location. ▲

For cabinets without a stand, place a bubble level onto the work tray surface and adjust the cabinet until the level indicates an absolutely horizontal position in all directions.

For cabinets with an optional stand, place a bubble level onto the work tray and adjust the four feet of the stand using an open end or adjustable wrench until the level indicates an absolutely horizontal position in all directions. Check from right to left, and from back to front.

Power Connection

Warning Contact with electrical components can cause a lethal shock.

Warning Before connecting the unit to a power source, check plug and power cord for possible damage. Do not use damaged components to connect the unit to the power source! ▲

1. Before connecting the unit to the power source, verify that the voltage of the outlet matches the specifications on the cabinet nameplate. If the ratings given for voltage (V) and maximum current (A) do not match, do not connect the unit to the power source.
2. Connect the power cord to a properly grounded and fused outlet. The outlet must be fused separately, using a fusible link T15A or using a circuit breaker B15. If the configuration of the receptacle does not match the power plug, consult a qualified electrician to replace or install the correct receptacle.
3. Make sure that the power cord is routed away from the counterweight and cable guide. The left side of the cabinet has additional fastening points that can be used for routing the power cord.
4. Make sure that the power cord is not stretched or pinched.

To protect from accidental disconnection, the power source outlets should be located out of casual reach and be accessible only to authorized persons. Ideally, the outlet should be located above the cabinet to avoid accidental shut-off.

The power supply cord is the mains disconnect.

If the unit includes service valves (gas, water), the valves must be installed properly to ground to the unit's main ground.

On connection to the power source, place the window at the working position and wait until all lights on the display are green. The cabinet is now ready for operation and can be operated using the control panel.

Installation Tests

Warning Do not operate the unit before initial operation, installation and certification tests have been performed. ▲

The installation test must be performed in accordance with the specifications of NSF/ANSI 49, 2004. The cabinet may be operated as a Class II biological safety cabinet, in accordance with NSF/ANSI 49 2004, if the unit functions listed below were verified and if the test results are within the safety value tolerances as specified in NSF/ANSI 49 2004, Annex F.

- Inflow velocity profile test
- Downflow velocity profile test
- HEPA filter leakage test
- Airflow smoke pattern test
- Site installation assessment tests
- A repeat test must also be performed annually, after repairs to the unit or after location changes (more than 2 in. [5cm]).
- The operator should request a written test report from the authorized service technician.

Warning The operational safety of the unit, particularly the personal and product protection, are guaranteed only if all safety functions of the unit have been tested and approved. ▲

Caution Thermo will not warrant operational safety if the unit is operated without the required installation and certification test, or if these tests and repeat test are not performed by adequately trained and authorized personnel. ▲

Caution The initial operation with subsequent installation test does not include any decontamination measures. The sample chamber and any accessories required must be disinfected and cleaned in accordance with the hygiene guidelines set forth for the desired application. ▲

Locating a Certifier

Caution Service and certification must be performed by qualified personnel. ▲

Biological safety cabinet certification consists of a series of tests designed to verify that the cabinet is performing within operating parameters established by the manufacturer. To assure that a biological safety cabinet is operating as intended, each cabinet should be field-tested at the time of installation and at least annually thereafter. Cabinets should be re-certified whenever HEPA filters are changed, internal maintenance is performed, or the unit is relocated.

Three industry-related organizations maintain lists of companies and individuals who are active in the certification industry. You may contact these organizations at the addresses listed below.

NSF International (NSF) and International Air Filtration Certifiers Association (IAFCA) sponsor certifier accreditation programs. Accredited certifiers have demonstrated proficiency at testing biological safety cabinets by successfully completing written and/or practical examinations.

Biohazard Cabinet Field Certifier Program

NSF International

PO Box 130140

789 N. Dixboro Rd

Ann Arbor, MI 48113-0140

Telephone (734) 769-8010 Or (800) NSF-MARK

Fax (734) 769-0109

<http://www.nsf.org/Certified/Biohazard-Certifier>

IAFCA

PO Box 12155

Columbus, OH 43212

Telephone (888) 679-1904

Fax (614) 486-1108

<http://www.iafca.com/certifier.html>

Locating a Certifier (continued)

The Controlled Environment Testing Association (CETA) is a trade association devoted to promoting and developing quality assurance within the controlled environment testing industry. A list of active members is available by contacting the organization.

Controlled Environment Testing Association

1500 Sunday Drive

Suite 102

Raleigh, NC 27607

Telephone (919) 787-5181

Fax (919) 787-4916

http://www.cetainternational.org/members/corp_indiv.htm

Note 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 for by the customer. ▲

Section 4 Operation

The control panel has been divided into three functions; display, keys, status indicators.

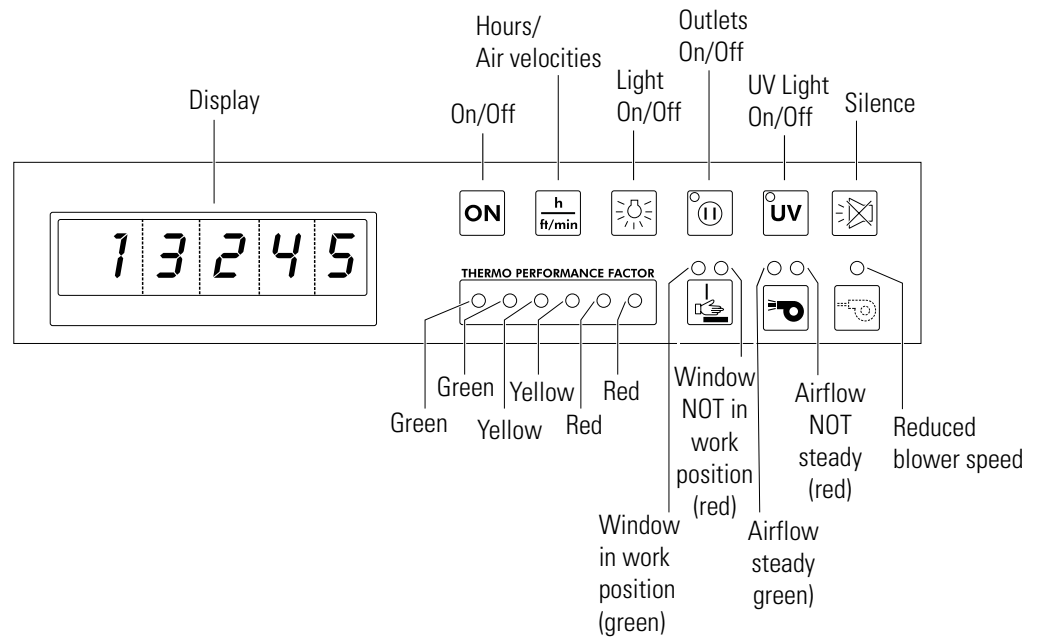


Figure 4-1. Control Panel Functions

The **display** shows the information below during each operation.

