thermoscientific

Class II, Type A2 Biological Safety Cabinet 1500 Series A2,

Made in USA

Operating Manual

7021555EN • Revision A • 11/26/24

ThermoFisher SCIENTIFIC

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 Fisher Scientific makes no representations or warranties with respect to this manual. In no event shall Thermo Fisher 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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Contents

1 General Notes

1.1 About this Manual

The Thermo Scientific™ 1500 Series Class II, Type A2 biological 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 manual provides instructions on how to use the 1500 Series A2 most effectively and safely. Contact Technical services for printed copy of this user manual, if required.

This manual covers the models shown below:

Stainless Steel Interior		Coated Interior		Size	Voltage
10 inch opening	8 inch opening	10 inch opening	8 inch opening		
1522A2	1541A2	1520A2	1539A2	3 ft	120 V
1523A2*	1542A2*	1521A2*	1540A2*	3 ft	120 V
1532A2	1592A2	1530A2	1590A2	3 ft	230 V
1533A2*	1593A2*	1531A2*	1591A2*	3 ft	230 V
1545A2	1505A2	1555A2	1525A2	4 ft	120 V
1575A2*	1535A2*	1585A2*	1595A2*	4 ft	120 V
1554A2	1506A2	1544A2	1526A2	4 ft	230 V
1576A2*	1536A2*	1586A2*	1596A2*	4 ft	230 V
1570A2	1552A2	1568A2	1550A2	5 ft	120 V
1571A2*	1553A2*	1569A2*	1551A2*	5 ft	120 V
1582A2	1566A2	1580A2	1572A2	5 ft	230 V
1583A2*	1567A2*	1581A2*	1573A2*	5 ft	230 V
1547A2	1507A2	1557A2	1527A2	6 ft	120 V
1577A2*	1537A2*	1587A2*	1597A2*	6 ft	120 V
1559A2	1508A2	1549A2	1528A2	6 ft	230 V
1578A2*	1538A2*	1588A2*	1598A2*	6 ft	230 V

* Includes cabinet, adjustable height stand, UV light and armrest.

1.2 Intended Use

The 1500 Series Class II, Type A2 biosafety cabinet is for installation and operation in microbiological and biotechnical laboratories of safety levels 1, 2 and 3 and offers protection for personnel, product, and environment in laboratories and similar environments working within biological hazards.

The device meets the requirements of NSF/ANSI 49 and has been validated to this standard by NSF. Proper operation includes initial and regular field testing as specified in the standard including inflow velocity of 100 – 110 fpm (0.508 – 0.558 m/s) and average down flow velocity of 58 – 68 fpm (0.295 – 0.345 m/s).

This device is intended for professional use only and must only be operated by trained staff.

It is the customers' responsibility to ensure that the performance of the products is suitable for customers' specific use or application.

WARNING: The safety cabinet must not be used in laboratories that do not comply with the requirements of safety levels 1, 2, and 3.

The unit must not be operated as a Class II safety 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 or addressed appropriately.

WARNING: The alarm system must not be tampered with or disabled. If alarm system components have been removed or disabled for service or repairs, the unit must only be released for operation if all alarm system components are functioning again properly.

The filters installed in the device are not capable of separating gaseous substances. Consider proper connection of the safety cabinet to external exhaust appropriate for such substances and do not work with or store substances in the device:

- are toxic which in quantity or concentration,
- if a reaction 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.

1.3 Signal Words and Symbols

1.3.1 Symbols Used in the Operating Instructions

CAUTION: This unit contains components and assemblies that are susceptible to damage from Electrostatic Discharge (ESD).

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.

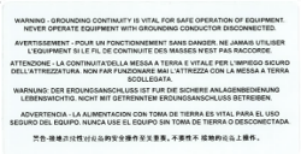
CAUTION: Important operating and/or maintenance instructions. Read the accompanying text carefully.

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

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

1.3.2 Symbols on the Device

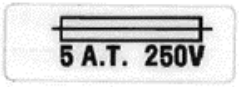
WARNING: Decontaminate cabinet (Indicates to decontaminate cabinet before opening the filter access cover).



WARNING: Grounding continuity.

LFBSC WARNING LABEL (Provides operating instructions).

Protective ground symbol.

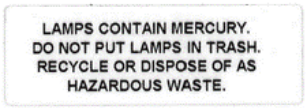


5A Fuse marking symbol (Indicates internal outlet fusing).

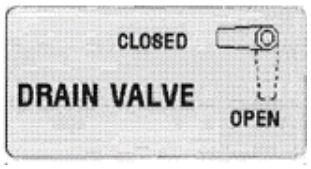
WARNING: Electric shock (Provides warning to customer for potential shock).

Refer to manual (Indicates refer manual for more details).

Maximum total outlet load 5A (Indicates maximum load for all the internal outlets inside the chamber).



Mercury lamps sticker (Provides direction for disposal of lamps).

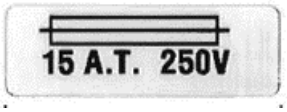


Drain valve sticker (Indicates closing and opening direction).

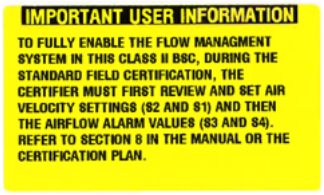
WARNING: Hand injury symbol (Indicates possible pinch points which may cause personal injury).

Exhaust sample port label (Indicates to decontaminate cabinet before opening).

Supply sample port label (Indicates to decontaminate cabinet before opening).



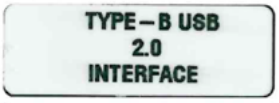
15A fuse marking label (Indicates mainboard fusing).



WARNING: Airflow setting (Provides direction for certifier to set the airflow velocities and alarms during filed certification).

Inspect for damage label (Provides attention to the customer to check for the damage while receiving the product).

Unity lab services label (Indicates service contact details).



TYPE-B USB 2.0 LABEL (Indicates USB interface).

STANDBY STICKER (Indicates standby mode position to the customer).

cULus certification

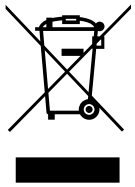
This product meet all the applicable requirements of the NSF/ANSI 49 standard.

CE conformity mark: confirms conformity according to EU Guidelines.

1.4 Regulatory Compliance

1.4.1 WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EC. It is marked with the adjacent symbol.



Thermo Fisher Scientific has contracted with companies for recycling/disposal in each EU Member State. For further information, email to weee.recycle@thermofisher.com.

1.4.2 Safety & EMC

This product complies with below regulations or standards related to Safety and EMC:

- Low Voltage Directive 2014/35/EU
- IEC 61010-1:2010/AMD1:2016
- EMC Directive 2014/30/EU
- IEC 61326-1:2020

FCC: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

ICES: This ISM device complies with Canadian ICES-001.

2 Technical Specifications

Table 1. Biological Safety Cabinet Technical Specifications for 4 ft & 6 ft Models

Dimensions		
Description	4 ft Models (10 inch window opening work position) 1544A2, 1545A2, 1554A2, 1555A2, 1575A2, 1576A2, 1585A2, 1586A2	6 ft Models (10 inch window opening work position) 1547A2, 1549A2, 1557A2, 1559A2, 1577A2, 1578A2, 1587A2, 1588A2
	4 ft Models (8 inch window opening work position) 1505A2, 1506A2, 1525A2, 1526A2, 1535A2, 1536A2, 1595A2, 1596A2	6 ft Models (8 inch window opening work position) 1507A2, 1508A2, 1527A2, 1528A2, 1537A2, 1538A2, 1597A2, 1598A2
Exterior Dimensions		
Width (mm / in)	1300 / 51.2	1900 / 74.8
Depth (mm / in)	805 / 31.7	
Height (mm / in)	1568 / 61.8	
Interior Dimensions		
Width (mm / in)	1200 / 47.2	1800 / 70.9
Depth (mm / in)	630 / 24.8	
Height (mm / in)	780 / 30.7	
Front Window		
Working Position (mm / in)	254 / 10 - pertains to all 4 ft & 6 ft models listed above with 10 inch window work position	203 / 8 - pertains to all 4 ft & 6 ft models listed above with 8 inch window work position
Opening max. (mm / in)	432 / 17	
Working surface height with a adjustable height stand		
Height Range (mm / in)	750 / 29.5 to 950 / 37.4	
SmartPort - Diameter (mm / in)	76.0 / 3.0	
Side wall access ports for service valves - Diameter (mm / in)	23 / 0.91	
Distance from bottom of cabinet to center of SmartPort (mm / in)	365.8 / 14.4	

Table 1. Biological Safety Cabinet Technical Specifications for 4 ft & 6 ft Models (Continued)

Dimensions	
Distance from bottom of cabinet to center of lower side wall access ports for service valves (mm / in)	227.2 / 8.9
Distance from bottom of cabinet to center of upper side wall access ports for service valves (mm / in)	354.2 / 13.9
Distance from back panel	
Smart Port (mm / in)	201.8 / 7.9
First access port for service valve (mm / in)	278 / 10.9
Second access port for service valve (mm / in)	328.8 / 12.9
Third access port for service valve (mm / in)	379.6 / 14.9

Table 2. Biological Safety Cabinet Technical Specifications for 3 ft & 5 ft Models

Dimensions		
Description	3 ft Models (10 inch window opening work position) 1520A2, 1521A2, 1522A2, 1523A2, 1530A2, 1531A2, 1532A2, 1533A2	5 ft Models (10 inch window opening work position) 1568A2, 1569A2, 1570A2, 1571A2, 1580A2, 1581A2, 1582A2, 1583A2
	3 ft Models (8 inch window opening work position) 1539A2, 1540A2, 1541A2, 1542A2, 1590A2, 1591A2, 1592A2, 1593A2	5 ft Models (8 inch window opening work position) 1550A2, 1551A2, 1552A2, 1553A2, 1566A2, 1567A2, 1572A2, 1573A2
Exterior Dimensions		
Width (mm / in)	1000 / 39.4	1600 / 63.0
Depth (mm / in)	805 / 31.7	
Height (mm / in)	1568 / 61.8	
Interior Dimensions		
Width (mm / in)	900 / 35.4	1500 / 59.1
Depth (mm / in)	630 / 24.8	
Height (mm / in)	780 / 30.7	
Front Window		
Working Position (mm / in)	254 / 10 - pertains to all 3 ft & 5 ft models listed above with 10 inch window work position	203 / 8 - pertains to all 3 ft & 5 ft models listed above with 8 inch window work position
Opening max. (mm / in)	432 / 17	
Working surface height with a adjustable height stand		
Height Range (mm / in)	750 / 29.5 to 950 / 37.4	
Smart Port - Diameter (mm / in)	76.0 / 3.0	
Side wall access ports for service valves - Diameter (mm / in)	23 / 0.91	
Distance from bottom of cabinet to center of Smart Port (mm / in)	365.8 / 14.4	

Table 2. Biological Safety Cabinet Technical Specifications for 3 ft & 5 ft Models (Continued)

Dimensions	
Distance from bottom of cabinet to center of lower side wall access ports for service valves (mm / in)	227.2 / 8.9
Distance from bottom of cabinet to center of upper side wall access ports for service valves (mm / in)	354.2 / 13.9

***** Declaration of Conformity available from the factory, on request.

Table 3. Volume, Weight, and Load Specifications for 4 ft & 6 ft Models

Volume, weights, and loads		
Description	4 ft Models (10 inch window opening work position) 1544A2, 1545A2, 1554A2, 1555A2, 1575A2, 1576A2, 1585A2, 1586A2	6 ft Models (10 inch window opening work position) 1547A2, 1549A2, 1557A2, 1559A2, 1577A2, 1578A2, 1587A2, 1588A2
	4 ft Models (8 inch window opening work position) 1505A2, 1506A2, 1525A2, 1526A2, 1535A2, 1536A2, 1595A2, 1596A2	6 ft Models (8 inch window opening work position) 1507A2, 1508A2, 1527A2, 1528A2, 1537A2, 1538A2, 1597A2, 1598A2
Volume		
Drain pan (l / gal)	20 / 5.3	30 / 7.9
Weights		
Cabinet (Kg / lb)	193 / 426	272 / 599
Stand (Kg / lb)	25.2 / 55.6	28.6 / 63.1
Loads		
Maximum load on work surface (kg/lb)	50 / 110	
Ambient conditions (indoor use only) **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/s	4 ft models 10”: 0.2 / 0.19 4 ft models 8”: 0.18 / 0.17	6 ft models 10”: 0.4 / 0.38 6 ft models 8”: 0.36 / 0.34
Room temperature rise		
Above room temp with window closed °K	< 2	< 2
Ergonomics		
Noise level* dB(A)	4 ft models 10”: ≤ 63 4 ft models 8”: ≤ 62	6ft models 10”: ≤ 65 6ft models 8”: ≤ 64
Average Illumination (Lx / FC)	4 ft models SS interior: 1130 / 105 4 ft models SC interior: 1163 / 108	6 ft models SS interior: 1130 / 105 6 ft models SC interior: 1152 / 107

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

Table 4. Volume, Weights, and Loads Specifications for 3 ft & 5 ft Models

Volume, weights, and loads		
Description	3 ft Models (10 inch window opening work position) 1520A2, 1521A2, 1522A2, 1523A2, 1530A2, 1531A2, 1532A2, 1533A2	5 ft Models (10 inch window opening work position) 1568A2, 1569A2, 1570A2, 1571A2, 1580A2, 1581A2, 1582A2, 1583A2
	3 ft Models (8 inch window opening work position) 1539A2, 1540A2, 1541A2, 1542A2, 1590A2, 1591A2, 1592A2, 1593A2	5 ft Models (8 inch window opening work position) 1550A2, 1551A2, 1552A2, 1553A2, 1566A2, 1567A2, 1572A2, 1573A2
Volume		
Drain pan (l / gal)	15 / 4.0	25 / 6.6
Weights		
Cabinet (Kg / lb)	169 / 372	240 / 529
Stand (Kg / lb)	23.5 / 51.9	26.9 / 59.4
Loads		
Maximum load on work surface (kg / lb)	50 / 110	
Ambient conditions (indoor use only) 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/s	3 ft models 10”: 0.17 / 0.16 3 ft models 8”: 0.15 / 0.14	5 ft models 10”: 0.31 / 0.29 5 ft models 8”: 0.28 / 0.27
Room temperature rise		
Above room temp with window closed °K	< 2	< 2
Ergonomics		
Noise level* dB(A)	3 ft models 10”: ≤ 63 3 ft models 8”: ≤ 62	5 ft models 10”: ≤ 65 5 ft models 8”: ≤ 64
Average Illumination (Lx / FC)	3 ft models SS interior: 936 / 87 3 ft models SC interior: 980 / 91	5 ft models SS interior: 1260 / 117 5 ft models SC interior: 1335 / 124

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

Table 5. Electrical Data for 3 ft & 5 ft models and 4 ft & 6 ft Models

Electrical data		
Models (Nominal voltages ±10%)	120 V Models - 4 ft / 6 ft 1505A2, 1507A2, 1525A2, 1527A2, 1535A2, 1537A2, 1545A2, 1555A2, 1575A2, 1585A2, 1547A2, 1557A2, 1577A2, 1587A2, 1595A2, 1597A2	230 V Models - 4 ft / 6 ft 1506A2, 1508A2, 1526A2, 1528A2, 1536A2, 1538A2, 1544A2, 1549A2, 1554A2, 1576A2, 1586A2, 1559A2, 1578A2, 1588A2, 1596A2, 1598A2
	120 V Models - 3 ft / 5 ft 1520A2, 1521A2, 1522A2, 1523A2, 1539A2, 1540A2, 1541A2, 1542A2, 1550A2, 1551A2, 1552A2, 1553A2, 1568A2, 1569A2, 1570A2, 1571A2	230 V Models - 3 ft / 5 ft 1530A2, 1531A2, 1532A2, 1533A2, 1566A2, 1567A2, 1572A2, 1573A2, 1580A2, 1581A2, 1582A2, 1583A2, 1590A2, 1591A2, 1592A2, 1593A2
Voltage		
Rated voltage V	1/N/PE AC, 120 V, 50/60 Hz	1/N/PE AC, 230 V, 50/60 Hz
Blower voltage V	48 V DC	
Current		
Power consumption maximum A	9 / 11	7 / 9
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	1080 / 1340	1630 / 2020
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 m / 10 ft) NEMA 5-15 plug	CEE 7/7 Plug
Lighting power (W)	3ft model: 18 4ft model: 24	5ft model: 30 6ft model: 30

***** With additional 5A load on cabinet receptacles, blowers at 100% and cabinet lighting switched on.

Table 6. Airflow System for 4 ft & 6 ft Models

Airflow System		
Description	4 ft Models (10 inch / 8 inch window opening work position) 1505A2, 1506A2, 1525A2, 1526A2, 1535A2, 1536A2, 1544A2, 1545A2, 1554A2, 1555A2, 1575A2, 1576A2, 1585A2, 1586A2, 1595A2, 1596A2	6 ft Models (10 inch / 8 inch window opening work position) 1507A2, 1508A2, 1527A2, 1528A2, 1537A2, 1538A2, 1547A2, 1549A2, 1557A2, 1559A2, 1577A2, 1578A2, 1587A2, 1588A2, 1597A2, 1598A2
Airflow / Airflow Velocities		
Inflow m / s	0.53	
Inflow ft / min	105	
downflow m / s	0.32	
downflow ft / min	63	
Air Volume		
Overall volume flow m^3/h (10” / 8”)	1415 / 1298	2122 / 1947
Overall volume flow ft^3/min (10” / 8”)	833 / 764	1249 / 1146
downflow volume flow m^3/h (10” / 8”)	829	1244
downflow volume flow ft^3/min (10” / 8”)	488	732
Exhaust air volume flow m^3/h (10” / 8”)	585 / 468	878 / 702
Exhaust air volume flow ft^3/min (10” / 8”)	344 / 276	517 / 413
Filters		
Type	HEPA (H14 per EN 1822)	
Material	Fiber glass	
Filtration Efficiency at MPPS %	99.995	
Filtration Efficiency at 0.3 µm particle size %	99.999	
Downflow Filter Dimensions		
Height mm / in	457 / 18	
Length mm / in	1220 / 48	1830 / 72
Depth mm / in	90 / 3.54	