- during normal operation, the operating hours of the unit,
- during safe work mode, the downflow and exhaust air velocities,
- with UV light (optional) timer on, the remaining disinfection time.

Press the **Hours/Velocities** key to switch between the operating hours, and the downflow and exhaust air velocities in safe work mode (with window in the open, safe operating work position).

To enable (I) / disable (0) the alarm ringback function, follow the steps below.

In OFF mode, press and hold the **Hours/Air Velocities** key for approximately five seconds. The display momentarily shows the operating hours, then the switching state:

- I = alarm acknowledge function enabled,
- 0 = alarm acknowledge function disabled.

Light key turns the sample chamber light on and off.

The **On/Off** key turns power to the unit on or off.

Outlet On/Off key turns power to the internal outlets on and off (the blue LED indicates that voltage is present).

UV Light key turns the UV light on and off. The yellow LED indicates the UV light has been activated. If the optional UV light is not installed, this key has no function.

When the optional UV light is turned on, the display alternates between dIS and the remaining preset time.

Silence key for muting the audible alarm.

Unit Start-Up

1. To turn the unit on, press and hold the ON key until the blowers start (audible blower operation), and the status indicators (LEDs) illuminate.

Note A several seconds delay may occur between key actuation and unit response. ▲

2. Move the window to the work position (10 inch opening). The correct position is reached when the green LED “front window is in work position” illuminates. The side guide rails have markings that define the lower edge of the front window. These markings can be used as an additional orientation aid.
3. Wait until the green LED “airflow is steady” illuminates.
4. The unit is ready for operation.

Operating Modes

The following are the operating modes for this unit.

- Calibration mode
- OFF mode
- Window open mode
- Working mode
- Standby mode
- UV mode

Off mode means the unit is in an idle state. The unit is turned off (blowers are off). The sample chamber light is enabled. The unit is connected to a power source. The blue LED “internal power supply activated” is lighted.

Window open mode is the state in which the window is open and positioned outside of the 10” working position. To install or remove accessories, the front window can be moved to the maximum open position. For cleaning, the front window can be lowered beyond the closed position (see Use of the Window, Section 1).

The air system blowers are switched on with the red LED “airflow volume steady” lighted. The front window is not in the work position, with the red LED “front window not in work position” is lighted. The sample chamber light is enabled. The power supply for the internal outlets is enabled with the blue LED “internal power supply on” is lighted.

Working mode is active when the front window is in the working position (10 inch opening) and the air system is operating steadily. The green LEDs “front window is in work position” and “airflow steady” are lighted.

The markings on the side guide rails and the lower edge of the front window are at the same height with no audible alarm signal.

The sample chamber light and power for the internal outlets are enabled with the yellow LED “internal power supply activated” is lighted.

The RS-232 contact is open. The display shows operating hours, downflow velocity and exhaust air velocity.

Standby mode is the state in which the window is closed with the blower velocity reduced. The red LED “front window not in work position” and the blue LED “airflow reduced” are lighted.

The sample chamber illumination is enabled. The internal power supply in the sample chamber is enabled. The red LED “airflow not steady” and the blue LED “internal power supply activated” are lighted.

Operating Modes (continued)

The bio-safety cabinet can be turned off (OFF mode) by pressing and holding the ON key for five seconds until all LEDs are off.

UV mode means the UV light is on with a set timer running. The window must be in the closed position to protect against UV radiation. The light will not turn on with the window open.

The yellow LED “UV disinfection routine activated” is lighted until the preset time has elapsed. Then, the UV lights turn off automatically, and the status indicator turns off.

The sample chamber illumination is disabled in this mode, as well as the internal power source in the sample chamber.

Loading the Chamber

1. Move the front window to the maximum opening position. This automatically switches the blowers to full speed.
2. Install needed work materials within the sample chamber work area. Avoid blocking the front air intake grille.
3. Move the front window to the work position (the green status indicator Front Window in Work position is illuminated) and wait until the airflow has stabilized (the green status indicator Airflow steady is illuminated).

Warning Personal and product protection is ensured only if the airflow system of the device is working properly. If the alarm system issues a failure message for more than a few minutes while the front window is in the work position, stop all applications that may jeopardize worker safety. ▲

4. Load the work tray with samples.
5. For work breaks or for extended experimental phases without manual intervention, switch the device to standby mode by closing the window.

Error Messages

Failure messages are shown on the display as codes ER 3 to ER 7. If one of these codes appears on the display, contact Technical Services immediately.

To isolate the cause of the failure, perform the following tests.

- Check to see if the exhaust opening on top of the cabinet is blocked.
- Ensure that the in-house exhaust air system is activated, if applicable.
- Close doors and windows in the laboratory to prevent drafts.
- Turn off devices in the vicinity of the bio-safety cabinet that cause air turbulence, or emit excessive heat.
- Open flames in the sample chamber may impair airflow conditions.

Working Recommendations

The observance of work rules ensures a minimum of operational safety when handling the bio-safety cabinet.

Before starting a procedure, take off all jewelry, put on required personal protective equipment (gloves, goggles, apron), and clean and disinfect the sample chamber surfaces at regular intervals.

During operation:

- Place samples only within the defined work area of the work tray.
- Do not place unnecessary items into the sample chamber.
- Use only disinfected and cleaned accessories for the work process.
- Do not cause air turbulence by quick hand, arm or body movements in the sample chamber or in front of the work opening.
- Do not place accessories into the sample chamber that cause air turbulence or emit excessive heat.
- Do not block air circulation at the ventilation slots of the work tray.