Table 6. Airflow System for 4 ft & 6 ft Models (Continued)

Airflow System			
Exhaust Filter Dimensions			
Height mm / in		457 / 18	
Length mm / in	610 / 24		915 / 36
Depth mm / in		117 / 4.61	

Table 7. Airflow System for 3 ft & 5 ft Models

Airflow system		
Description	3 ft Models (10 inch / 8 inch window opening work position) 1520A2, 1521A2, 1522A2, 1523A2, 1530A2, 1531A2, 1532A2, 1533A2, 1539A2, 1540A2, 1541A2, 1542A2, 1590A2, 1591A2, 1592A2, 1593A2	5 ft Models (10 inch / 8 window opening work position) 1550A2, 1551A2, 1552A2, 1553A2, 1566A2, 1567A2, 1568A2, 1569A2, 1570A2, 1571A2, 1572A2, 1573A2, 1580A2, 1581A2, 1582A2, 1583A2
Airflows / Airflow velocities		
Inflow m / s	0.53	
Inflow ft / min	105	
down flow m / s	0.32	
down flow ft / min	63	
Air volume		
Overall volume flow m^3/h (10” / 8”)	1061 / 973	1768 / 1622
Overall volume flow ft^3/min (10” / 8”)	625 / 573	1041 / 955
down flow volume flow m^3/h (10” / 8”)	622	1037
down flow volume flow ft^3/min (10” / 8”)	366	610
Exhaust air volume flow m^3/h (10” / 8”)	439 / 351	732 / 585
Exhaust air volume flow ft^3/min (10” / 8”)	258 / 207	431 / 344
Filters		
Type	HEPA (H14 per EN 1822)	
Material	Fiber glass	
Filtration Efficiency at MPPS %	99.995	
Filtration Efficiency at 0.3 µm particle size %	99.999	
Down flow Filter Dimensions		
Height mm / in	457 / 18	
Length mm / in	915 / 36	1525 / 60
Depth mm / in	90 / 3.54	

Table 7. Airflow System for 3 ft & 5 ft Models (Continued)

Airflow system	
Exhaust Filter Dimensions	
Height mm / in	457 / 18
Length mm / in	610 / 24
Depth mm / in	117 / 4.61

3 Description

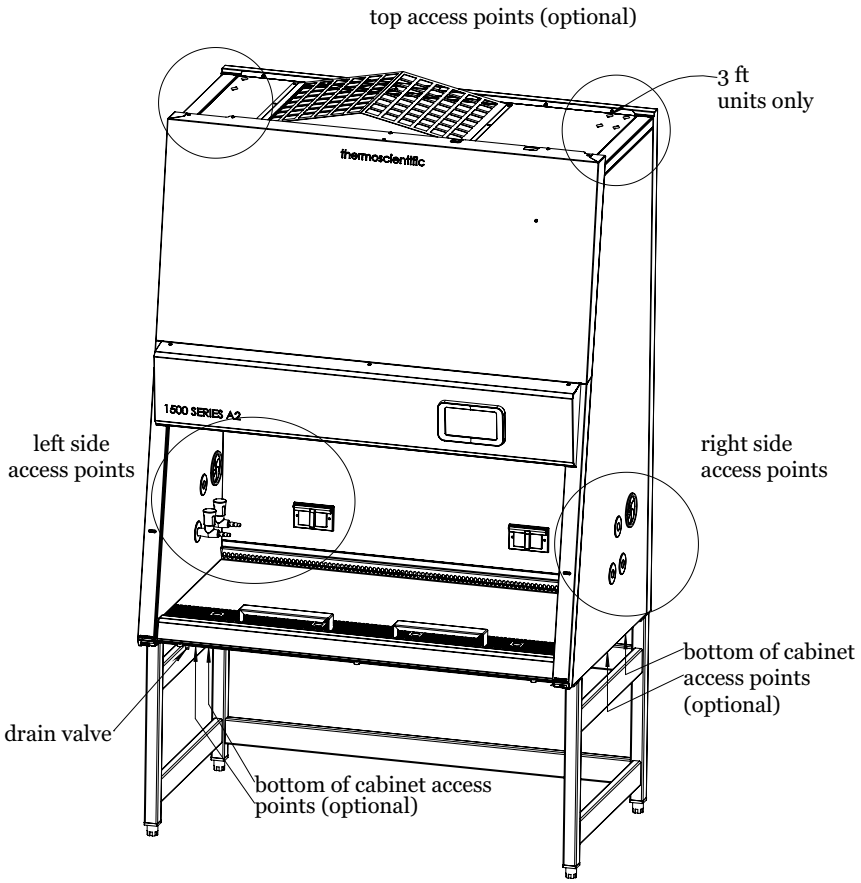


Figure 1. Unit Components

The Thermo Scientific™ 1500 Series A2 biosafety cabinet offers innovative Smart Flow™ Plus technology; an automatic airflow compensation system that adjusts motor speeds independently as filters load, without the use of a manual damper. The Smart Flow™ Plus system ensures safe working conditions, even between annual certifications.

The plenum assembly consists of two plenums; one for the down flow blower and other for the exhaust air blower. Each blower includes a filter. The filtered exhaust air is discharged through an opening in the top of the cabinet.

Chamber lighting includes two LED bulbs for 3, 4, 5 & 6 foot models.

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

Three 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 manually adjustable from 30” to 38” working height, and a fixed 34” working height with attached casters and an electric height adjustable stand.

Every cabinet includes a standard stainless steel one-piece flat work surface, while an indented stainless steel work surface is available as an optional addition. Optional stainless steel arm rests or optional silicone padded stainless steel arm rests ensures a comfortable working position for the user and minimizes blockage of airflow at the front grille.

Table 8. Standard Configuration: Internal Outlets as Accessory Power Source

Two duplex right and left side	Two single right and left side
1505A2, 1507A2, 1520A2, 1521A2, 1522A2, 1523A2, 1525A2, 1527A2, 1535A2, 1537A2, 1539A2, 1540A2, 1541A2, 1542A2, 1545A2, 1547A2, 1550A2, 1551A2, 1552A2, 1553A2, 1555A2, 1557A2, 1568A2, 1569A2, 1570A2, 1571A2, 1575A2, 1577A2, 1585A2, 1587A2, 1595A2, 1597A2	1506A2, 1508A2, 1526A2, 1528A2, 1530A2, 1531A2, 1532A2, 1533A2, 1536A2, 1538A2, 1544A2, 1549A2, 1554A2, 1559A2, 1566A2, 1567A2, 1572A2, 1573A2, 1576A2, 1578A2, 1580A2, 1581A2, 1582A2, 1583A2, 1586A2, 1588A2, 1590A2, 1591A2, 1592A2, 1593A2, 1596A2, 1598A2

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.

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

3.1 Safety Systems

3.1.1 Negative Pressure Air System

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

3.1.2 Personnel Protection

Inflow air along the entire work 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.

3.1.3 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).

3.1.4 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 should remain closed as it blocks out the UV rays. Opening the window will cause the UV light to turn off.

3.1.5 Digital Airflow Verification (DAVe)

Independent monitoring of inflow and downflow air velocities guarantees that the product and personnel protection are consistently maintained. 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.

3.1.6 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.

3.2 HEPA Filters

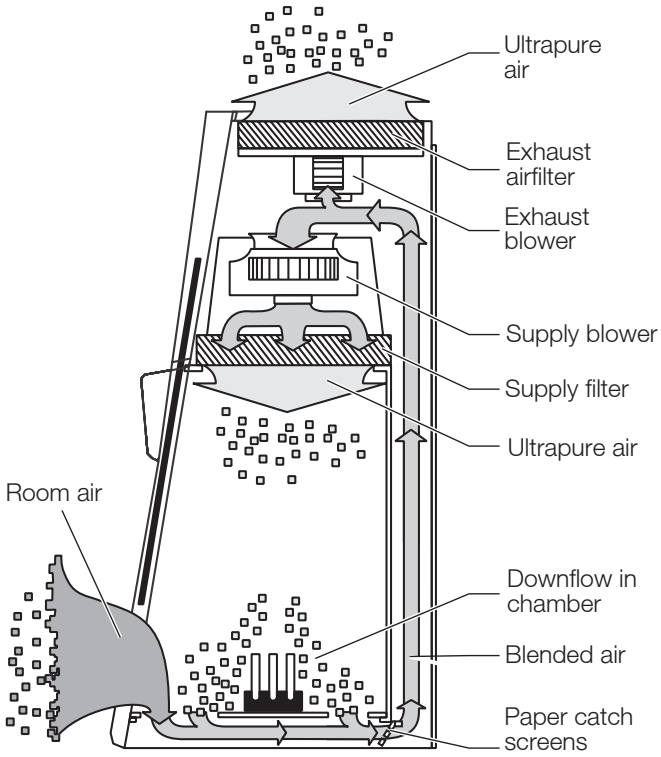


Figure 2. Airflow Filtering System

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

3.3 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.

3.4 Use of the Window

The sample chamber is accessible through various positions of the front window. The working position of the window is an 8” or 10” opening, +0.25”, -0.75” (depending on model - check data label and first page of this manual). For loading the chamber, the

window opens fully. For decontamination and energy saving, enter into standby mode by closing the window. When the window is closed, the blower speed is reduced; minimizing energy consumption and noise emittance without compromising particulate containment inside the work chamber.

Note: The working and loading window positions are indicated on the user interface, as controlled by micro switches and displayed on the GUI.

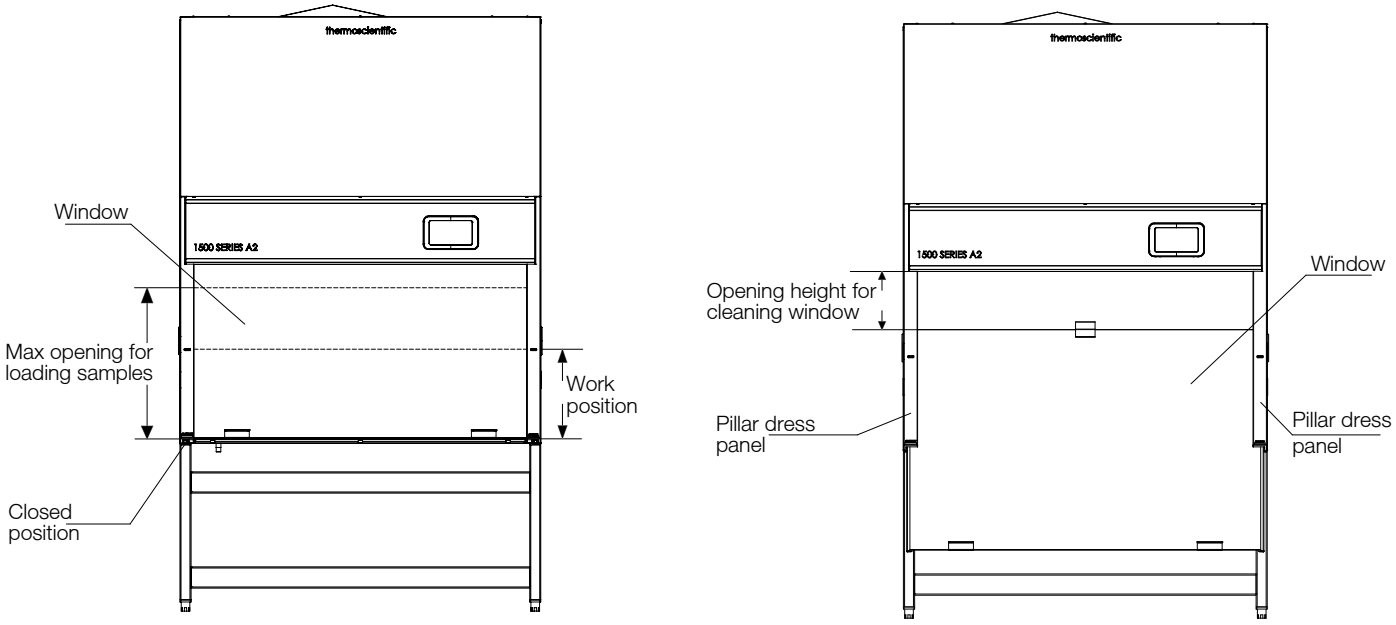


Figure 3. Window Openings

To place the window at the work position, move it to the area of the top "dimple" **Figure 4** and watch for the window status as **Ready** on display screen **Figure 5**. If the window is moved away from the work position, window status is displayed as **Open** (see **Figure 7**).

To place the window in the closed or reduced mode position, move it to the "Standby" position **Figure 6** and watch for the **Standby mode** on display screen **Figure 6** and make sure that the window touches the gasket below. If the window is not positioned correctly, or is moved away from stand by position, display screen will show window status as open **Figure 7**.

Figure 4. Work Position

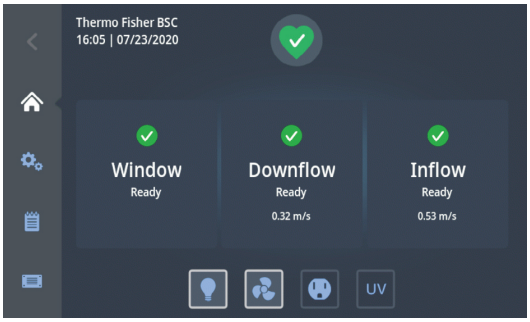


Figure 5. Window Ready

Figure 6. Standby Mode

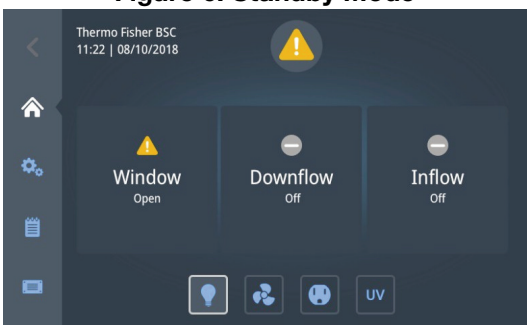


Figure 7. Window Open

Our patented SmartClean™ window design easily lowers below the work position for replacing the sample chamber light bulbs (See **Figure 3**).

CAUTION: Do not use force, if the front window gets jam or is difficult to move. Contact Technical Services immediately and do not attempt to repair the problem yourself.

3.5 Unit Interface

The standard unit includes accessory outlets, service valve access ports, a USB connection and a remote alarm connection.

The power cord, to be connected to the power source, is located on the top and near the front of the cabinet.

The accessory outlets (max 5A) are located on the interior chamber back wall.

Two fuse holders for 5A accessory outlet fuses and one USB connection (signal source, not customer interface) are located on top of the unit.

Service valve access ports are located on each side of the cabinet. To use these ports, remove the center perforation.

Note: Service valves are available as optional accessories.

The remote alarm accessory can be used for notification of window movement or access.

WARNING: If a gas burner is 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.

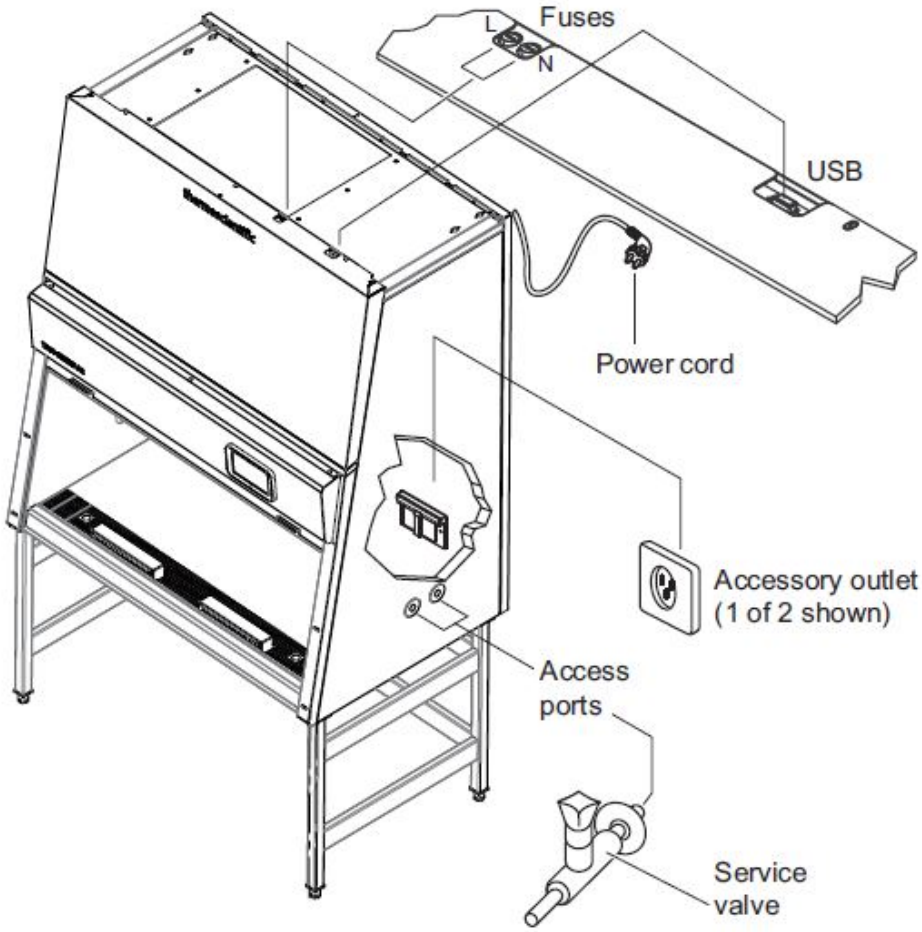


Figure 8. Interfaces (2 of 4 access ports are shown)

3.6 Chamber Lighting

The Thermo Scientific™ 1500 Series A2 bio safety cabinet offers a bright workspace for a more comfortable working environment. Models with coated rear and side walls resist glare and make it easier for the user to work safely.

Lighting for the sample chamber includes two LED bulbs for 3, 4, 5 & 6 foot units. The bulbs are installed behind the light canopy.

3.7 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 the **UV** key on the control panel with the window in the closed position. If the window is opened, the procedure is immediately canceled.

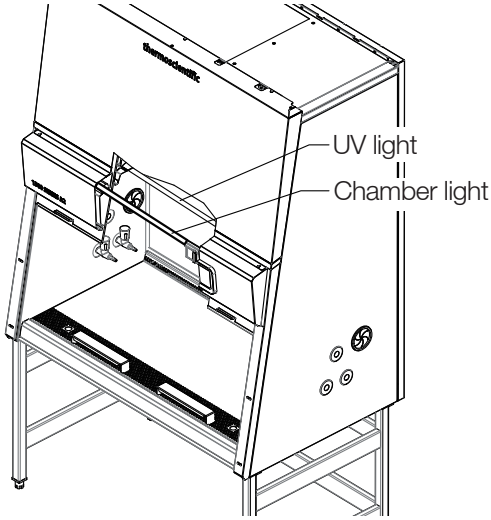


Figure 9. UV Light and Chamber Light

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

3.8 Work Area

A 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” (20 cm) from each other. To attach the armrests, insert into the first perforated track of the work tray.

Note: Pay attention to the maximum work load details shown in section **2 Technical Specifications**.

WARNING: Work safety is assured only if the armrests are used correctly.

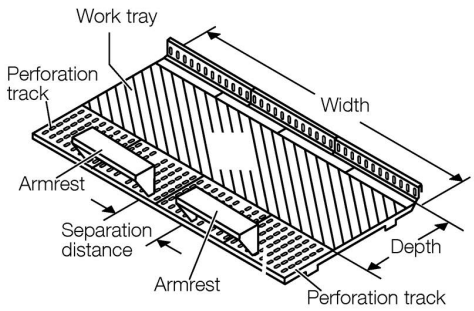


Figure 10. Work Tray

4 Installation

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

- Up to 6,562 ft (2000 m) above sea level.
- We recommend the outlet on the wall be installed above the biological safety cabinet. The power cord serves as the main disconnect.
- An appropriate location that can support the weight of the device.
- If the factory-approved stand is not purchased, the holding device must support two times the cabinet weight.
- Adequate room height: For devices that are not connected to an exhaust system, A distance of at least 12" between the exhaust air opening at the device and the room ceiling is recommended by NSF/ANSI 49.
- Equipped with an appropriate ventilation system.
- Room temperature between 10 °C and 40 °C (50 °F and 104 °F).
- Relative humidity must not exceed 90%, non condensing.
- 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 biological safety cabinet air system.

When positioning the cabinet, make sure the counterweight on the back of the unit can move freely. The minimal distance to the wall or adjacent objects should be 3” (7.6 cm), unless upper wall brackets or rear covers are used.

Note: Ambient conditions!

If ambient conditions vary from those described above, please contact Thermo Fisher Scientific for assistance in installing the device.

4.1 Optional Exhaust Transition

The part numbers for the optional thimble exhaust connection are as follows:

- P/N: 1911505 for 3, 4 and 5 foot units
- P/N: 1911506 for 6 foot units

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

An available accessory for the biological safety cabinet exhaust system is an exhaust thimble connection for an on-site exhaust system with blower. According to NSF/ANSI Standard 49, an exhaust alarm is required with this connection and available under Exhaust Alarm (P/N 1910185).

4.2 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 3, 4, 5 and 6 foot models:

1. Turn the unit off and disconnect it from the power source.
2. Thoroughly clean the surfaces around the exhaust opening and the accessory to be installed, to ensure that they are free of debris.

3. Secure the accessory by tightening the supplied retaining screws (M5) wrench-tight.
4. Use the adjustment nuts on the sliding panel to set the gap height to an opening of 2”.

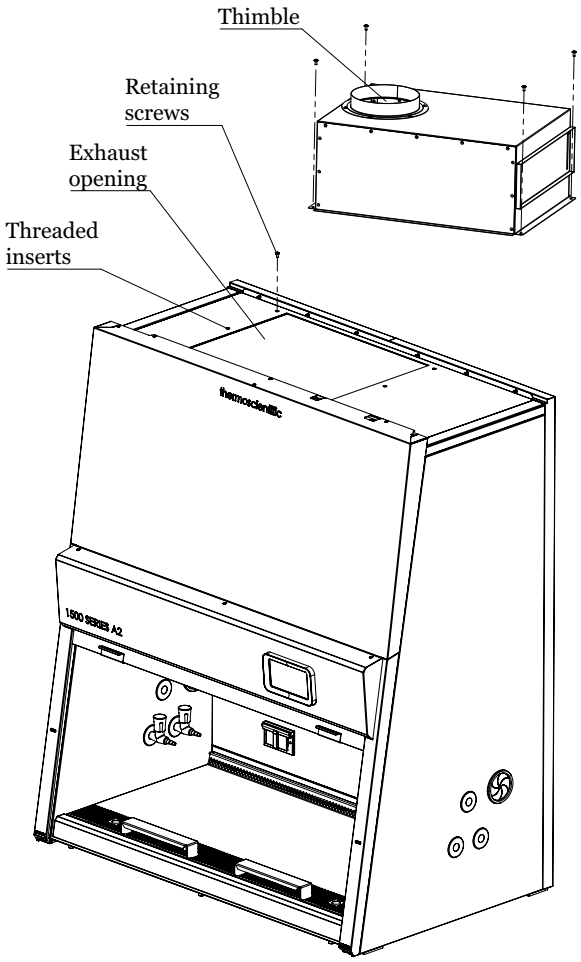


Figure 11. Thimble

4.2.1 Connecting Sleeve

1. Place the connecting sleeve onto the connecting opening of the accessory and secure it with the screws.

   Note: The positions of the cover and connecting sleeves can be positioned to provide the connecting opening on the side or top of the thimble accessory.

2. Fit the connecting pipe [200 mm (8 in)] of the on-site exhaust air system to the connecting sleeve.
3. Seal the unused connecting opening with the cover. Place the cover onto the connecting opening at the housing and secure it with the screws.

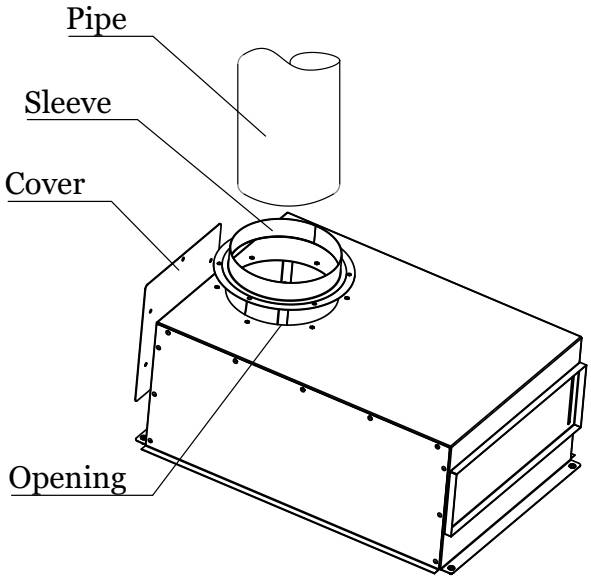


Figure 12. Sleeve

4.3 Moving the Unit/Internal Transport

To prevent tilting, transport the cabinet separately from the stand, using equipment capable of supporting the weight, even when moving within a building.

CAUTION: When moving the unit, lift at the lift points as shown in **Figure 13**.

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 shipping screws (see **Figure 20**).

CAUTION: Tilting danger!

If the unit is tilted too much during lifting, risk of tipping exists. Lift the biological safety cabinet only vertically! For transportation (including inside buildings) use an appropriate lifting device, which ensures that the unit:

- is on a stable stand and
- is secured against lateral tilting.

Do not transport the biological safety cabinet on a base with roles.

WARNING: Device must be detached from the support frame while transport to avoid tilting of the cabinet.

WARNING: When using a roller frame (optional): Only move on smooth floors within a room and not on steps and edges.

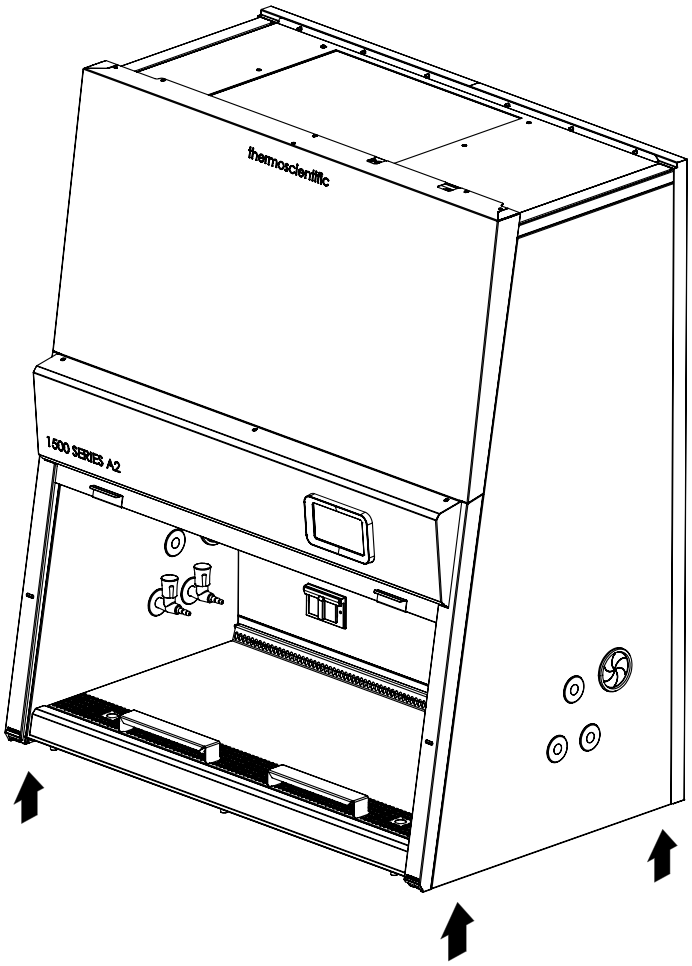


Figure 13. Lift Points

4.4 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 is indicated in **Figure 14**.

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

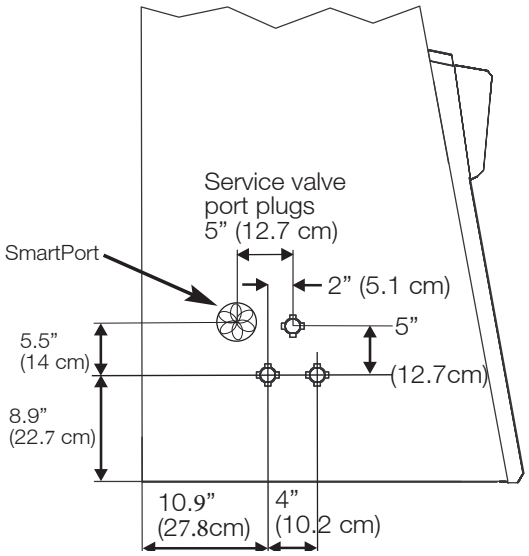


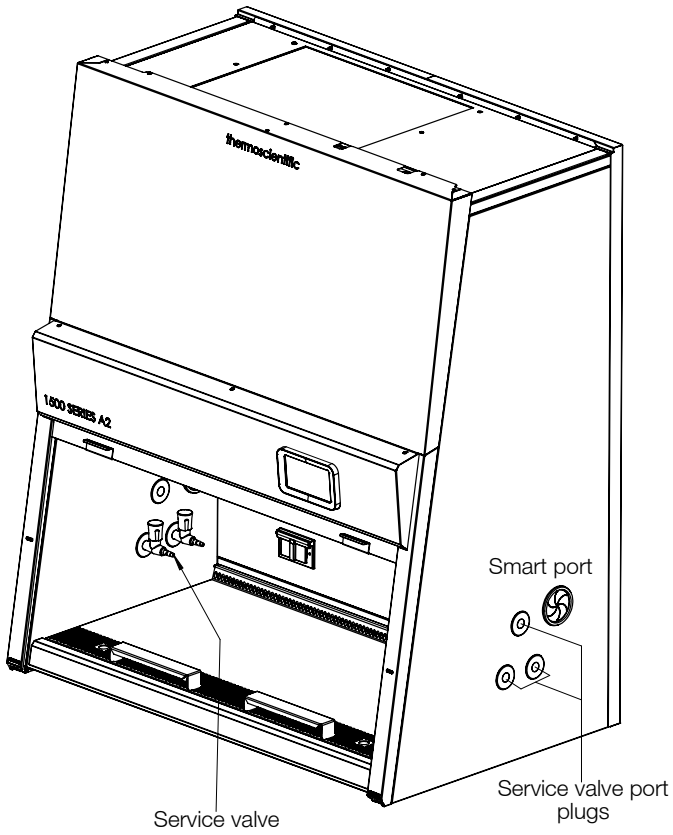
Figure 14. Valve Location

At each side panel, service valves can be installed through the three service valve port plugs (P/N 249095 exterior port plug, P/N 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 a pre-determined point (inside and outside). Remove the centers.
4. Refer to **Figure 15** on the following page and slide the bezel onto the threaded pipe of the service valve. Apply a thin bead of silicon on the inner flange of the service valve.
5. From inside of the sample chamber, slide the service valve through the desired plug.
6. From the outside, slide 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.

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

CAUTION: Connection of service valve to facility systems for gas, vacuum or other media should be by qualified staff only.



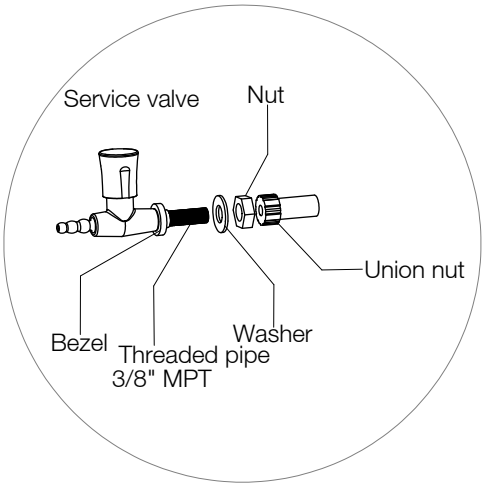


Figure 15. Valve Assembly and Installation

4.5 Universal Piping Connections

Universal piping is a factory-installed option. The piping can be installed on either one or both the 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 **Figure 16**.

Note: The top left access point is not available on 3 ft units, due to the proximity of the exhaust filter. On 3 ft units, the right side access points are next to the right side rope channel and the left side access points are next to the right side access points.

Note: Electric height adjustable stands cannot be used in combination with Universal piping connections at the bottom of the cabinet.

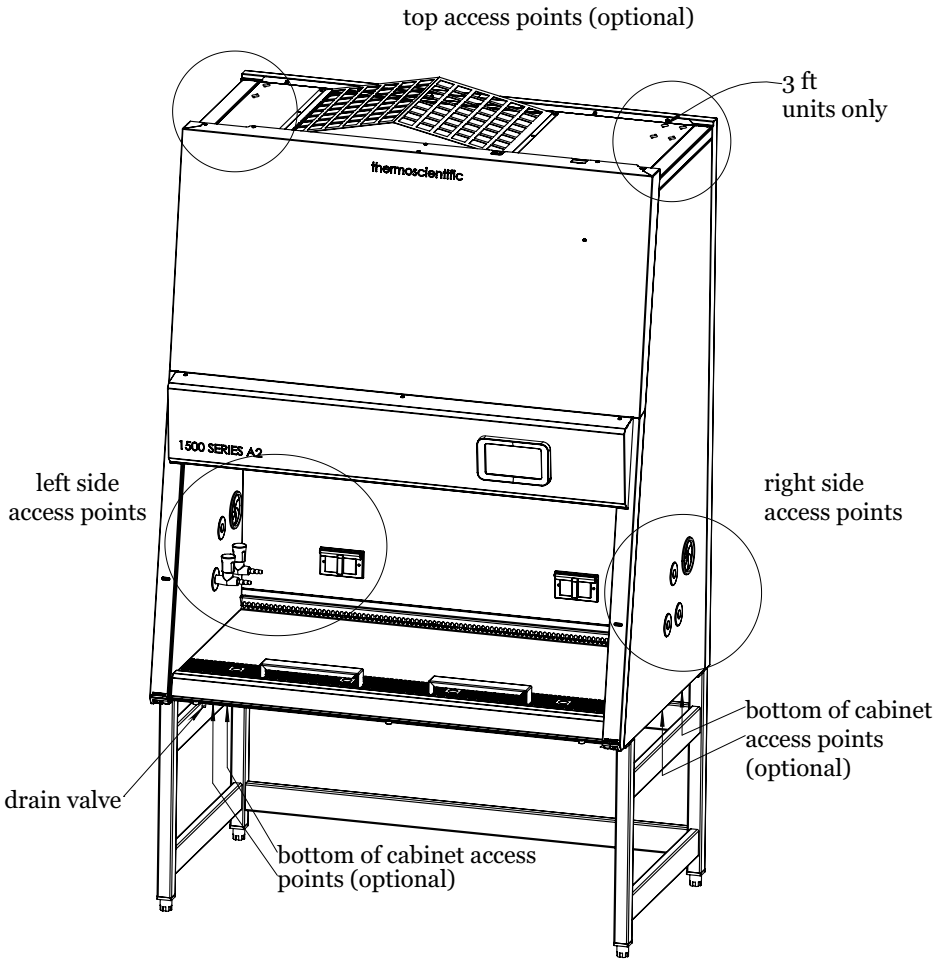


Figure 16. Possible Universal Piping Access Points/Drain Valve

4.6 SmartPort™

SmartPort™ locations are indicated in **Figure 16** (one on each side).The SmartPort™ feature on the 1500 Series A2, designed to improve work area organization inside the biological safety cabinet. It is designed to accommodate the routing of tubing, line cords and data cables from the interior of the cabinet to the exterior working area, providing space inside the work area.