Working (continued)

- A height-adjustable working chair with an adjustable seat back should be used during extended work periods at the cabinet.
- When the forearm rests on the armrest, it should be in a nearly horizontal position.
- When the upper leg is in a horizontal position, the angle between upper and lower leg should not exceed 90°.
- To compensate between the floor and sitting height, a footrest should be used. The minimal effective size of the footrest should be 18 x 14 in (45 x 35cm). The slope should be adjustable to within a range from 5° to 15°. The adjustable height should extend to a minimum of 4 in (11cm) above the floor.

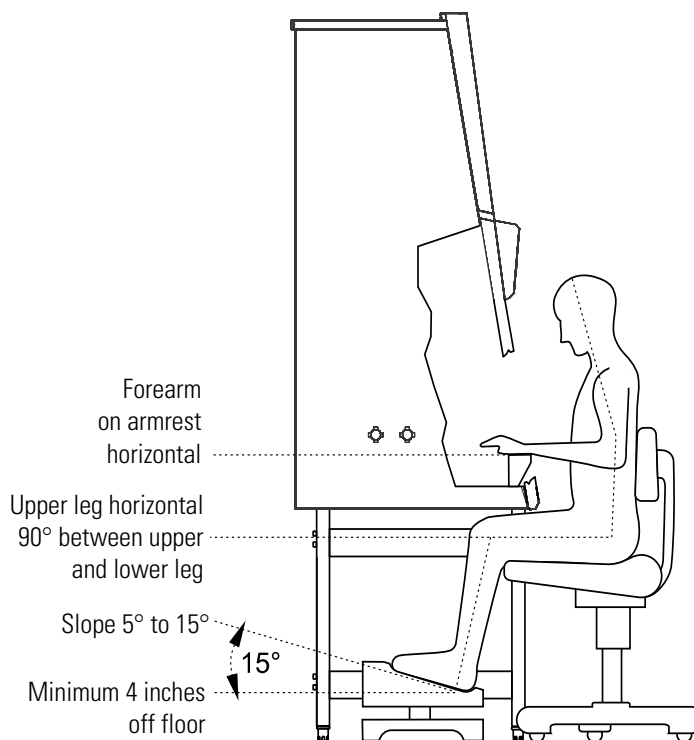


Figure 4-2. Sitting Posture

After completing a procedure,

1. Remove samples from the sample chamber and store them properly.
2. Clean and disinfect the sample chamber surfaces, including the work tray and the drain pan.
3. Clean and disinfect all accessories.

Procedure Interrupt

To interrupt a work process:

1. Remove all samples from the chamber and store them properly.
2. Remove any accessories from the chamber, and clean and disinfect them.
3. Clean and disinfect the chamber surfaces, work tray, and drain pan.
4. Turn the unit to standby mode by first closing the window. Then press and hold the ON key until the indicators are off (the right indicator segment of the display shows a dot to indicate that voltage is present).

Caution For safety reasons, the blowers can be switched off only when the front window is closed. ▲

Unit Shut-down

If the device is not to be used or is to be stored for an extended period of time, it must be completely decontaminated.

Warning To shut the device down, the sample chamber must be disinfected completely and the plenum, including the filters, must be decontaminated using the appropriate and authorized procedures. ▲

1. After the device has been decontaminated, close the window completely.
2. Disconnect the unit from the power source.

Unit Disposal

All components with the exception of the HEPA filters can be discarded after having been thoroughly cleaned and decontaminated. The HEPA filters must be discarded in accordance with the applicable national, state and local regulations for special solid waste.

Warning As this unit can be used for processing and treating infectious substances, it must be decontaminated prior to disposal, in accordance with acceptable standards and procedures.

Section 5 Cleaning / Decontamination

Several procedures can be used for decontaminating the bio-safety cabinet. Which procedure is selected, depends on the potential risk imminent in the agents used, and/or the degree of cleanliness required by an experiment or work process.

One possible decontamination procedure is to use wipe/spray disinfection. This is the standard disinfection procedure for cabinets used for microbiological experiments.

UV disinfection can also be used. It is particularly suited as a more intense disinfection after a wipe/spray disinfection.

Autoclaving (sterilization with steam) can be used for treating the removable stainless steel components. The bezels of the UV lights, the work tray(s), armrests and paper catch grids are autoclavable components.

Disinfection with formaldehyde can be performed if a sterile sample chamber is required for the work procedure. This sterilization procedure is mandatory before filters are replaced, or before the unit is discarded.

Wipe/Spray Disinfection

The wipe/spray disinfection is performed in three steps. First pre-disinfection, then cleaning, and a final disinfection.

Caution Disinfectants containing chlorine may damage some surfaces, Therefore, use only chlorine free disinfectants!

Disinfectants with an alcohol content of more than 70% may cause plastic components to become brittle after extended exposure. Use only disinfectants with a low alcohol content. When using a disinfectant with an alcohol content of more than 70 %, the release limit of 200 g (7 oz) within 2 hours must not be exceeded.

Also appropriate are disinfectants based on quaternary ammonium compounds. ▲

Section 5

Cleaning and Decontamination

Pre-disinfection

1. Remove all samples from the chamber and store them properly.
2. Remove accessories from the cabinet and disinfect them using the disinfection procedure recommended by the manufacturer of the accessory.
3. The work tray(s) and stainless steel components can be removed from the chamber and disinfected separately.
4. For pre-disinfection, spray disinfectant on all chamber surfaces, or wipe the surfaces using disinfectant.
5. Do not remove the optional UV lights from the sockets. Wipe them thoroughly with a damp cloth. Do not saturate.
6. Move the window to the work position (10 inch opening).
7. Allow the disinfectant to remain as recommended by the manufacturer of the disinfectant, then operate the cabinet for at least 15 to 20 minutes in work mode so that released gases can be absorbed by the filters.

Cleaning

1. Remove residues and deposits thoroughly, using a solution of tepid water and commercially available mild dishwashing agent.
2. Wipe the surfaces using a clean cloth and plenty of clean water.
3. Remove the cleaning liquid from the drain pan and dry all chamber surfaces with a soft cloth.

Final Disinfection

1. Spray disinfectant on all chamber surfaces again, or wipe the surfaces clean with disinfectant.
2. Allow disinfectant to remain as recommended by the manufacturer of the disinfectant.