If SmartPorts are installed, replace the SmartPort™ grommet or seal over the exterior grommet before starting a decontamination procedure. The P/N 1910112 kit containing 4 grommets can be ordered.

A 3" access port with an inner and outer solid rubber grommet is located on the left and right side walls of the cabinet. Following a risk assessment and appropriate mitigation, the user may cut the inner and outer grommet along the pre-cut indentations using a surgical scalpel, cutting only the area which is required to accommodate the tubing or cable. As per the risk assessment and appropriate procedures, tubing or cables can be passed into and out of the cabinet through the grommets and removed as necessary.

At any time, new solid rubber grommets may be installed into the SmartPort™ to provide a complete seal in the side walls. It is recommended that new solid grommets should be installed on the exterior side walls or the grommet opening sealed, prior to decontaminating or soap bubble leak testing the cabinet. The kit for P/N 1910112 (four grommets) can be ordered.

4.7 Drain Valve

After the unit has been installed, either on a stand or a workstation, the drain valve must be installed. The drain valve itself is shipped in the manual bag taped to the inside of the unit.

Locate the drain piping underneath the unit on the left side (see **Figure 16**). Apply thread sealant sparingly to the threads.

Install the drain valve. Ensure the valve is in the closed position.

CAUTION: Be aware of the valve when moving the unit from the stand or workstation.

5 Start-Up

CAUTION: Correct assembly and installation is essential for proper start-up and operation.

5.1 Assemble the Stand

For a unit without stand, place the cabinet onto a stable structure that can support twice the weight of the unit. Make sure the weight is not resting on the drain valve or nipple.

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

CAUTION: Make sure each leveler is turned all the way in, to avoid bending of edges during installation.

Table 9. Installing the Height Adjustable Stand

Cabinet	Height Adjustable Stand
1911580	Adjustable stand (3 foot)
1911578	Adjustable stand (4 foot)
1911581	Adjustable stand (5 foot)
1911579	Adjustable stand (6 foot)

1. Locate the four telescoping legs in the side panel packaging. Install adjustable leveler from the hardware bag into the swaged end of the telescoping legs (if not already installed).

   Note: Make sure leveler is screwed all the way in, before installation. Tap the leveller into place with a hammer.

2. Locate the left and right side panels. Install the telescoping leg assemblies into the side panels as shown in **Figure 17**.

3. The height-adjustable stand can be set to a height range of 26.8 in - 34.7 in (680 mm - 880 mm). To achieve the desired height of the stand, lower the legs out of the channels downward to the desired height. Ensure the height adjustment remains secure by installing two lock-washers and screws for each channel on the leg.

   Note: All lock-washers are wedge-lock type. The wedges fit together with the smoother sides toward the unit and the screw.

4. Locate the two cross-members from the packaging. Note that they are packaged separately from the side panels. With the label on the cross-member to the outside **Figure 17**, install the cross-members onto the retaining tabs of the side panels. Place lock-washers on screws, then install all screws with hand, before tightening to secure together.

5. To achieve the desired height for the stand, simply lower the legs from the channels to your preferred level.

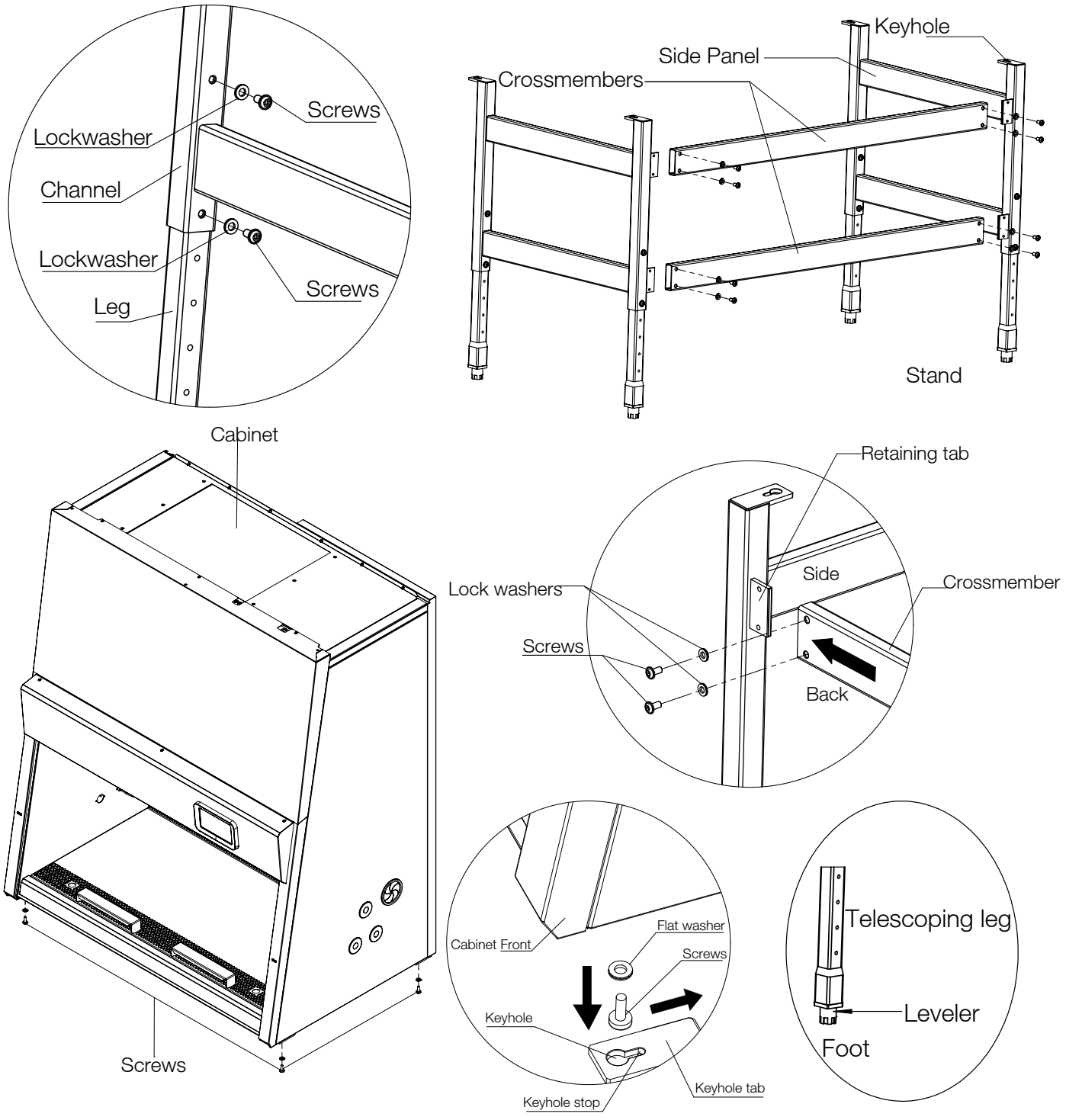


Figure 17. Stand Assembly

6. To install the cabinet frame to the stand, insert four flat washers and Allen screws loosely into the threaded holes at the bottom of the cabinet.
7. Place the safety cabinet onto the stand so that the Allen screws are routed through the holes of the keyhole tabs.
8. Slide the cabinet frame to the keyhole stop (see **Figure 17**).
9. Tighten the four Allen screws.
10. Level the cabinet (follow instructions in this section).

Table 10. Installing the Caster Stand

Cabinet	Caster Stand
1911584	Caster Stand (3 foot)
1911582	Caster Stand (4 foot)
1911585	Caster Stand (5 foot)
1911583	Caster Stand (6 foot)

1. Slide the two cross-members **(2)** onto the retaining angles **(3)** of the side panels **(1)**, then secure the crossmembers to the side panels using the screws **(4)** with fitted wedge lock washers **(4a).**
2. Remove the legs **(6)** out of the side panel channels **(5)**.
3. Insert the profiles **(7)** of the castor units **(8)** into the side panel channels.
4. Tighten the screws **(9)** fitted with their wedge lockwashers **(9a)**.

Note: Flushing joints. Flush the joints between the side panel channels **(5)** and the castor units **(8)** with silicone **(10).**

Note: Wedge lock washers for screws **(3)** and **(9)** should always be used in pair of two as shown in the figure below.

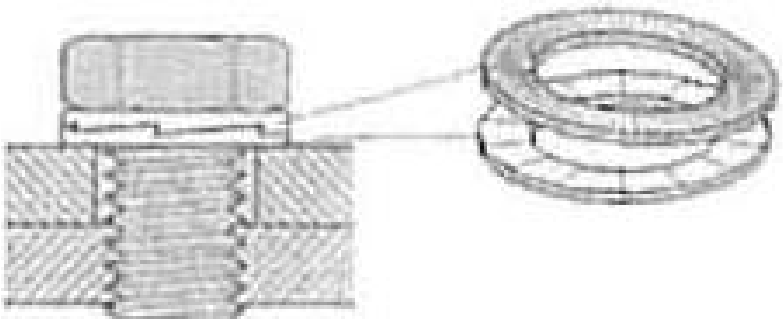


Figure 18. Wedge Lock Washer

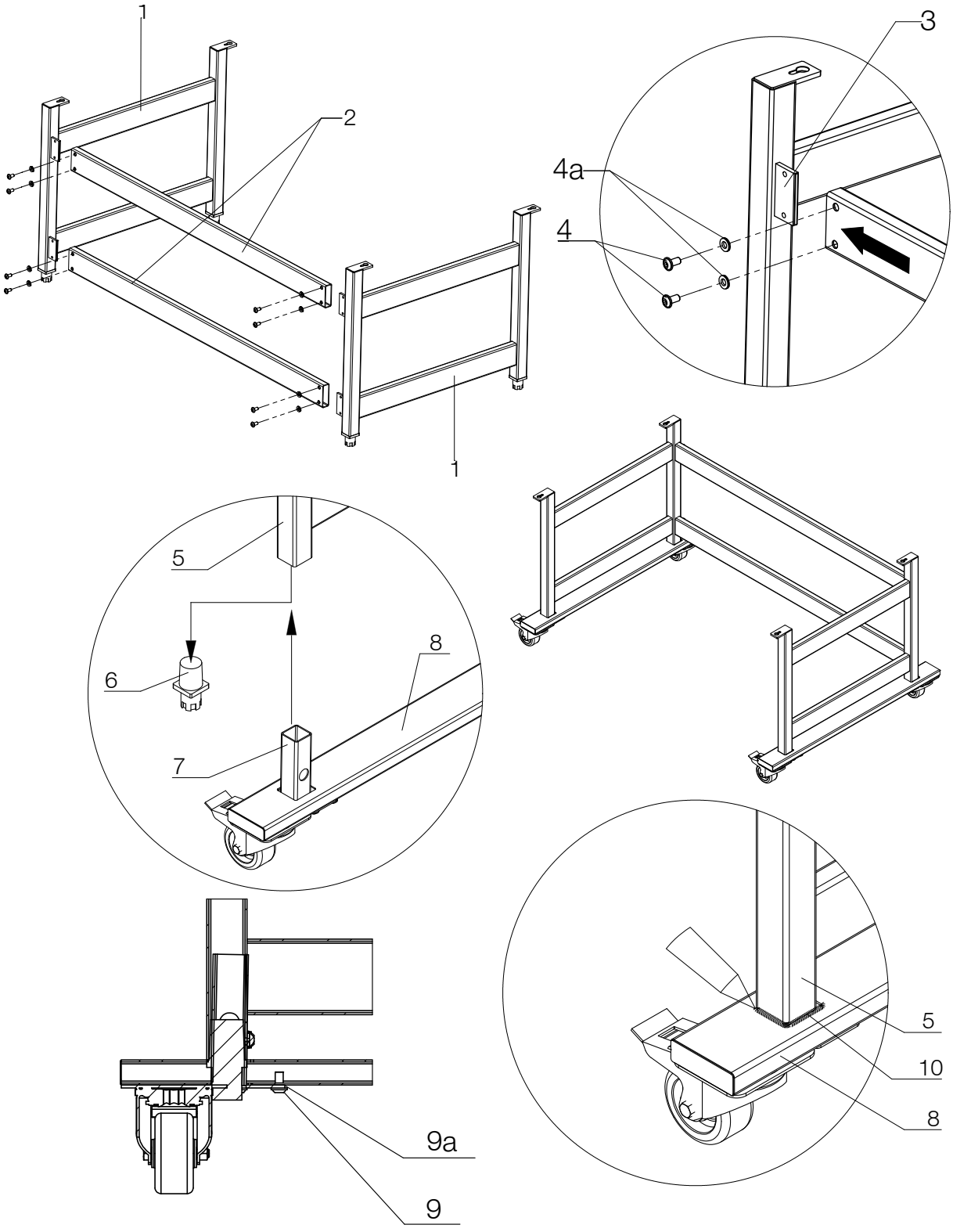


Figure 19. Installing the Caster Stand

5.2 Unlock Counterweight

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

CAUTION: The counterweight on the cabinet back 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.

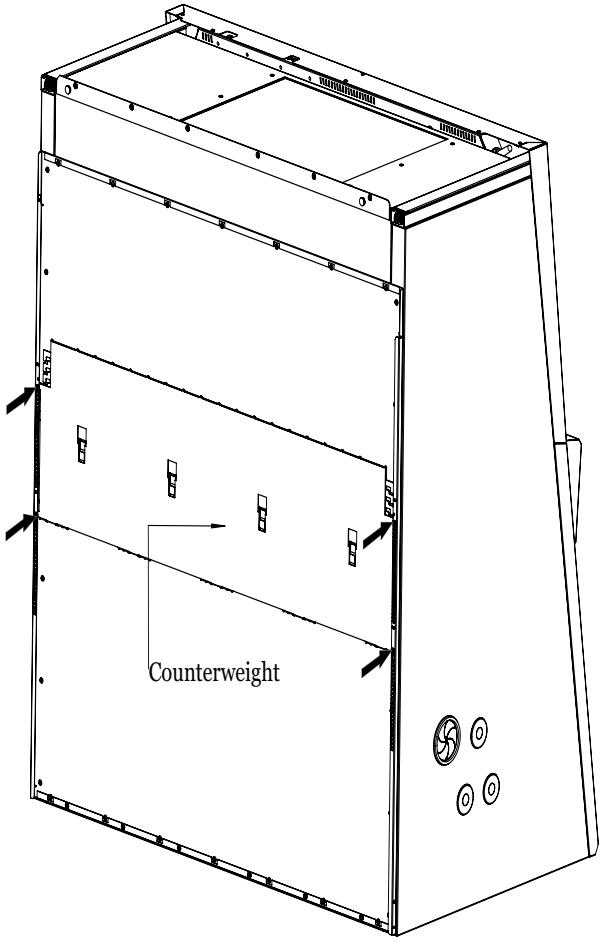


Figure 20. Unlocking the Counterweight

To unlock the counterweight, remove the shipping screws (refer to **Figure 20**) and retain them for future shipping needs. A Torx wrench is shipped in the manual bag for this purpose.

WARNING: One person should hold the counterweight while second person remove the screws. This facilitates screw removal and avoids the possibility of stripping the screws.

5.3 Level the Cabinet

Note: The cabinet should be leveled 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 levelers of the stand using an open end or adjustable wrench until the bubble level indicates an absolutely horizontal position in all directions. Check from right to left, and from back to front.

5.4 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 accessed only by authorized persons. Ideally, the outlet should be located above the cabinet to avoid accidental shut-off.

The power supply cord serves as the mains disconnect. Maintain access at all times.

CAUTION: If the unit includes service valves (gas, vacuum etc), the valves must be installed properly, to the unit's main ground by qualified personnel only.

5.5 Installation Tests

WARNING: Do not operate the unit before initial operation, installation and certification tests have performed.

The installation test must be performed in accordance with the specifications of NSF/ANSI 49 for field certification. The cabinet may be operated as a Class II biological safety cabinet, in accordance with NSF/ANSI 49, 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, Normative Annex 5.

- Inflow velocity profile test
- Downflow velocity profile test

- HEPA filter leakage test
- Airflow smoke pattern test
- Site installation assessment tests
- Subsequent field certification should be performed at least annually, after repairs to the unit or after location changes.
- The operator should request a written test report from the authorized service technician.

WARNING: The operational safety of the unit, particularly the personnel and product protection, are guaranteed only if all safety functions of the unit have been tested and approved.

CAUTION: Thermo Scientific 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.

CAUTION: Alarms on this unit are not factory-set. Set the alarms to avoid product loss and ensure personnel safety. Refer to **9 Certification Testing**.

5.6 Locating a Certifier

Note: 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.