UV Disinfection after Wipe/Spray Disinfection

A UV disinfection can be performed by using the optional factory installed UV light.

To start the UV disinfection procedure,

1. Close the front window, the air system operates in the reduced mode (blue LED illuminated).
2. Press and hold the UV key on the control panel until the display alternates between dIS and the remaining disinfection time.

To interrupt or cancel the UV disinfection procedure, just press the UV key (the display shows the operating hours) and slide the window up.

Change the UV Disinfection Time

The UV disinfection time is preset. However, this setting can be changed, if required.

1. Turn the unit on and move the window to the work position.
2. Press and hold the UV key until the preset time is displayed.
3. To increase the time, press the internal power supply key. Each time the key is pressed, the time increases by 30 minutes.
4. To reduce the time, press the sample chamber light key. Each time the key is pressed, reduces the time by 30 minutes.
5. To save the value, press the UV key. The display shows the operating hours again.

Note The UV disinfection time is adjustable from 0:00 (disabled) to 24:00 hours. ▲

Disinfection with Formaldehyde

Warning Decontamination with formaldehyde must be performed in accordance with the specifications of NSF/ANSI 49, 2004, Annex G. As this procedure has considerable risks, it must only be performed by specially trained and authorized service personnel! ▲

Clean Exterior Surfaces

Wipe the exterior surfaces of the cabinet using a solution of tepid water and commercially available mild dishwashing agent. Then, dry all surfaces using a soft, clean cloth.

Clean Window

For cleaning (and using the wipe disinfection procedure), the window can be lowered beyond the closing position (Use of the Window, Section 1).

Creating a gap between the light dome and the window's upper edge ensures that the upper portion of the window can be cleaned and/or disinfected. Use a commercially available window cleaner to clean the window.

Clean the Drain Pan

Clean the drain pan, using a solution of tepid water and commercially available mild dishwashing agent.

1. Remove the work tray(s) from the chamber.
2. Remove residues and deposits thoroughly.
3. Wipe the drain pan, using a clean cloth and plenty of clean water.
4. Remove the cleaning liquid from the drain pan and dry the surfaces thoroughly.

Note After cleaning, make sure that all cleaning product has been removed completely from the drain pan. ▲

5. Re-install the work tray.

Clean the Paper Catch Grid

The protective paper catch grids are retained in the airduct wall by their own tension.

1. To remove a grid section, push the retaining tab down until the section can be moved out from under the inner back wall.
2. To install the grid section, first place it on the lip of the back wall, then push the retaining tab down and towards the back until the locking tabs are secured behind the inner back wall.

Caution Do not operate the unit without the paper catch grids installed! ▲

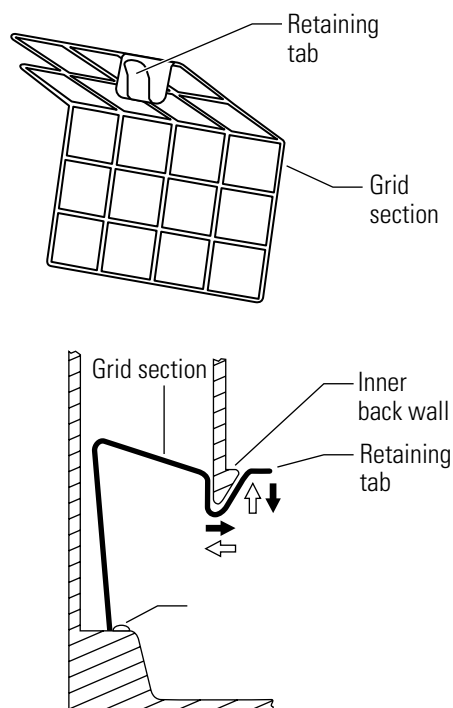


Figure 5-1. Protective Paper Catch Grid

Section 6 Maintenance

The Thermo Performance Factor, the test routine for the bio-safety cabinet, determines the cabinet's system status by way of adjusting various device parameters.

An inspection of the device should be performed if the indicated Thermo Performance Factor drops to a value below 60%. In this event, the corresponding LEDs (yellow or red) of the performance indicator light.

Regardless of the indicated Thermo Performance Factor, the bio-safety cabinet should be certified annually.

The annual certification consists of the following checks:

- Electrical safety in accordance with national regulations.
- Functional test of the device.
- Checking all components for possible damage.
- Checking the filter state.
- Verifying device air flows
- Checking the airflow conditions.
- Repeat test in accordance with NSF/ANSI 49/2004.

Warning The diffuser plate on the chamber ceiling serves as protection for the downflow filter and prevents refluxing of downflow air. When scanning the filter surface for a leak test, the perforated plate must be removed. ▲

Service

As filter replacement is an interference with the safety system of the unit, filters must only be replaced by adequately trained and authorized service personnel.

Warning For any service work in a potentially contaminated section of the bio-safety cabinet, the unit must first be decontaminated. ▲

Sample Chamber Lights

The sample chamber is illuminated by one (4 foot units) or two (6 foot units) fluorescent bulbs. The spring-loaded sockets of the fluorescent bulbs are installed in the light mounting frame in the sample chamber (Fig. 6-1).

1. Switch the unit off and disconnect it from the power source.
2. Move the window to the cleaning position (below closed position) to ensure a sufficient gap between the window's upper edge and the light dome.
3. The fluorescent bulbs are installed in rotating sockets. To remove, rotate the bulb counterclockwise to disengage the latch and remove it from the sockets.
4. To install, slide the bulb contact pins into the rotating socket grooves and rotate the bulb clockwise to latch the sockets.

Optional UV Lights

The optional, factory installed UV light is installed in the chamber ceiling immediately behind the window. The UV light should be replaced after 1500 operating hours. See Figure 6-1.

1. Turn the unit off and disconnect it from the power source.
2. Move the window to the maximum open position.
3. Wear protective gloves to prevent skin oils from burning into the bulb. The UV bulb is installed in rotating sockets. To remove, rotate the bulb counterclockwise to disengage the latch and remove it from the sockets.
4. To install, slide the bulb contact pins into the rotating socket grooves and rotate the bulb clockwise to latch the sockets.

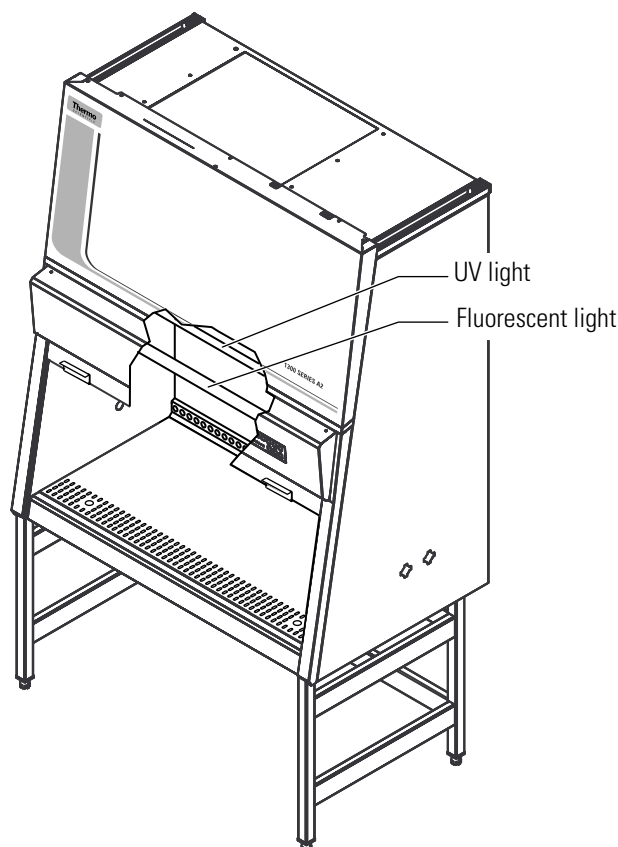


Figure 6-1. Light Replacement

Replacements and Repairs

Caution Remote alarm systems can be retrofitted and integrated into the unit controls. Specifically, modifications to the filter system and resulting changes of the airflow may impair personal and product protection. Such work must be performed only by authorized service personnel. ▲

Unit Disposal

The entire cabinet with the exception of the HEPA filters can be discarded after having been thoroughly cleaned and decontaminated. The HEPA filters must be discarded in accordance with the applicable national, state and local regulations for special solid waste.

Warning As this unit can be used for processing and treating infectious substances, it may become contaminated. Prior to disposal, the entire unit with filters must be decontaminated in accordance with acceptable standards and procedures. ▲

Section 7 Specifications

| Dimensions | | | | |
|--|---------|------------------------------------|------------|------------------------------------|
| Description | | 4 ft Models 1355, 1356, 1385, 1386 | | 6 ft Models 1357, 1358, 1387, 1388 |
| Exterior dimensions | | | | |
| Width | mm / in | 1300 / 51.2 | | 1900 / 74.8 |
| Depth | mm / in | 795 / 31.3 | 802 / 31.6 | 802 / 31.6 802 / 31.6 |
| Height | mm / in | 1520 / 59.8 | | |
| Interior dimensions | | | | |
| Width | mm / in | 1200 / 47.24 | | 1800 / 70.9 |
| Depth | mm / in | 630 / 24.8 | 627 / 24.7 | 627 / 24.7 627 / 24.7 |
| Height | mm / in | 780 / 30.7 | 780 / 30.7 | 780 / 30.7 780 / 30.7 |
| Front window | | | | |
| Working position | mm / in | 254 / 10 | | |
| Opening max. | mm / in | 500 / 19.7 | | |
| Working area height with fixed height stand | | | | |
| Seat position | mm / in | 750 / 29.5 | | |
| Side wall access ports | | | | |
| Diameter | mm / in | 23 / 0.91 | 23 | 23 23 |
| Distance lower edge | mm / in | 150 / 5.91 | 130 | 130 130 |
| Distance from back panel | | | | |
| First access port | mm / in | 150 / 5.91 | 130 | 130 130 |
| Second access port | mm / in | 250 / 9.84 | 246 | 246 246 |

Section 7
Specifications

| Volume, weights, and loads | | | |
|---|---------|------------------------------------|------------------------------------|
| Description | | 4 ft Models 1355, 1356, 1385, 1386 | 6 ft Models 1357, 1358, 1387, 1388 |
| Volume | | | |
| Drain pan | l / gal | 20 / 5.3 | 30 / 7.9 |
| Weights | | | |
| Cabinet | kg / lb | 170 / 375 | 230 / 507 |
| Stand | kg / lb | 30 / 66 | 35 / 77 |
| Loads | | | |
| Maximum load on work surface | kg / lb | 25 / 55 | |
| Maximum load on overall working area | kg / lb | 50 / 110 | 75 / 165 |

| Ambient conditions | | | |
|---|------------|------------------------------------|------------------------------------|
| Description | | 4 ft Models 1355, 1357, 1385, 1387 | 6 ft Models 1356, 1358, 1386, 1388 |
| Temperature | | | |
| Max. ambient temp during operation | °C / °F | 40 / 104 | |
| Min. ambient temp during operation | °C / °F | 10 / 50 | |
| Humidity | | | |
| Max. humidity / operation | % r.H. | 90, non-condensing | |
| Max. humidity / storage | % r.H. | 95 | |
| Heat dissipation to environment | | | |
| Room temperature 20°C | kJ/s / BTU | 0.15 / 0.14 | 0.26 / 0.25 |
| Room temperature rise | | | |
| Above room temp with window closed | °K | < 2 | < 2 |
| Ergonomics | | | |
| Noise level* | dB(A) | 63, ±2 | 65, ±2 |

*The noise level was determined in accordance with NSF/ANSI 49. 2004. The measurement uncertainty is within a range of ± 2 dB.