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

- NSF International (NSF)

NSF International (NSF) sponsor a certifier accreditation program. 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

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.

1. Controlled Environment Testing Association

   230 Washington Avenue Ext.

   Suite 101

   Albany, NY 12203

   Telephone: 919-792-6339

   www.cetainternational.org

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.

5.7 Rear Cover

The rear cover is an optional feature on the 1500 Series A2, designed to improve efficiency of cleaning the exterior of the biological safety cabinet. For 3 & 4 foot models, 2 pieces of sheet metal covers are provided. For 5 & 6 foot models, 3 pieces of sheet metal covers are provided.

Note: Wall mounting brackets “1911402 & 1911407” are optional features provided by Thermo Fisher to protect the cabinets from earthquakes. These wall mounting brackets are not compatible with the rear covers.

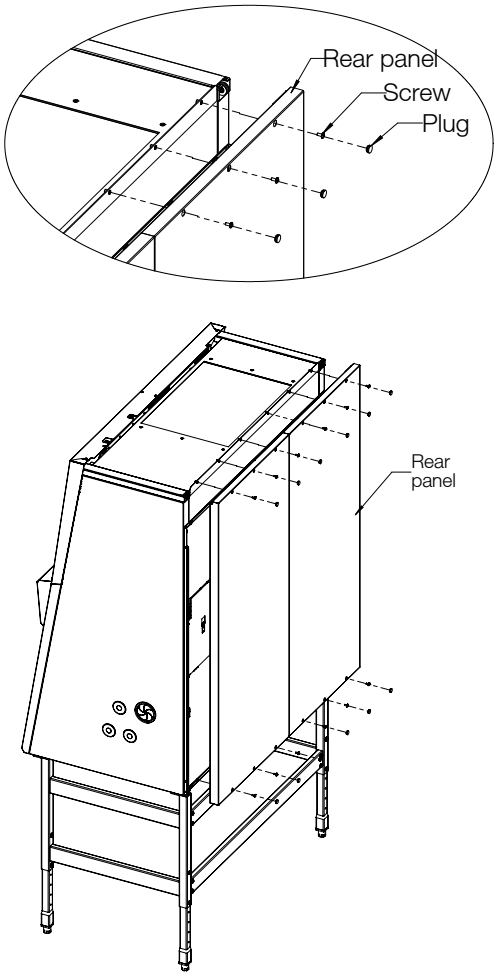


Figure 21. Rear Panel

6 Operation

6.1 Initial Setup

This section explains how to set up the device using the initial setup routine.

When the unit is turned on for the first time after delivery to the customer site, you must complete an initial setup process before you can use the unit.

Proceed as follows to start up the unit:

1. Power up the device by connecting the external power source. A startup screen with a **Start Setup** button appears, prompting you to run the setup, as shown below:

Figure 22. Initial Startup: Startup Screen

2. Tap the **Start Setup** button. The initial setup screen appears as shown below, prompting you to choose a display language, set the date and time.

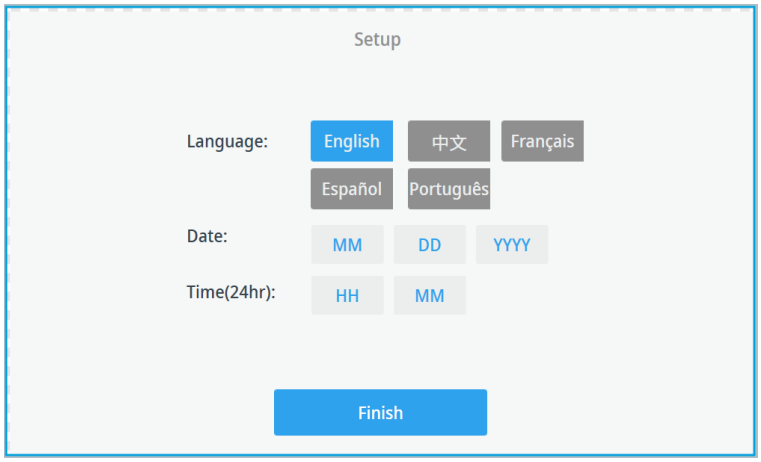


Figure 23. Initial Setup

3. Tap the **language** button to turn blue to set the language (default is English).
   Tap the **date** button (MM/DD/YYYY) to open the keypad to set the date.

Figure 24. Date Setup

4. Tap the **time** button (HH:MM) to open the keypad to set the time.

Figure 25. Time Setup

5. Tap the **Finish** button to complete the initial set up. The unit comes up in idle mode, as shown below, assuming that the window is closed.

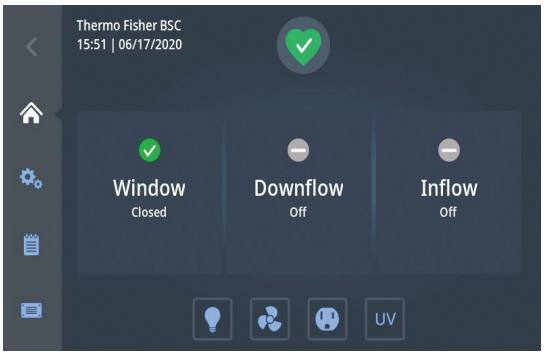


Figure 26. Main screen – Idle Mode

The Setup is complete now. You can start using the unit.

Note: All of the settings made in the previous steps can be edited by tapping the **Settings** icon in the left - hand Main Navigation Bar. See **Main Navigation Bar**.

6.2 Operation

This chapter describes how to control the Cabinets from the touchscreen display mounted in the light dome of the unit.

The screen display unit measures 17.8 cm (7”) diagonally across and has touch-sensitive areas that support finger gestures like tapping, it can be used with gloves.

6.2.1 Screen Layout

The **touchscreen** display unit of the Biological Safety Cabinets is subdivided into the four main screen areas. **Figure 27** presents the arrangement of the screen areas discussed in the following.

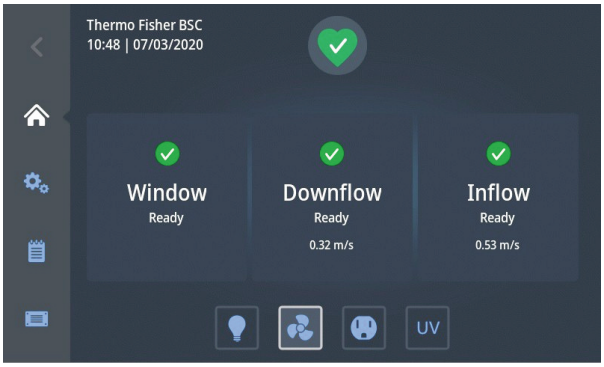


Figure 27. Screen Areas

The four screen areas offer the following features:

- The Info & Health Status area (**Figure 27** above) shows the biological safety cabinet‘s name, the current date and time, the unit‘s overall health status. For an overview, see **Info & Health Status Area.**
- The Main Screen (**Figure 27** above) displays the main operating parameters of the unit, including window status and airflow speeds. When alarms or reportable events occur, this part of the display screen shows alarm or event information. For an overview, see **Main Screen.**
- The Control Panel (**Figure 27** above) offers touch-sensitive buttons for controlling the major functions of the unit, such as Light Bulb, Fan, Power Receptacle, UV button. For an overview, see **Control Panel.**
- The Main Navigation Bar holds iconic shortcuts to the related screens. For an overview, see **Main Navigation Bar.**

6.2.2 Info & Health Status Area

The Info & Health Status Area at the top of the display window appears in all screen displays. **Figure 28** shows an example of the Info & Health Status Area on a unit that is in a proper working condition.

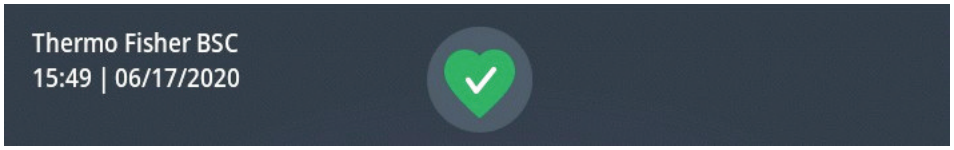


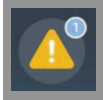
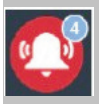
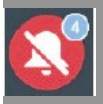
Figure 28. Info & Health Status Area

The Info & Health Status Area displays the following information:

- Unit Name (top left in **Figure 28**)
- Date/Time (bottom left in **Figure 28**), as entered during the initial setup (see **6.1 Initial Setup**) or adjusted later on (see **Display Setting**).
- The **Unit Health Status** icon (center in **Figure 28**) is a touch-sensitive area that opens a Health Status pop-up window on top of the Main Screen.

The following different icons may appear in this place, representing the overall health status of the biological safety cabinet:

Table 11. Biological Safety Cabinet Health Status Icons

Icon	Meaning
	The green Health Status Good icon indicates that the unit is in proper operating condition. The Unit Health Status icon is a touch-sensitive area that opens a Health Status pop-up window on top of the Main Screen the unit itself.
	The yellow alert triangle is a Health Status Alert icon. It indicates that there is a warning that is unexpected by the operator, yet requires the operator's attention soon, such as during the starting up of unit (The fan speed is not ready).
	The yellow alert triangle is a Health Status Alert icon. It indicates that there is an issue that does not stop operation of the biological safety cabinet immediately, yet requires the operator's attention soon, such as a HEPA filter to be replaced. The Unit Health Status icon is a touch-sensitive area that opens a Health Status pop-up window on top of the Main Screen the unit itself. The blue circle indicates how many alerts exist.
	The red bell Health Status Alarm icon indicates that there are one or more major alarm conditions that need to be corrected because they may constitute a hazard to the operator or the Unit Health Status icon is a touch-sensitive area that opens a Health Status pop-up window on top of the Main Screen the unit itself. The blue circle indicates how many alarms exist.
	A red bell with sound waves on both sides (top) means that the alarm is sounding, while the red bell with the diagonal line across (bottom) shows that the alarm has been snoozed.

6.2.3 Main Screen

The Main Screen takes up the main part of the "Display Settings" screen and displays the status details on the biological safety cabinet.

Figure 29 shows the unit in working mode, with the window ready in the working position and the downflow and inflow speeds at operational speeds, and blowers are all on.

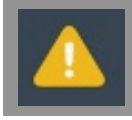
Figure 29. Main Screen

The screen content changes with operational state, depending on whether the unit is:

- in Startup mode, as shown in **6.3 Startup Mode**
- in Working mode, as shown in **6.4 Working Mode**
- in Standby mode, as explained in **6.5 Standby Mode**
- in Idle mode, as explained in **6.6 Idle Mode**
- Running UV Disinfection, as explained in **6.7 Running UV Disinfection**

Three status indicator boxes appear in the center of the Main Screen. It shows, from left to right, the state of the window, downflow and inflow status. Status indicator boxes may display with five different status icons:

Table 12. Status Icons for Status Indicator Boxes

Icon	Indication
	The checkmark on the green circle indicates that this particular function is working properly.
	The yellow animated “Timer” icon indicates that the unit is working up towards an operational state.
	The white cross on the red circle indicates that there is a problem with that particular function.
	The light gray dash on the gray circle signifies there is no activity. This icon indicates, for example, that there is no airflow when the unit is on, but the blowers are off.
	The yellow alert triangle icon indicates that there is an alert with that particular function.

6.2.4 Control Panel

The Control Panel contains a complete set of controls for operating the functions of the biological safety cabinet, as can be seen in **Figure 30**.

The Control Panel is visible at all times below the Main Screen.

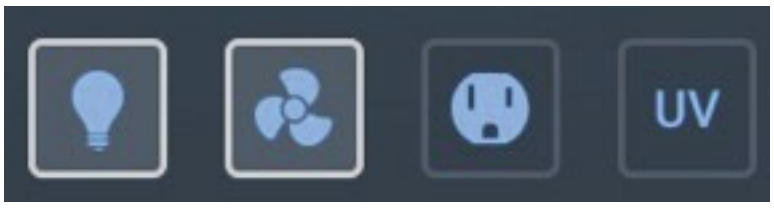
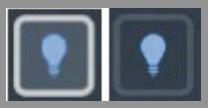


Figure 30. Control Panel for Fully Equipped Unit

Table 13. Button and Indicator Meaning

Indicator	Meaning
	The **Light Bulb** button switches the interior sample chamber illumination of the biological safety cabinet on and off.
	The **Fan** button switches the device on and off. Tap and hold this button for 5 sec. to switch the device off (including the blowers) during the Standby mode. Tap and hold this button for 2 sec. to switch the device on (including the blowers) during the OFF (Idle) mode. During the UV disinfection cycle, the blowers run in reduced flow mode, which is indicated by a small blue circle labeled “1/2” (see lower image on the left side). The fans also run in reduced flow mode when the front window is closed and there is no UV disinfection ongoing.
	The **Power Receptacle** button switches the power receptacles in the sample chamber of the biological safety cabinet on and off.
	The **UV** button switches UV disinfection of the sample chamber on and off.

Note: Many of our units are equipped with a Ground Fault Circuit Interrupter (GFCI) on the left side of the cabinet. This device monitors the amount of current flowing from hot to neutral. If there is an imbalance, it trips the circuit . This single GFCI protects both outlets within the cabinet.

If the outlets do not operate when the power button is turned on, press the Reset button in the center of the GFCI outlet to ensure the GFCI is set and power is flowing through it. If this does not restore power, contact Technical Services for additional troubleshooting.

Figure 31. Reset Button on GFCI Outlet

Note: The work mode of the unit determines whether the control panel button is operable or not. The unit will ignore the inoperable icon tapping.

Table 14. Operational Modes and Unit Functionality

Button	Idle Mode	Work Mode	Window Open Mode	Standby Mode	UV Mode
Light Bulb	Operable	Operable	Operable	Operable	Inoperable
Fan	Operable	Inoperable	Inoperable	Operable	Inoperable
Receptacle	Operable	Operable	Operable	Operable	Operable
UV	Operable	Inoperable	Inoperable	Operable	Operable

Note: Window open mode is window not closed and not in working position but fans are on. Alarm is triggered in this mode.

6.2.5 Main Navigation Bar

The Main Navigation Bar hold icons for all major settings of the biological safety cabinets.
The Main Navigation Bar is visible all time on all screens.

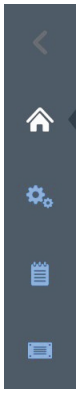
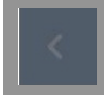
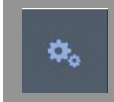
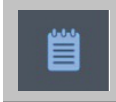
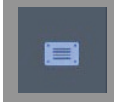


Figure 32. Main Navigation Bar

Icon	Meaning
	**Back**: Tapping this button will bring the user back up one level if one level or several levels down. If there is no level to go back to, this icon must be dark grey and must not be tappable. If there is a level to go back to, this icon must be blue and must be tappable.
	**Home**: Returns to the Main screen.
	**Settings**: Opens the Settings screen with various options for parameter settings.
	**Alarm/Alert log**: Record all the alarms/alerts. It means that this is the historical record.
	**Data Plate**: Opens the Data Plate screen showing general data about the unit.

6.3 Startup Mode

Figure 33 shows the Main Screen while the unit is starting up. The following startup screen shows what happens when the **Fan** button is tapped for turning on fans. The screen displays an alert due to the fact that the airflow speed has not reached the required level yet.

Figure 33. Main Screen - Unit Starting Up

The yellow alert triangle indicates that the airflow is not ready. The three status indicator boxes show:

- A **green checkmark** icon in the window status box to indicate that the window is ready.
- **Yellow Timer** icons with rotating hands shown in the downflow and Inflow boxes, signifying that the airflows are not up to proper speed yet.

Note: When the operational downflow and inflow speeds are reached, the yellow timers are replaced by **green checkmark** icons. The Biological Safety Cabinets enter the working mode.

Figure 33 shows a typical startup mode example for starting up, with the **Light Bulb**, **Fans** buttons already enabled.

6.4 Working Mode

Figure 34 shows the unit in working mode, with the window ready in the working position and the downflow and inflow speeds at operational speeds. The sample space illumination, and blowers are all on.

Figure 34. Main Screen - Unit Working

Buttons are highlighted in the Control Panel Area to indicate that the sample chamber illumination and blowers are both on. Power receptacle and UV functions are both off.

6.5 Standby Mode

Figure 35 shows the Main Screen in standby mode.

Figure 35. Main Screen - Unit in Standby

Standby mode is entered when you close the window from within a working session.

A Standby Mode header appears to show the unit is in standby mode, maintaining containment, and ready to resume work when you move the window back to the working position. The green **Health Status Good** icon on the Info & Health Status Area signifies that everything is working properly.

In the Control Panel Area, the buttons are highlighted to indicate that functions are still on, including the blowers.

If the window is closed, the blowers will switch to reduced flow, as indicated by the small blue circle with the “1/2” label.

6.6 Idle Mode

Idle mode is entered when you turn the fans off, it is better for user to make sure that the window is either in the working position or closed.

Figure 36 shows that it is in Idle mode with the window closed. Idle mode is indicated by the gray **no activity** icons in the downflow and inflow status indicator boxes.

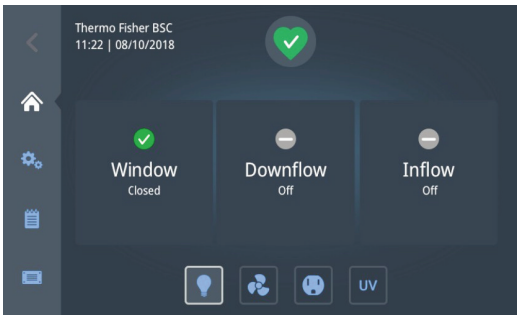


Figure 36. Main Screen - Idle Mode, Window Closed

Figure 37 shows that it is in Idle mode with the window ready. In this case, the downflow and inflow status indicator boxes show an **Alert** icon.