| Electrical data | | | |
|--|----|--|--|
| Models | | 120V Models - 4 ft / 6 ft 1355 & 1385 / 1357 & 1387 | 230V Models - 4 ft / 6 ft 1356 & 1386 / 1358 & 1388 |
| Voltage | | | |
| Rated voltage | V | 1/N/PE AC, 120V, 50/60 Hz | 1/N/PE AC, 230V, 50/60 Hz |
| Blower voltage | V | 48 V DC | |
| Current | | | |
| Power consumption maximum | A | 8 / 10 | 7 / 8 |
| Leakage current IEC 61010-1, UL61010-1 | mA | < 3.5 | |
| Motherboard fusing | A | 2 x T 15 A | |
| Outlet fusing | A | 2 x T 5 A | |
| On-site fusing | A | Circuit breaker 15 A / Fuse T 15 A | |
| Power | | | |
| Power input maximum | W | 1130 / 1700 | 1440 / 2000 |
| Protection | | | |
| Protection class | | I | |
| Protection type | | IP 20 | |
| Overvoltage category (IEC 61010-1, UL61010-1) | | II | |
| Contamination degree (IEC 61010-1, UL61010-1) | | 2 | |
| Connecting lines | | | |
| Mains connection | | Power Cord (3.7 m / 12.1 ft) | |

Section 7
Specifications

| Airflow system | | | |
|---|----------------------|------------------------------------|------------------------------------|
| Description | | 4 ft Models 1355, 1357, 1385, 1387 | 6 ft Models 1356, 1358, 1386, 1388 |
| Airflows / Airflow velocities | | | |
| Inflow | m/s | | 0.53 |
| | ft/min | | 104 |
| Downflow | m/s | | 0.32 |
| | ft/min | | 63 |
| Air volume | | | |
| Overall volume flow | m ³ /h | 1412 | 2122 |
| | ft ³ /min | 831 | 1249 |
| Downflow volume flow | m ³ /h | 830 | 1250 |
| | ft ³ /min | 489 | 736 |
| Exhaust air volume flow | m ³ /h | 582 | 872 |
| Exhaust air volume flow | ft ³ /min | 342 | 513 |
| Filters | | | |
| Type | | | HEPA |
| Material | | | Fiberglass |
| Separability in MPPS | % | | 99.995 |
| Separability at 0,3 µm particle size | % | | 99.999 |
| Downflow | | | |
| Width | mm / in | 1220 / 48.03 | 1830 / 72.05 |
| Depth | mm / in | | 457 / 17.99 |
| Height | mm / in | | 93 / 3.66 |
| Exhaust air | | | |
| Width | mm / in | 610 / 24.02 | 915 / 36.02 |
| Depth | mm / in | 457 / 17.99 | 457 / 17.99 |
| Height | mm / in | 117 / 4.61 | 117 / 4.61 |

Section 8 Certification Testing

Classification of the Safety Cabinet

For application in the USA, the unit has been rated as a Class II safety cabinet, Type A2, in accordance with NSF/ANSI Standard 49/2004.

For operation as a unit of said classifications, a certification test and repeat test in accordance with NSF/ANSI Standard 49-2004, Annex F should be completed at the time of installation, and at least annually thereafter. As described in Annex F, recertification should be performed whenever HEPA filters are changed, maintenance repairs are made to internal parts, or the cabinet is relocated. More frequent recertification should be considered when working with safety-critical materials (three to six months).

Test Terms

Nominal value:

Default value as specified by Thermo.

Measured value:

Value measured at the location of the safety cabinet.

Tolerance:

Acceptable deviation from the nominal value.

Average value:

The sum of the measuring values divided by the number of tests. The average value is compared to the nominal value.

Setpoint:

Acceptable operating value for the inflow and downflow velocities.

Inflow velocity (FPM):

Velocity of the air entering the sample chamber opening.

Downflow velocity (FPM):

Velocity of the displacement flow circulating through the work chamber.

Exhaust velocity (FPM):

Velocity of the airflow discharged through the exhaust filter opening.

Exhaust airflow volume (CFM):

Amount of air discharged at the exhaust filter.

Testing

According to NSF/ANSI Standard 49/2004, tests related to the safety of the personnel, product and environment that must be conducted on-site for Class II, Type A2 biological safety cabinets, at a minimum frequency of annually, are;

- downflow velocity profile test
- inflow velocity test
- airflow smoke patterns test
- HEPA filter leak test
- site installation assessment tests
 - alarm functions
 - exhaust system performance (proper exhaust duct negative pressure and canopy performance).

As described in Annex F, in addition to the above, the following tests performed at the request of the customer, or at the discretion of the certification provider.

- comfort and safety tests
 - lighting intensity
 - noise level
 - vibration
 - electrical leakage, ground circuit resistance and polarity tests

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 for by the customer. s

Test Equipment

For conducting these tests, Thermo recommends testing equipment of the manufacturers listed below.

| Testing equipment | Manufacturer | Application |
|---------------------------------|--|--|
| Smoke tubes | MSA Pittsburgh, Pennsylvania, 15230 | Airflow pattern test |
| Thermoanemometer | TSI Shoreview, Minnesota 55126 | Downflow velocity test |
| Digital Safety Inspector | Ohmic Instruments Co. Easton, Maryland 21601 | Electrical leakage and ground resistance tests |
| GFI Circuit Tester | Leviton Manufacturing Little Neck, New York, 11362 | Electrical leakage, ground resistance, and polarity tests |
| Photometer | Air Techniques Owing Mills, Maryland, 21117 | Filter leak test |
| Aerosol Generator | Air Techniques Owing Mills, Maryland, 21117 | Generation of aerosol mist |
| Vibration Meter | Quest Technologies Oconomowoc, Wisconsin, 53066 | Vibration test |
| Flow Hood Airdata Multimeter | Shortridge Instruments. Inc. Scottsdale, Arizona, 85260 | Downflow velocity test and alternate method for inflow velocity using constricted access |

Testing Information

Inflow Velocity – DIM Method (Primary)

Description: Inflow velocity using the direct inflow measurement method (DIM).

Equipment: . . .Shortridge ADM-870, or equivalent
Flow hood Series 8400, or equivalent

Method:

1. Move the front window to the work position (25.4 cm/10 in.).
2. Attach the flow hood [1] in the work opening [2] and seal the remaining open areas.
3. Operate the system blowers for approx 20 min.
4. Record at least 5 measurements of the inflow air volume.
5. Average those readings and calculate the inflow velocity (V1) as described below.

Testing Information (continued)

Inflow Area:

- 4-foot models 1355 / 1356 / 1385 / 1386: Front opening - 3.28 sq ft
- 6-foot models 1357 / 1358 / 1387 / 1388: Front opening - 4.91 sq ft

Calculation:

- Inflow Velocity (V1) = Inflow Air Volume (V2)/Actual Inflow Area (A2)

Acceptance:

- 100 – 110 FPM

Correction measures:

- Enter the service level and activate S2, change S2 until the desired velocity is reached and save the new value.
- If the velocity can't be adjusted due to clogging of the filters, change the exhaust filter.
- If the filter is in order, change the exhaust blower.

Note Check of alarm limits: If S1 or S2 are changed, the alarm limits S3 and S4 must be checked and saved again. s

Inflow Velocity – Constricted Window Method (Secondary)

Description:

- Inflow velocity measured over several points through a constricted window.

Equipment:

- Thermal Anemometer, or equivalent (hotwire)
- Anemometer Probe Holder, part number 1911325

Testing Information (continued)

Method:

1. Lower the front window to a height of 3 in. (7.6cm).
2. Operate the system blowers for approximately 20 minutes.
3. Insert the thermal anemometer probe into the probe holder. Place the probe holder at the window opening work surface, ensuring it is seated properly. See Figure 8-1. Adjust the probe so the air passing through probe is centered in the window opening (1.5 in. [3.8cm]).
4. Beginning 5.9 inches in from the left inside wall, record successive readings every 5.9 inches (7 readings for 4 foot models and 11 readings for 6 foot models).
5. Average those readings and calculate the inflow velocity (V1) as described below.

Calculation:

- Inflow velocity (V1) = average of actual inflow velocity * factor * 0.3

Acceptance:

- 100 – 110 FPM

Note The thermoanemometer probe must be positioned at a 10° angle from front vertical and located on the same plane as the inside of the window glass.

Multiply the K factor (0.9929 for 4 ft, 0.9918 for 6 ft) by the average velocity reading (V1).

- 3" access opening of 0.985 sq ft
- 10" access opening 3.285 sq ft

Refer to the data plate on the lower right corner of the unit face. s

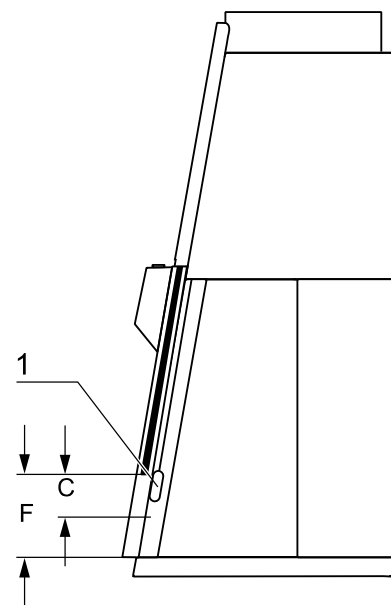
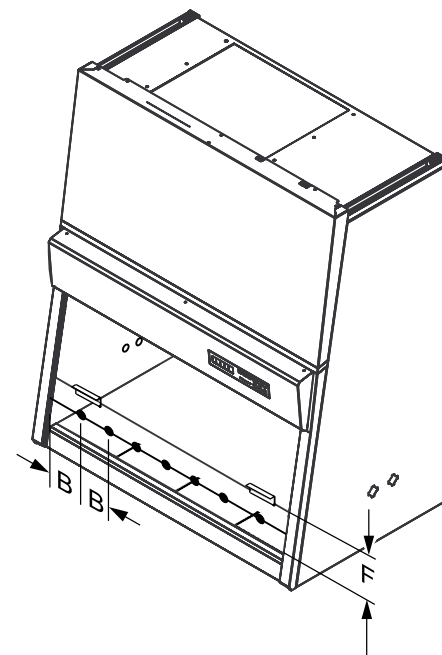


Figure 8-1. Constricted Window Method

Testing Information (continued)

Inflow Velocity – Calculating Exhaust Flow (Alternative)

Description:

- Exhaust velocity measurements to determine inflow velocity.

Equipment:

- Thermal Anemometer, or equivalent (hotwire)
- Freestanding Fixture, or equivalent

Method:

1. Operate the unit in the work position for approximately 20 minutes.
2. Insert the anemometer probe into the probe stand, adjusting the height to 4 inches (10cm) above the exhaust filter.
3. Record the readings on a horizontal plane 4 inches (10cm) above the effective exhaust filter area, in a grid pattern not to exceed 4 inches (10cm) x 4 inches (10cm).
4. Average the readings and calculate the inflow velocity.

Grid Pattern:

- 4-foot models (1355 / 1356 / 1385 / 1386)

| | | | | | | | | | | |
|-----------|---|------|------|------|------|------|------|------|---|--------|
| 24 points | | | | | | | | | | 6 |
| | | | | | | | | | | 5.65 |
| | | | | | | | | | | 5.65 |
| | | | | | | | | | | 6 |
| | 6 | 5.88 | 5.88 | 5.88 | 5.88 | 5.88 | 5.88 | 5.88 | 6 | inches |

- 6-foot models (1357 / 1358 / 1387 / 1388)

| | | | | | | | | | | | |
|-----------|---|------|------|------|------|------|------|------|------|---|--------|
| 36 points | | | | | | | | | | | 6 |
| | | | | | | | | | | | 5.5 |
| | | | | | | | | | | | 5.5 |
| | | | | | | | | | | | 6 |
| | 6 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 6 | inches |

Effective Exhaust Filter Area:

- 4-foot models (1355 / 1356 / 1385 / 1386): 16.8” x 22.8” = 2.66 sq ft
- 6-foot models (1357 / 1358 / 1387 / 1388): 16.8” x 34.8” = 4.06 sq ft

Testing Information (continued)

Inflow Area:

- 4-foot models (1355 / 1356 / 1385 / 1386): Front opening – 3.28 sq ft
- 6-foot models (1357 / 1358 / 1387 / 1388): Front opening – 4.90 sq ft

Calculation:

- Average exhaust velocity (V2) = Sum of measurements / Number of readings
- Exhaust Volume (V3) = Average velocity (V2) x Effective filter area (A3)
- Inflow velocity (V1) = Exhaust volume (V3) / Work opening area (A2)

Acceptance:

- 100 – 110 FPM

Downflow Velocity – Uniform Cabinet

Description:

- Measures the velocity of air flow onto the work surface through the supply filter.