Figure 37. Main Screen - Idle Mode, Window Ready

Figure 38 shows that it is in Idle mode with the window open. In this case, the window status indicator boxes show an **Alert** icon.

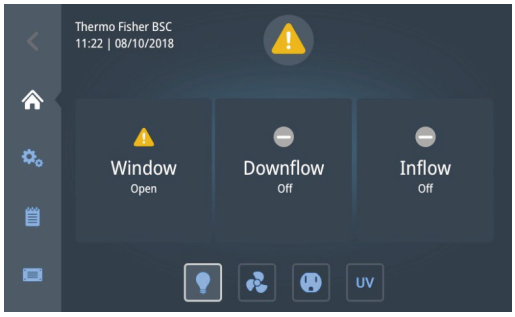


Figure 38. Main Screen - Idle Mode, Window Opened

6.7 Running UV Disinfection

The biological safety cabinet has an optional UV light that affords an intensifying additional disinfection after a standard wipe/spray disinfection. UV disinfection can be started by pressing the **UV** button on the Control Panel or can be started automatically at the specified time if the UV-auto-start function is enabled. If the UV light is not installed, the UV button on the control panel has no function.

For running the UV disinfection routine, the front window must be completely lowered to protect against UV radiation. A safety interlock ensures that the routine cannot be run until the front window is in the closed position. And the LED light must be switched off.

6.7.1 Manual UV Disinfection

If the **UV** button is pressed while the window is open and/or the LED light is on, the following pop-up window shown below is displayed on the Main Screen:

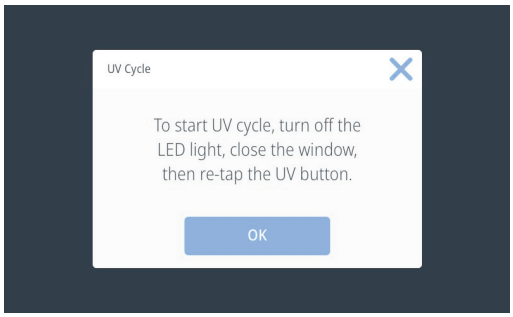


Figure 39. Main Screen - UV Disinfection rejected

While the routine is running, the “UV disinfection” screen shown below is displayed on the Main Screen.

Figure 40. Main Screen - UV Disinfection running

Additionally, the “Total cycle time” in hours and the time remaining in hours, minutes and seconds are displayed.

UV disinfection ends when the preset total cycle time for the routine has elapsed. Then, the UV lamps are switched off automatically, and the “UV disinfection” screen goes away.

6.7.2 Auto UV Disinfection

The UV disinfection can be started automatically at the specified time if the UV-auto-start function is enabled.
Refer to **6.7 Running UV Disinfection**.

To enable the UV auto start function, mark the checkbox displayed in **Figure 53**.

Under the UV Auto Start Time, use the drop-down menu and select the time you desire for the UV to start. For example, if you would like the UV to begin at 9:30 PM, enter 09 hr 30 min PM using the drop down.

Note: When the cabinet is not in standby mode, the UV disinfection will not be started automatically even though the specified time has reached, which means that the UV disinfection will be ignored once.

During the disinfection cycle, when the **Light Bulb** button is tapped, Biological Safety Cabinets will ignore this operation. But opening the window will interrupt the disinfection cycle as shown in **Figure 41**. If tapping the **Cancel**, the disinfection cycle will be stopped. If tapping the **Restart UV Cycle**, the disinfection will be restarted.

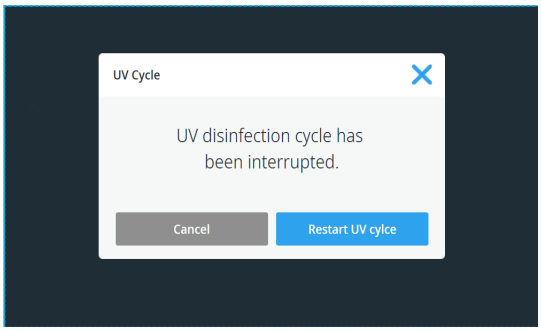


Figure 41. UV Cycle Interrupt When Window is Open

6.8 Viewing Status and Replacing UV Bulb

Tapping the **Health Status Good** icon in the Info & Health Status Area takes you to the unit status shown in **Figure 42**. In this screen, you can check the operating hours, UV status and the Filter hours.

6.8.1 Viewing General Status Information

- Operating hours, shows the total work hours.
- UV, shows the total UV work hours and the UV bulb install date.
- Filter, shows the filter running time, and the filter install date.

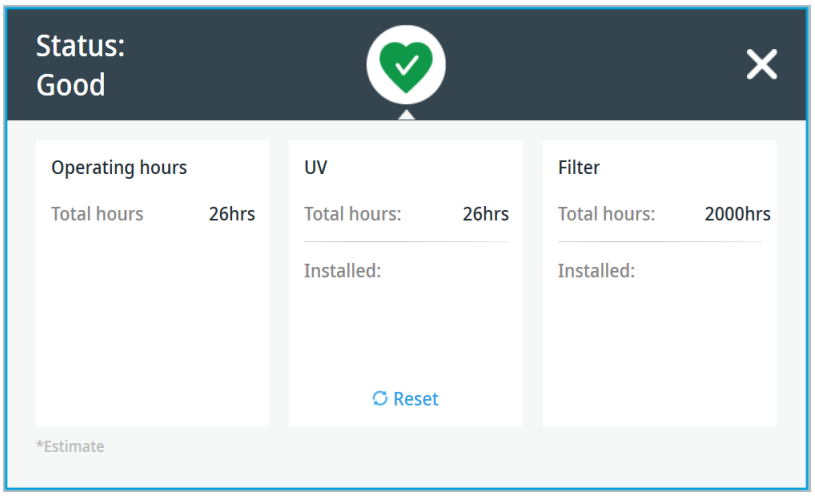


Figure 42. Status Main Screen

6.8.2 Replacing UV Bulb

If you replace a new UV bulb, please follow below process to update the UV status

- Tap the **Reset** button to update the installed date, and the UV work hours will be fall to zero.
  When you tap the **Reset** button, a pop-up screen shown in **Figure 43**.

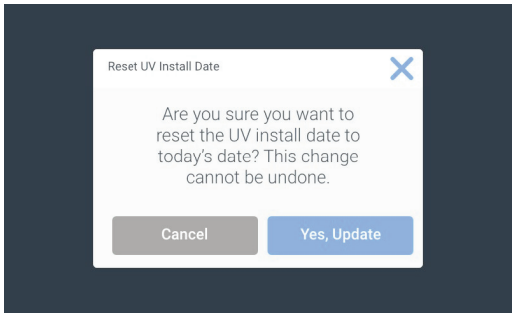


Figure 43. UV Reset Confirm Pop-up Screen

- Tap **Yes, Update** button to save your setting, you can also tap **Cancel** button to cancel your setting.
  If you tapped the **Yes, Update** button, a pop-up screen shown in **Figure 44** will appear.

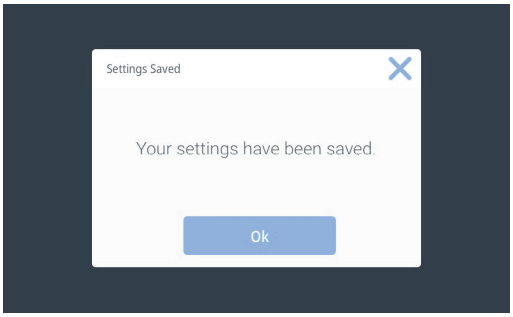


Figure 44. UV Reset Saved Pop-up Screen

6.9 Alarms

If the downflow, inflow or other parameters are not at operational settings, there may be at risk of exposure to biohazardous material or contamination. In this case, the biological safety cabinet emits a visual and audible alarm to alert the user, as shown in **Figure 45**.

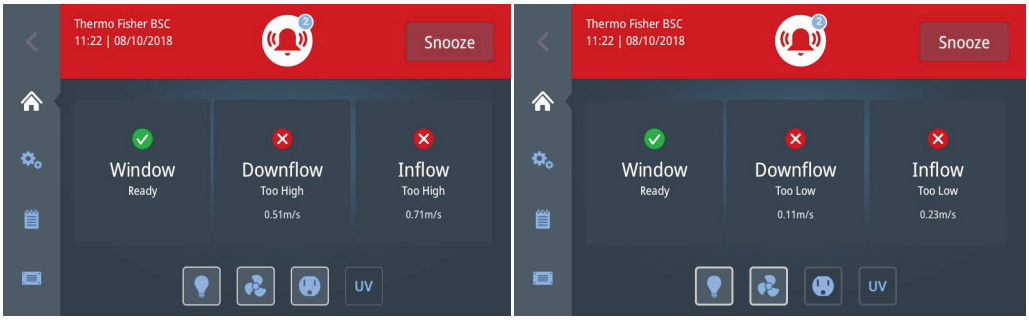


Figure 45. Alarming Screen for Downflow too High and too Low Alarm

A **Health status** icon in the shape of an alarm bell appears on a red background, along with a **Snooze** button.

Additionally, the **Health status** icon has a small blue circle overlay that shows the number of pending alarms.

Tapping the **Snooze** button silences the audible alarm temporarily for a pre-set timeout period. (The default alarm snooze timeout period is 5 minutes, but the setting may be changed in the "Alarms and Alerts" screen, as explained in **Snooze Timeout**). The **Alarm bell** icon is crossed out to indicate that the audible alarm signal has been snoozed as shown in **Figure 46**.

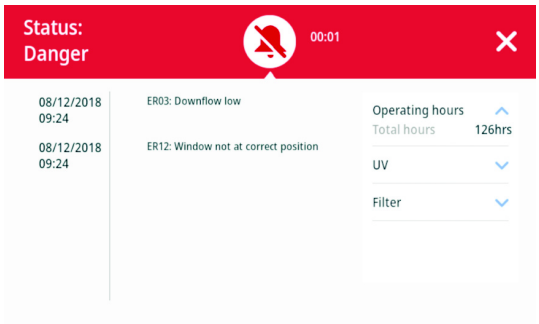


Figure 46. Main Screen after Two Cycles of Alarm Ticker Message

The **Health status** icon has changed to show the audible alarm is snoozed. To the right of the **Health status** icon is a countdown timer showing the snooze time remaining, i.e., the time period after which the audible alarm is resumed.

When the issue causing the alarm has been resolved, for example, when the user moves the front window to the appropriate position, the audible and visual alarms automatically disappear, and the screen display returns to the healthy state.

Table 15. Events that Produce Alarms include:

Information Displayed on Screen	Alarm Type
ER01: Inflow low	Inflow alarm low
ER02: Inflow high	Inflow alarm high
ER03: downflow low	Downflow alarm low
ER04: downflow high	Downflow alarm high
ER05: Inflow pressure error	Inflow pressure error
ER06: downflow pressure error	Downflow pressure error
ER07: NVRAM error	NVRAM Error
ER09: Window switch error	Faulty window position switch
ER10: Communication error	Communication error
ER11: Frequency error	FAN frequency error
ER12: Window not at correct position	Window not at the correct position

6.10 Handling Alarms

To handle the problem, proceed as follows:

- Inspect the small blue alarm counter in the red **Health Status Alarm** icon to find out how many alarms you have to handle.
- Tap the red **Health Status Alarm** icon to display the “Health Status Alarm” screen, then you can review the alarm list. **Figure 47** is an example.

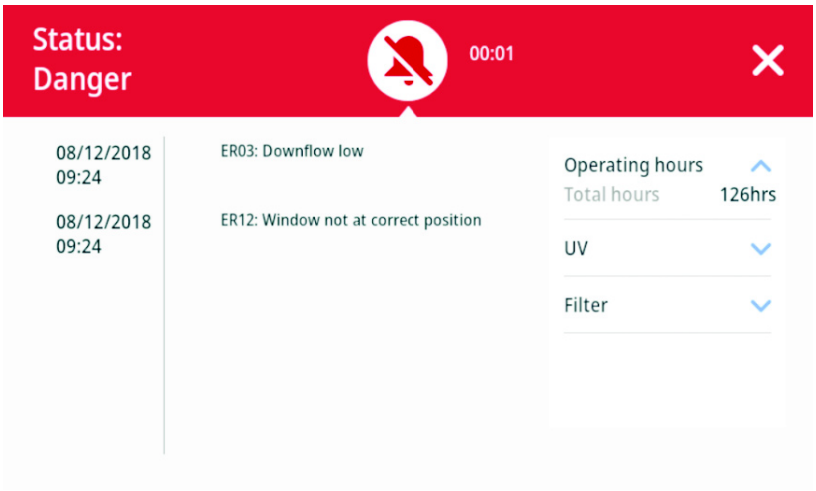


Figure 47. Health Status Alarm Screen

- Correct each issue that has caused an alarm.
  As you correct the pending issues, they will disappear from the alarm list on the “Health Status Alarm” screen one by one. When the last issue has been cleared, the screen display returns to the healthy state and the green **Health Status Good** icon replaces the red **Health Status Alarm** icon.

6.11 Alerts

Some events in the biological safety cabinet that do not immediately affect containment or cleanliness produce alerts. These alerts appear with the visual features shown in the example in **Figure 48**.

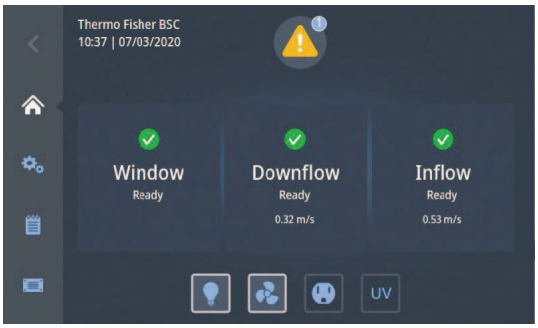


Figure 48. Alert Screen

The **Health Status Alert** icon in the shape of a yellow **Alert triangle** icon appears on a black background.

Additionally, the **Health status** icon has a small blue circle overlay that shows the number of pending alerts.

If you tap the **Alert triangle** icon, you will be taken directly to the "Status Alert" screen with its alert list, as shown in **Figure 49**.

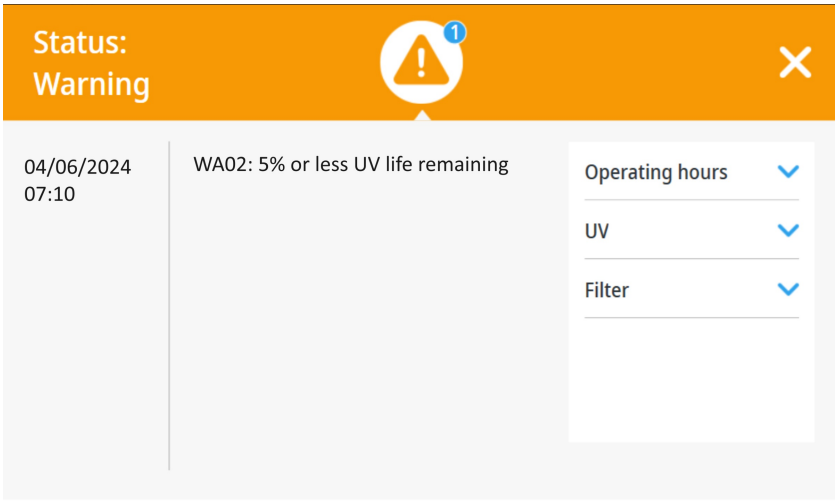


Figure 49. Status Alert Screen with Alert Screen Message

Table 16. Events that Produce Alerts Include:

Information Displayed on Screen	Alert Type
WA01: Annual field certification expiring	Annual field certification expiring
WA02: 5% or less UV life remaining	5% or less UV life remaining

6.12 Handling Alerts

To handle alerts, proceed as follows:

- When an alert appears, inspect the small blue alarm counter in the **Health Status Alert** icon to find out how many alerts you have to handle.
- Tap the yellow **Health Status Alert** icon to display the "Status Alert" screen shown in **Figure 49** and review the alerts list.
- Correct each issue that has caused an alarm.

As you correct the pending issues, they will disappear from the alerts list on the "Health Status Alert" screen one by one.

When the last issue has been cleared, the screen display returns to the healthy state and the green **Health Status Good** icon replaces the yellow **Health Status Alert** icon.

6.13 Settings

This section explains how to set up the unit using the various options of the “Settings” screen. After completing the initial setup process, you can further set up and customize the unit by using the options of the “Settings” screen shown below in **Figure 50**.

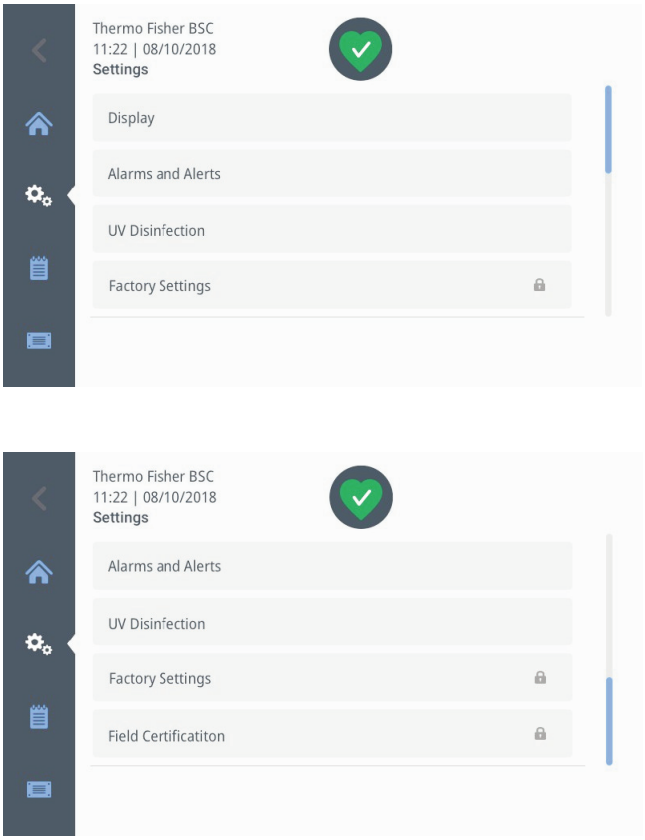


Figure 50. Settings Screen

6.13.1 Display Setting

Tapping the **Display** icon in the “Settings” screen takes you to the unit display setting shown in **Figure 51**. In this screen, you can set below 5 parameters.

- Brightness - The unit offers 4 brightness: 25%, 50%, 75% and 100%, 50% brightness is the default setting.
- Language - The unit offers 5 languages for display, English, Chinese, Spanish, French and Portuguese. English is the default setting.
- Units of Measurement - The unit offers 2 units for flow display, metric units and imperial units. Imperial units is the default setting.

  Metric units: m/s (meters per second), cmh (cubic meters per hour).

  Imperial units: FPM (feet per minute), cfm (cubic feet per minute).
- Date - Please refer to the initial setup process.
- Time - Please refer to the initial setup process.

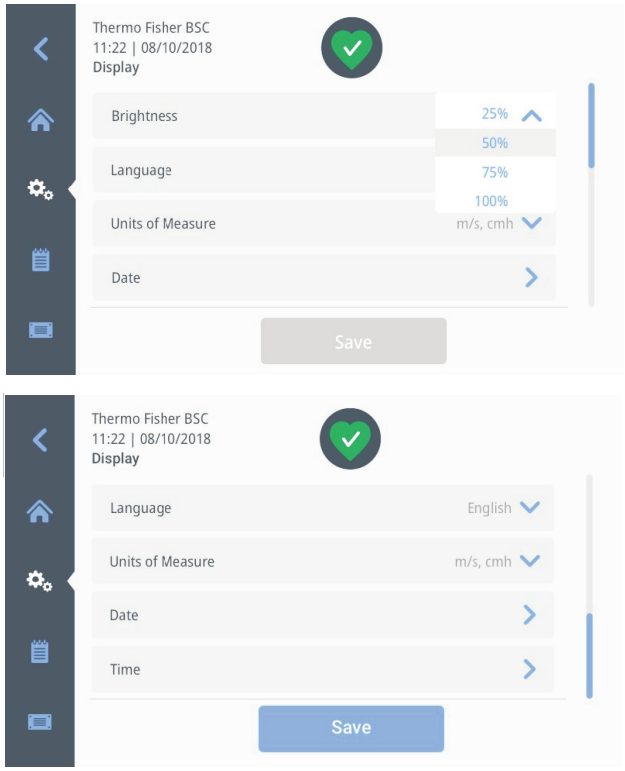


Figure 51. Display Setting Screen

6.13.2 Alarms and Alerts Snooze Time Setting

Tapping the **Alarms and Alerts** button on the "Settings" screen takes you to the "Alarms and Alerts" screen, shown in **Figure 52** below.

From the "Alarms and Alerts" screen, you may change the audible alarms suspend time when **Snooze** button was tapped. Minutes are selectable from a drop-down list. The default setting is 5 minutes. You can tap the **Save** button to save the setting.

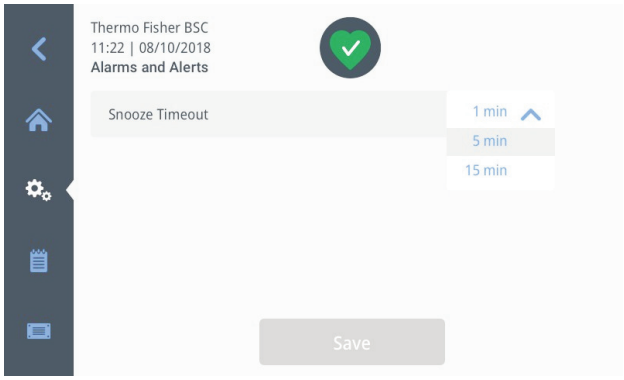


Figure 52. Alarms and Alerts Settings Screen

6.13.3 UV Disinfection

Tapping the **UV Disinfection** button takes you to the "Disinfection Settings" screen, shown in **Figure 53** below. From this screen, you can change the default running time of the UV disinfection cycle. This value is used by default when you start the Disinfection cycle by tapping the **UV light** button in the Control Panel Area of the display window.

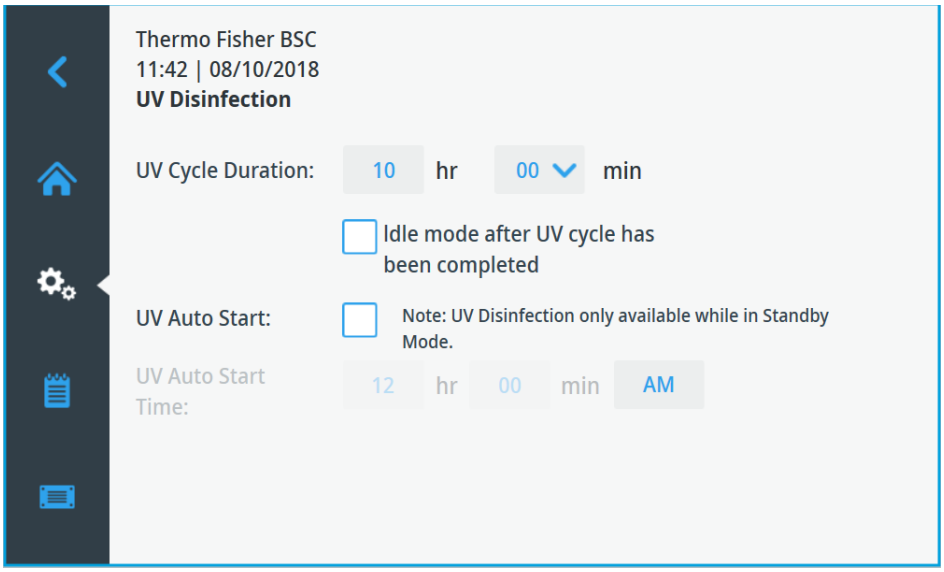


Figure 53. Disinfection Settings Screen

The "Disinfection Cycle Settings" screen displays the following fields:

- **UV Cycle Duration**: Sets the duration of the UV Disinfection cycle from 0 to 23 hours, with additional intervals of 00, 15, 30, and 45 minutes. Hours are entered by using a calculator-style keypad, minutes are selectable from a drop-down list. After UV cycle has been completed, the default setting is to enter standby mode, and you can also choose to enter idle mode where the fans are off by selecting the "Idle mode after UV cycle has been completed".

  Note: The default setting is 1 hour, 00 minutes. 0 hours and 00 minutes is NOT a selectable option.

- **UV Auto Start** & **UV Auto Start Time**: Enable/Disable the Auto UV disinfection function by **UV Auto Start**. If the Auto UV disinfection function is enabled, you can also set the auto start time by **UV Auto Start Time**.
- Tap the **Save** button to save the setting.

6.13.4 Factory Settings

Factory Settings is reserved for manufacture & Field Service.

6.13.5 Field Certification

Field Certification is reserved for the professionals.

6.14 Alarm/Alert Log

Tapping the **Alarm/Alert log** icon in Main Navigation Bar takes you to the "alarm/alert log" screen shown in **Figure 54**. You can browse up to 50 latest records of alarm/alert events.

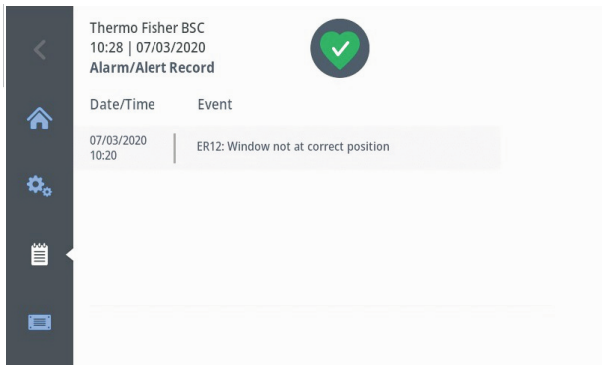


Figure 54. Alarm/Alert log Log file Screen

6.15 Data Plate

Tapping the **Data Plate** icon in the "Settings" screen takes you to the unit information shown in **Figure 55**. You can check the unit information.

- Model
- Serial number
- Main board firmware version
- GUI display board firmware version
- Cabinet size
- Filter Specifications
- Downflow velocity specifications
- Inflow velocity specifications

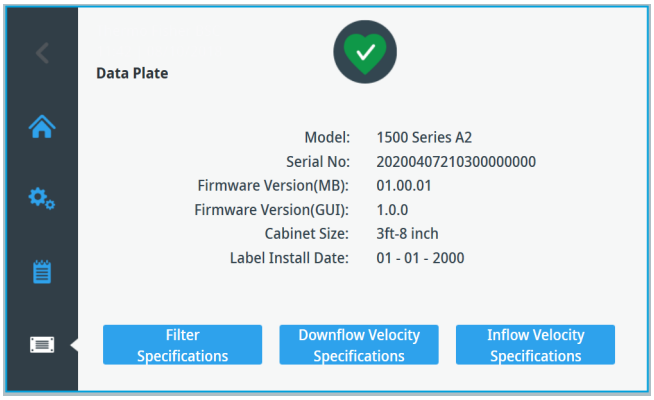


Figure 55. Data Plate Screen

6.16 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 (window ready symbol will be shown on the display) and wait until the airflow has stabilized (inflow & downflow ready symbol will be shown on the display).

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 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.

6.17 Working Recommendations

The observance of work rules ensures a maximum of operational safety when handling the biological 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.
- 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, is should be in a nearly horizontal position.
- When the upper leg is in a horizontal position, the angle between upper and lower leg should be 90 degrees or more.

- 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 35 cm). The slope should be adjustable to within a range from 5° to 15°. The adjustable height should extend to a minimum of 4 in (11 cm) above the floor.

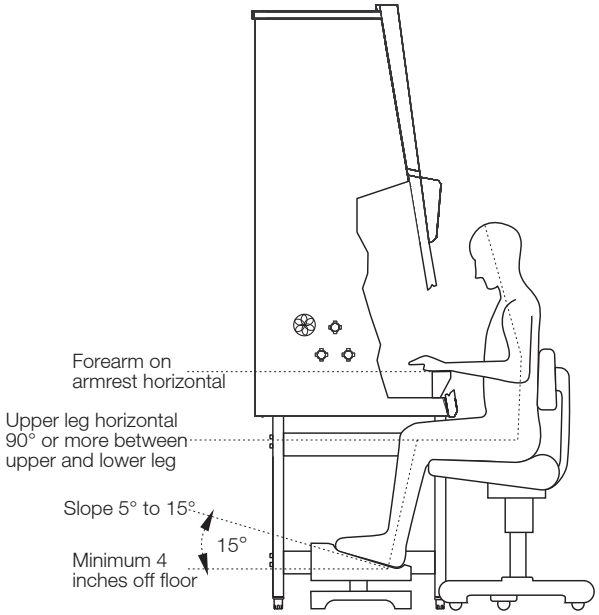


Figure 56. Sitting Posture

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.

6.18 Unit Shut-down

To turn the unit off:

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 the **Fan** button to turn off the blowers.

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

6.19 Power Supply Connection

The safety cabinet should remain connected to the power supply system at all times to ensure that settings for the individual unit configuration remain active in the memory. If the power supply is interrupted and later the power supply connection has been re-established, the system switches to the operating mode that had been active last. Additionally, a window with the message “Mains voltage has been restored” appears as soon as power has been restored, prompting the user to confirm by tapping OK. This message may, for e.g. be caused by a power outage.

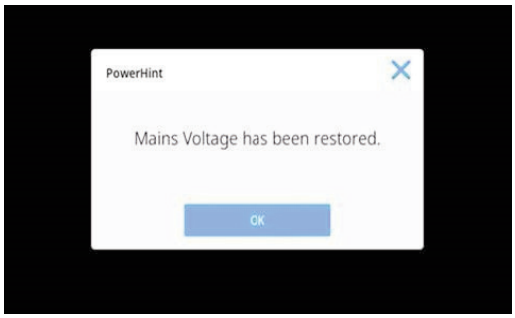


Figure 57. Power Supply Connection

6.20 Extended Period 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.

6.21 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.

7 Cleaning / Decontamination

Several procedures can be used for decontaminating the biological safety cabinet. The procedure is selected, depending 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 clean, rinse and dry with a disinfection liquid or spray, and sterile distilled water.

UV disinfection can also be used. It is particularly suited as a more intense disinfection after the above procedure.

Autoclaving (sterilization with steam) can be used for treating the removable stainless steel components. The work trays, 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. An appropriate decontamination procedure is mandatory before filt.ers are replaced, or before the unit is discarded.

7.1 Care and Cleaning of Stainless Steel

Stainless steel is a combination of many different metals including iron and chromium. Iron, the primary element in stainless steel, tends to corrode (rust) when in its natural state. The chromium content in stainless steel prevents corrosion.

Stainless steel is not corrosion or rust proof, but resistant to stains, or stains “less”. The chromium, in the presence of oxygen, forms a tough, invisible, passive layer of chromium oxide film on the steel surface. If damaged mechanically or chemically, this film is self-healing as long as it has enough oxygen. The presence of any liquid or solid that remains in contact with the stainless steel for a prolonged time can prevent oxygen contact and promote corrosion, as can prolonged contact with cleaners or disinfectants containing chlorine, ammonia, iodine or other caustic agents.

1. To properly care for stainless steel, use cleaners and disinfectants free of caustic agents such as chlorine, iodine and ammonia.
2. Always follow the application of any corrosive cleaner or disinfectant with a minimum of two clean distilled water rinses, then a thorough drying with a clean soft cloth. By rinsing with distilled water and drying, any remaining residue is removed from contact with the stainless steel.

CAUTION: Never use abrasive cleaners, scouring pads or steel wool when caring for stainless steel.

7.2 Cleaning and Caring for Coated Surfaces

All the coated surfaces of this equipment are powder coated. Powder coating is a method of applying a dry powder to electro-statically charged metal, then baked in an oven where the dry powder molecules are melted and fused together. This is by far the most durable finish available today and, if cared properly, will last for many years. The coated surfaces should be cleaned with a neutral detergent and rinsed twice with clean distilled water, then dried thoroughly with a clean soft cloth. Cleaning or disinfecting coated surfaces without rinsing with clean distilled water and drying thoroughly will result in smearing, streaking and dulling of the coated surfaces. Never use abrasive cleaners, scouring pads or steel wool. If the coated surfaces becomes dull, streaked, smeared or marred in some other way, there is no known method to restore the finish.

7.3 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 trays and stainless steel components can be disinfected separately.
4. Clean all chamber surfaces with disinfectant.
5. Do not remove the optional UV lights from the sockets. Clean thoroughly with a damp cloth. Do not saturate. Be sure to dry completely.
6. Discard any liquid from the drain pan. Rinse pan.
7. Dry all chamber surfaces completely.

7.4 UV Disinfection after Cleaning

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. The display shows “Standby mode” screen.
2. Press the UV key on the control panel. The display shows “UV disinfection” screen with total cycle time and 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.

7.5 Microbiological Space Decontamination

NSF/ANSI 49, Informative Annex 2 recommends a microbiological space decontamination when maintenance work, filter changes, and performance tests require access to any contaminated portion of the cabinet and before the BSC is moved to another location. A microbiological space decontamination may also be required by the BSC owner or user before certification or as a part of their work procedures. NSF/ANSI 49 provides recommended procedures for microbiological space decontamination using formaldehyde, vaporized hydrogen peroxide and chlorine dioxide. The appropriate method and procedure should be reviewed and approved by interested parties including the BSC user, institution biological safety officer, and BSC certification and service personnel as appropriate.

WARNING: Space decontamination must be performed in accordance with the specifications of NSF/ANSI 49, Informative Annex 2. As this procedure has considerable risks, it must only be performed by specially trained and authorized service personnel! Before Decontamination with chlorine dioxide, the BSC must be sealed at the exhaust opening and front opening to eliminate exposure to chlorine dioxide, of the power supplies, PCBs and other components under the front canopy as they are susceptible to damage from the process.

7.6 Clean Exterior Surfaces

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

7.7 Clean Window

For cleaning, the window can be lowered beyond the closing position (See **3.4 Use of the Window**).

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

7.8 Clean the Drain Pan

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

1. Make sure the drain valve is closed.
2. Remove the work tray(s) from the chamber or raise for access to the drain pan.
3. Clean thoroughly to remove any residues and/or deposits.
4. Wipe the drain pan, using a clean cloth and plenty of clean water.
5. Safely discard any liquid in the drain pan. Rinse and dry thoroughly.

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

6. Lower or re-install the work tray.

7.9 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.