Equipment:

- Thermal Anemometer, or equivalent (hotwire)
- Freestanding Fixture, or equivalent

Method:

1. Operate the unit in the work position for approximately 20 minutes.
2. Insert the anemometer probe into the probe stand, adjusting for a height of 4 inches (10 cm) above the bottom edge of the window opening while in the work position.
3. Record the readings on a horizontal plane 4 inches (10 cm) above the bottom edge of the window opening while in the work position, in a grid pattern not to exceed 6 inches (15 cm) x 6 inches (15 cm).

Testing Information (continued)

Grid Pattern:

- 4-foot models (1355 / 1356 / 1385 / 1386)

21 points

| | | | | | | | | | |
|---|------|------|------|------|------|------|------|---|--------|
| | | | | | | | | | 6 |
| | | | | | | | | | 5.65 |
| | | | | | | | | | 5.65 |
| | | | | | | | | | 6 |
| 6 | 5.88 | 5.88 | 5.88 | 5.88 | 5.88 | 5.88 | 5.88 | 6 | inches |

- 6-foot models (1357 / 1358 / 1387 / 1388)

33 points

| | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|-----|--------|
| | | | | | | | | | 6 | |
| | | | | | | | | | 5.5 | |
| | | | | | | | | | 5.5 | |
| | | | | | | | | | 6 | |
| 6 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 6 | inches |

Calculation:

- Average Downflow Velocity = Sum of all measurements / Number of readings

Correction measures:

- Enter the service level and activate S1 (chapter 14.2.2), change S1 until the desired velocity is reached and save the new value.
- If the velocity can't be adjusted due to clogging of the filters, change the supply filter.
- If the filter is in order, change the supply blower.

Note Check of alarm limits: If S1 or S2 are changed, the alarm limits S3 and S4 have to be checked and saved again. s

HEPA Filter Leak Test

Description:

- Determines the integrity of the downflow and exhaust filters.

Equipment:

- Aerosol Photometer, or equivalent
- Aerosol Generator, or equivalent

Filters that can be Accessed and Scanned

Method:

1. Allow the cabinet to operate for approximately 20 minutes.
2. Remove the work tray and protective covers, as appropriate.
3. Introduce the aerosol from the generator in the center rear of the work area, using a tee fitting to evenly distribute the aerosol.
4. If desired, and if the cabinet has not been used with hazardous materials since an effective decontamination, the upstream concentration can be measured. If desired, connect the photometer sample hose to the appropriate (supply or exhaust) test hose connection (exhaust test hose - right side / supply test hose - left side) from under the work tray.
5. Using either the appropriate upstream challenge measurement or calculated challenge value, set the photometer accordingly.
6. Scan the downstream side and perimeter of the filter as prescribed in NSF/ANSI 49-2004, Annex F.

Acceptance:

- Filters scanned – 0.01% of upstream concentration at any point

Filters that cannot be Accessed or Scanned

Method:

1. Set up as in steps 1 through 5 above
2. In the duct, downstream of the filter, sample in accordance with NSF/ANSI Standard 49, 2004.

Acceptance:

- Filters not scanned – 0.005% of upstream concentration

Airflow Pattern Test

Description:

- Determines the internal and external behavior of the air movement.

Equipment:

- Cold smoke (titanium tetrachloride)

Method:

- Downflow:

Pass smoke across the centerline of the work surface, 4 inches (10 cm) above the work opening.

- View Screen Retention:

Pass smoke 1 inch (2.5 cm) behind the window opening, 6 inches (15 cm) above the work opening.

- Work Opening Edge Retention:

Pass smoke around the entire outside work opening, approximately 1.5 inches (3.8 cm) away from the cabinet.

- Window Seal Test:

Pass smoke up both sides and across the top of the window opening from inside the work area, approximately 2 inches (5 cm) from the edges.

Acceptance:

- No smoke shall have dead spots, reflux or escape the cabinet once drawn in.

Elect. Leakage , Ground Resistance, Polarity Tests

Description:

- Refer to UL 61010-1

Site Installation Assessment Tests

Description:

- Verify the unit is integrated properly into the facility.

Airflow Alarms

Description:

- Verify the airflow alarms will activate within 15 seconds when there is a 20% loss.

Equipment:

- Thermal Anemometer or equivalent (hotwire)
- Anemometer probe holder, part 1911325
- Shortridge ADM-870 or equivalent
- Flowhood series 8400 or equivalent

Method:

- Downflow:

Enter the service level and activate S03.

Verify that the average downflow velocity is 20% lower than the rated velocity by following the method described in chapter 5.4. Change and save S03 if needed and leave the service level. Enter the service level again and set S01 to the value of S03 -0.5%. The LED "AIRFLOW STABLE" must change from green to red. Leave the service level without saving this value by pressing the "acknowledge alarm" key.

- Inflow:

Enter the service level and activate S04.

Verify that the inflow velocity is 20% lower than the rated velocity by following one method described in chapters 5.1, 5.2 and 5.3. Change and save S04 if needed and leave the service level.

Enter the service level again and set S02 to the value of S04 -0.5%.

The LED "AIRFLOW STABLE" must change from green to red. Leave the service level without saving this value by pressing the "acknowledge alarm" key.

Acceptance:

- Unit alarm activates within 15 seconds when the downflow and inflow velocity is set to the correct values and the LED „Airflow STABLE“ changes from green to red (as described above).

Sash Alarms

Description:

- Verify the window alarms are operating properly

Equipment:

- Operating manual

Method:

- Raise the window 1 inch (2.5 cm) above work position

Acceptance:

- Window alarm activates

Exhaust System Performance

Description:

- Verify the exhaust system is functioning properly

Canopy Connections

Equipment:

- Cold smoke (titanium tetrachloride)

Method:

- Pass smoke around the air gap, to ensure negative pressure exists

Acceptance:

- No smoke refluxes back into the room once drawn into the canopy

Direct Connections

Equipment:

- Manometer, or equivalent

Method:

- Measure static pressure in the duct between the unit and balancing dampers.

Acceptance:

- Negative pressure exists

Note Standard: For additional and detailed information regarding these tests, refer to NSF/ANSI Standard 49, 2004. s

| Device type: | | Part number: | |
|-----------------------------|--------------|-------------------------|------------------|
| Serial number: | | Service number: | |
| Location: | | Operator's note: | |
| Technician / Company | Notes | Date | Signature |
| | | | |
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