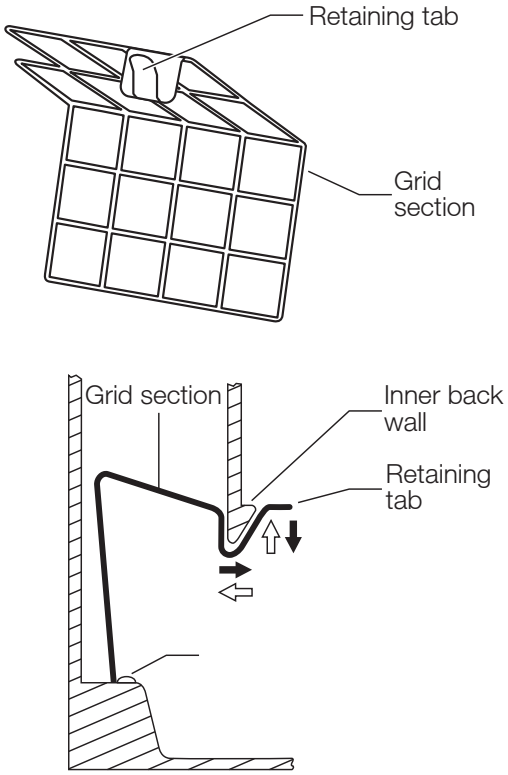


Figure 58. Protective Paper Catch Grid

8 Maintenance & Service

8.1 Inspection

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.
- Field certification in accordance with NSF/ANSI 49 which includes
  - Inflow velocity test
  - Downflow velocity test
  - HEPA Filter Leak test
  - Airflow Patterns Test
  - Site Installation Test

In addition to the annual certification, Thermo Fisher Scientific offers the following inspection points for your consideration.

- Confirm the unit is within its certification window.
- Check and if necessary, clear any debris from under the work tray and paper traps.
- Confirm LED and UV (if present) bulbs are clean and working properly.
- Ensure all service valves (if applicable) are in working order.
- Ensure the counterweight path is clear, unobstructed and the sash can move freely through its full range of travel.
  a. As a reminder, Thermo Fisher Scientific has specifically designed our sash to jam if the glass attachment point fails. Consequently, if the sash jams or seems sluggish to move, do not use force! Contact your local distributor immediately.

Note: Checking these items on a routine basis, will help to ensure your cabinet is always safe and operating as intended.

WARNING: The diffuser plate on the chamber ceiling serves as protection for the downflow filter and prevents refluxing of downflow air.

8.2 Service

8.2.1 HEPA Filters

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 biological safety cabinet, the unit must first be appropriately decontaminated.

8.2.2 Sample Chamber Lights

The sample chamber is illuminated by two (3, 4, 5 & 6 ft units) LED bulbs. The LED bulbs are installed in the light mounting frame in the sample chamber (see **Figure 59**).

Note: Orientation of the LED bulb should be in such a way that LED strip inside LED tube should not be oriented towards work tray.

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 LED 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.

8.2.3 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 9000 operating hours. (See **Figure 59**) The UV light model is G36T5.

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.

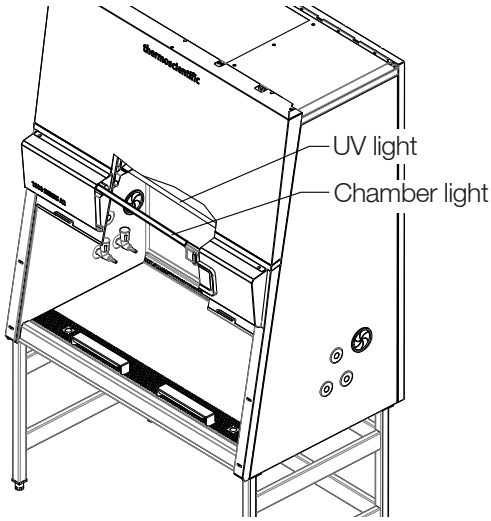


Figure 59. Light Replacement

8.3 Replacements and Repairs

CAUTION: Remote alarm systems can be retrofitted and integrated into the unit controls. Alarm contacts change state based on window position. Airflow changes from window position could impair personnel and product protection. Installation of these systems should only be performed by authorized service personnel.

8.4 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.

9 Certification Testing

9.1 Classification of the Safety Cabinet

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

For operation as a unit of said classifications, a certification test and repeat test in accordance with NSF/ANSI 49, Normative Annex 5 should be completed at the time of installation, and at least annually thereafter. As described in Normative Annex 5, recertification should be performed whenever HEPA filters are changed, maintenance repairs are made to internal parts, or the cabinet is relocated. More frequent recertification may be considered when appropriate.

9.2 Test Terms

Table 17. Term Assessment and Description

Test Term	Description
Nominal value	Default value as specified by Thermo Fisher Scientific.
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.

9.2.1 Testing

According to NSF/ANSI 49, 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;

- Inflow velocity test
- Downflow velocity profile test
- Airflow patterns test
- HEPA filter leak test
- Site installation assessment tests
  - Alarm functions
  - Exhaust system performance (canopy performance and canopy exhaust alarm).

As described in NSF/ANSI 49, Normative Annex 5, 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.

9.3 Test Equipments

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

Table 18. Thermo Recommended Testing Equipment Manufacturers

Testing Equipments	Manufacturer	Application
Smoke tubes	MSA Pittsburgh, Pennsylvania, 15230	Airflow pattern test
Thermoanemometer	TSI Shoreview, Minnesota 55126	Downflow velocity test and alternate method for inflow velocity using constricted access
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 Air Data Multimeter	Shortridge Instruments. Inc. Scottsdale, Arizona, 85260	Inflow velocity test

9.4 Testing Information

Inflow Velocity – DIM Method (Primary)

Description:

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

Equipment:

- Short ridge ADM-870, or equivalent
- Flow hood Series 8400, or equivalent

Method:

1. Move the front window to the work position (25.4 cm / 10" or 20.3 cm / 8", depending on model).
2. Attach the flow hood in the work opening and seal the remaining open areas.
3. Allow the airflow to stabilize.
4. Record at least 5 measurements of the inflow air volume.
5. Average those readings and calculate the inflow velocity (V1) as described below.

Table 19. Inflow Area

Model		Inflow Area
3ft Models	(10 inch window opening work position) 1520A2, 1521A2, 1522A2, 1523A2, 1530A2, 1531A2, 1532A2, 1533A2	2.46 sq ft
	(8 inch window opening work position) 1539A2, 1540A2, 1541A2, 1542A2, 1590A2, 1591A2, 1592A2, 1593A2	1.97 sq ft
5ft Models	(10 inch window opening work position) 1568A2, 1569A2, 1570A2, 1571A2, 1580A2, 1581A2, 1582A2, 1583A2	4.10 sq ft
	(8 inch window opening work position) 1550A2, 1551A2, 1552A2, 1553A2, 1566A2, 1567A2, 1572A2, 1573A2	3.28 sq ft
4ft Models	(10 inch window opening work position) 1544A2, 1545A2, 1554A2, 1555A2, 1575A2, 1576A2, 1585A2, 1586A2	3.28 sq ft
	(8 inch window opening work position) 1505A2, 1506A2, 1525A2, 1526A2, 1535A2, 1536A2, 1595A2, 1596A2	2.62 sq ft
6ft Models	(10 inch window opening work position) 1547A2, 1549A2, 1557A2, 1559A2, 1577A2, 1578A2, 1587A2, 1588A2	4.92 sq ft
	(8 inch window opening work position) 1507A2, 1508A2, 1527A2, 1528A2, 1537A2, 1538A2, 1597A2, 1598A2	3.93 sq ft

Calculation:

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

Acceptance:

- 100 – 110 FPM

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, P/N - 50124143

Method:

1. Lower the front window to a height of 3” (7.6 cm).
2. Operate the system blowers for approximately 20 minutes.
3. Insert the thermal anemometer probe into the probe holder. Slide the probe holder onto the lower edge of the window glass with measurement probe extending down into constricted opening, ensuring it is seated properly. Adjust the probe so the air passing through probe is centered in the window opening [1.5” (3.8 cm)]. Refer to **Figure 60**.
4. Take measurements in a single row across the constricted opening as specified in the cabinet digital data plate accessible at the Graphical User Interface.
5. Average those readings and calculate the inflow velocity (V1) as described below.

Calculation:

- Inflow velocity (V1) = average of actual constricted inflow velocity* K factor * 0.3 for 10 ft window opening work position, 0.375 for 8 ft window opening work position.

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 by the average velocity reading (V1)

Note: K factor details are also available under data plate screen of GUI.

Refer to the data plate section on the GUI.

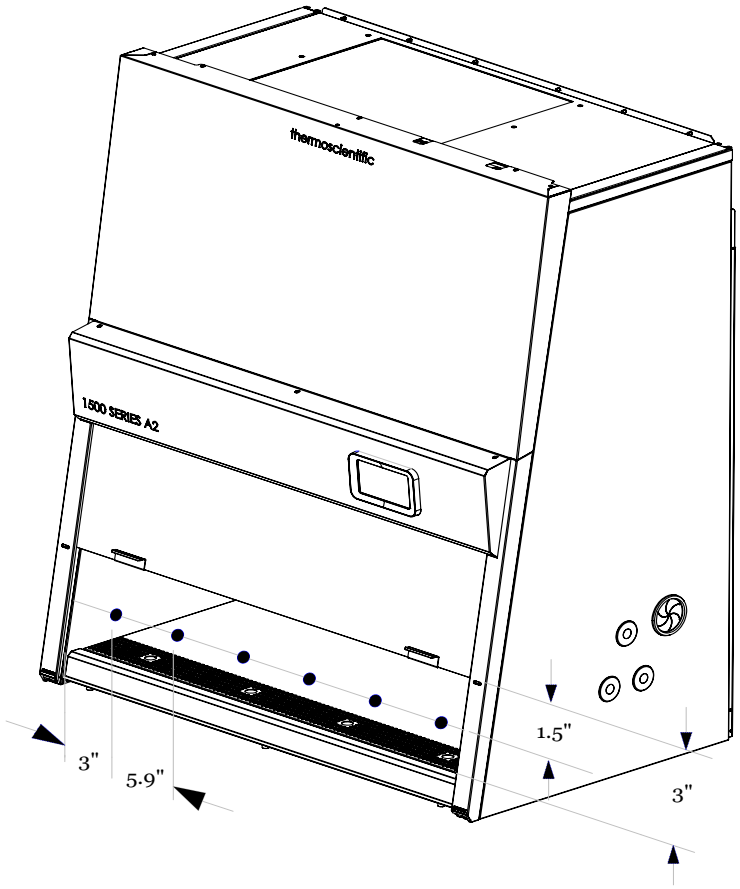


Figure 60. Constricted Window Method

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. Allow the airflow to stabilize.
2. Insert the anemometer probe into the probe stand, adjusting for a height of 4” (10 cm) above the bottom edge of the window opening while in the work position.
3. Record the readings on a horizontal plane 4” (10 cm) above the bottom edge of the window opening while in the work position, in the grid pattern described within the dataplate screens of the GUI.

Grid Pattern:

- 3 ft Models - 1520A2, 1521A2, 1522A2, 1523A2, 1530A2, 1531A2, 1532A2, 1533A2, 1539A2, 1540A2, 1541A2, 1542A2, 1590A2, 1591A2, 1592A2, 1593A2

21 Points								6
								5.5 for 10" opening models 5.7 for 8" opening models
								6
	6	3.9	3.9	3.9	3.9	3.9	6	inches

- 4 ft Models - 1505A2, 1506A2, 1525A2, 1526A2, 1535A2, 1536A2, 1545A2, 1554A2, 1555A2, 1544A2, 1575A2, 1576A2, 1585A2, 1586A2, 1595A2, 1596A2

21 Points								6
								5.5 for 10" opening models 5.7 for 8" opening models
								6
	6	5.88	5.88	5.88	5.88	5.88	6	inches

- 5 ft Models - 1550A2, 1551A2, 1552A2, 1553A2, 1566A2, 1567A2, 1568A2, 1569A2, 1570A2, 1571A2, 1572A2, 1573A2, 1580A2, 1581A2, 1582A2, 1583A2

27 Points										6
										5.5 for 10" opening models 5.7 for 8" opening models
										6
	6	5.90	5.90	5.90	5.90	5.90	5.90	5.90	6	inches

- 6 ft models - 1507A2 / 1508A2 / 1527A2 / 1528A2 / 1537A2 / 1538A2 / 1547A2 / 1549A2 / 1557A2 / 1559A2 / 1577A2 / 1578A2 / 1587A2 / 1588A2 / 1597A2 / 1598A2

33 Points												6
												5.5 for 10" opening models 5.7 for 8" opening models
												6
	6	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	6	inches

Calculation:

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

Acceptance:

- 58-68 FPM

9.5 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 airflow to stabilize.
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 49-2019, Annex N.5.

Acceptance:

- Filters scanned – no sustained leakage will exceed 0.01% of upstream concentration at any point.

Filters that cannot be accessed and 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 49.

Acceptance:

- Filters not scanned – no sustained leakage will exceed 0.005% of upstream concentration at any point.

9.6 Airflow Smoke Pattern Test

Description:

- These four tests determines the internal and external behavior of the air movement.

Equipment:

- Cold smoke (titanium tetrachloride or alternative)

Downflow Method and Acceptance

Method:

- Pass smoke from right to left along the centerline (front to back) of the work surface, 4" (10 cm) above the top of the work opening.

Acceptance:

- Smoke shall show smooth downward flow with no dead spots or upward flow.

Sash retention method and acceptance (formerly view screen retention)

Method:

- Pass smoke from right to left 1" (2.5 cm) behind the window opening, 6" (15 cm) above the top of the work opening.

Acceptance:

- Smoke shall show smooth downward flow with no dead spots or upward flow. No smoke shall escape from the cabinet.

Work opening edge method and acceptance

Method:

- Pass smoke along the entire perimeter of the work opening edges, approximately 1.5" (3.8 cm) in front of the cabinet.

Acceptance:

- No smoke shall be refluxed out of the cabinet once drawn in. No smoke shall billow over the solid work surface or penetrate onto it.

Sash seal method and acceptance

Method:

- Pass smoke up both sides and across the top of the window opening from inside the work area, approximately 2" (5 cm) from the edges starting and ending 6 inches above the bottom edge of the sash.

Acceptance:

- No smoke shall escape the cabinet.

9.7 Electrical Leakage, Ground Resistance, Polarity Tests

Description:

- Refer to UL 61010-1

9.8 Site Installation Assessment Tests

Description:

- Verify the unit is integrated properly into the facility.

9.8.1 Internal Supply/Exhaust Fan Interlock Alarm Test

Description:

- Verify the downflow fan(s) are interlocked to shut down and alarm when the internal exhaust fan is interrupted.

Equipment:

- N/A

Note: To test the function of fan interlocking alarm you need to access to the Field Certification screen. This function is reserved to Thermo Scientific Field Service and requires a special passcode.

Acceptance:

- Within 15 seconds audible and visual airflow alarms will signal. The cabinet downflow fan(s) will be de-energized.

9.8.2 Inflow Maintenance on Thimble Connected Units

Description:

- Verify the inflow does not drop below 92 FPM when the external exhaust system fail for thimble connected BSCs where the thimble is not an NSF listed accessory.

Equipment:

- Shortridge ADM-870 or equivalent
- Flowhood series 8400 or equivalent

Method:

- Properly install a DIM airflow capture device to the front of the thimble connected BSC.
- De-energize or block the external exhaust drawing from the thimble.

Acceptance:

- The measured inflow must not drop below 92 FPM (0.467 m/s).

9.8.3 Airflow Alarms

Description:

- Verify the airflow alarms will activate within 15 seconds when the inflow velocity reached 95 fpm or less and downflow velocity reached 20% less than nominal.

Equipment:

- Thermal Anemometer or equivalent (hotwire)
- Anemometer probe holder, P/N - 1911325
- Shortridge ADM-870 or equivalent
- Flow hood series 8400 or equivalent

Note: To test the function of Airflow Alarms you need to access to the Field Certification screen. This function is reserved to Thermo Scientific Field Service and requires a special passcode.

Acceptance:

- Unit alarm activates within 15 seconds.

9.8.4 Sash Alarms

Description:

- Verify the window alarms are operating properly.

Equipment:

- Operating manual

Method:

- Raise the window 1” (2.5 cm) above work position.
- Lower the window 1” (2.5 cm) below work position.

Acceptance:

- Window alarm activates.

9.8.5 Exhaust System Performance (Canopy Connections)

Description:

- Verify the exhaust system is functioning properly.

Equipment:

- Cold smoke (titanium tetrachloride)

Method:

- Introduce a smoke source into the intake on the side of the Thermo Scientific thimble connection. If the external exhaust flow is greater than the cabinet exhaust (as required), smoke will be drawn in. This demonstrates containment.
- Slowly reduce external exhaust volume.

Acceptance:

- Audible and visual alarms on the Exhaust Alarm Monitor should signal before 15 seconds has elapsed after smoke is not being contained.

10 Warranty Information

THERMO FISHER SCIENTIFIC LAMINAR FLOW EQUIPMENT WARRANTY USA

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner.

During the first sixty (60) months, component parts proven to be non-conforming in material or workmanship will be repaired or replaced at Thermo's expense, including labor. Installation, calibration and certification is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters and gasket are covered by this warranty to the extent that
Thermo Fisher Scientific determines that they were defective at the time of delivery to the carrier.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any component or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

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Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation and preventive maintenance.

If equipment service is required, please call your Technical Services Department at 1-800-438-4851 (USA and Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service, and special applications. Outside the USA, contract your local distributor for warranty information.

THERMO FISHER SCIENTIFIC LAMINAR FLOW EQUIPMENT WARRANTY INTERNATIONAL

The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner.

During the first thirty six (36) months, component parts proven to be non-conforming in material or workmanship will be repaired or replaced at Thermo's expense, excepting labor. Installation, calibration and certification is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters and gaskets are excluded from this warranty.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any component or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

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If equipment service is required, please call your Technical Services Department at 1-800-438-4851 (USA or Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service, and special applications. Outside the USA, contract your local distributor for warranty information.

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