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User's Manual

Protector[®] Filtered Glove Boxes

Base Catalog Model No.	Liner Material	Filter Type	Liner Width	Electrical Receptacle Voltage/Frequency				
				North America 100-115V 50/60 Hz	British (UK) 230V 50/60 Hz	Schuko 230V 50/60 Hz	China/Australia 230V 50/60 Hz	North America 230V 60 Hz only
50650	Fiberglass	HEPA	Single	10	31	35	40	45
50655	Stainless Steel	ULPA	Single	10	31	35	40	45
50655	Stainless Steel	ULPA	Double	12	33	37	42	47

To receive important product updates, complete your product registration card online at register.labconco.com

Please read the User's Manual before operating the equipment.

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Warranty

Labconco Corporation provides a warranty to the original buyer for the repair or replacement of parts and reasonable labor as a result of normal and proper use of the equipment with compatible chemicals. Broken glassware and maintenance items, such as filters, gaskets, light bulbs, finishes and lubrication are not warranted. Excluded from warranty are products with improper installation, erratic electrical or utility supply, unauthorized repair and products used with incompatible chemicals.

The warranty for Protector® Filtered Glove Boxes will expire one year from date of installation or two years from date of shipment from Labconco, whichever is sooner. Warranty is non-transferable and only applies to the owner (organization) of record.

Buyer is exclusively responsible for the set-up, installation, verification, decontamination or calibration of equipment. This limited warranty covers parts and labor, but not transportation and insurance charges. If the failure is determined to be covered under this warranty, the dealer or Labconco Corporation will authorize repair or replacement of all defective parts to restore the unit to operation. Repairs may be completed by 3rd party service agents approved by Labconco Corporation. Labconco Corporation reserves the rights to limit this warranty based on a service agent's travel, working hours, the site's entry restrictions and unobstructed access to serviceable components of the product.

Under no circumstances shall Labconco Corporation be liable for indirect, consequential, or special damages of any kind. This warranty is exclusive and in lieu of all other warranties whether oral, or implied.

Returned or Damaged Goods

Do not return goods without the prior authorization from Labconco. Unauthorized returns will not be accepted. If your shipment was damaged in transit, you must file a claim directly with the freight carrier. Labconco Corporation and its dealers are not responsible for shipping damages.

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

Limitation of Liability

The disposal and/or emission of substances used in connection with this equipment may be governed by various federal, state, or local regulations. All users of this equipment are required to become familiar with any regulations that apply in the user's area concerning the dumping of waste materials in or upon water, land, or air and to comply with such regulations. Labconco Corporation is held harmless with respect to user's compliance with such regulations.

Contacting Labconco Corporation

If you have questions that are not addressed in this manual, or if you need technical assistance, contact Labconco's Customer Service Department or Labconco's Product Service Department at 1-800-821-5525 or 1-816-333-8811, between the hours of 7:30 a.m. and 5:30 p.m., Central Standard Time.

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Chapter 1: Introduction

Congratulations on your purchase of a Labconco Protector® Filtered Glove Box. The stainless steel-lined glove box uses ULPA filters and the fiberglass glove box uses HEPA filters. Your glove box provides personnel protection through superior containment.

These glove boxes effectively contain toxic or noxious particulates when properly installed and operated. In standard negative or optional positive pressure operation modes, the glove box can create an ISO standard Class 3 (ISO 14644-1) clean air environment. This glove box uses either HEPA filters, rated at least 99.99% efficient for 0.3-micron particles or ULPA filters, rated at least 99.999% efficient for 0.12-micron particles.

The Protector Filtered Glove Boxes offer many unique features to enhance safety and performance. To take full advantage of them, please acquaint yourself with this manual and keep it handy for future reference. All glove box operators **must** read and understand how filtered glove boxes operate; please review *Chapter 4: Performance Features and Safety Precautions* before beginning to work with this glove box. Even if you are an experienced user, please review *Chapter 5: Using Your Filtered Glove Box*, which describes the Protector features so that you can use the filtered glove box effectively and safely.



Protector Stainless Steel ULPA-Filtered Glove Box shown on Adjustable Height Base Stand.

Figure 1-1



Protector Double Width Stainless Steel ULPA-Filtered Glove Box shown on Doublewide Base Stand.

Figure 1-2

Chapter 2: Prerequisites

Before you install the glove box, you need to prepare your site for installation. You must be certain that the area is level and of solid construction. In addition, a dedicated source of electrical power should be located near the installation site to power the glove box. The glove box should be strategically placed in the lab to provide efficient workflow and prevent operator interference from normal traffic patterns.

Carefully read this chapter to learn the requirements for your installation site:

- The support, vibration and preventive requirements.
- The location requirements.
- The exhaust and blower requirements.
- The electrical power requirements.
- The space requirements.

Refer to *Appendix B: Protector Filtered Glove Box Dimensions* for complete glove box dimensions.

Refer to *Appendix C: Protector Filtered Glove Box Specifications* for complete electrical and environmental conditions, specifications and requirements.

Support, Vibration and Preventive Requirements

In the preparation of a glove box site, please consider the following:

- A bench or stand that is rigidly mounted to the floor or fixed to the wall, but not both, may be appropriate. 35" to 40" (889mm-1016mm) is typical for standing height. (Labconco stands offered in Chapter 7 vary from 33" to 40".)
- The corners of a building typically have less vibration than the center, which promotes analytical balance stability.
- The bench typically should not contain any vibration-producing equipment, such as shakers or pumps.
- A marble slab with dampening pads placed within the enclosure is an effective low cost means of controlling vibration (see *Chapter 7: Accessorizing Your Filtered Glove Box*).

Location Requirements

The Protector Filtered Glove Boxes have been designed to rest on a typical 29"-30" (737mm-762mm) deep work surface. The height should be 35"-40" for standing position. Avoid placing the glove box in high traffic areas where walking might disrupt the operator or experimentation.

Exhaust and Blower Requirements

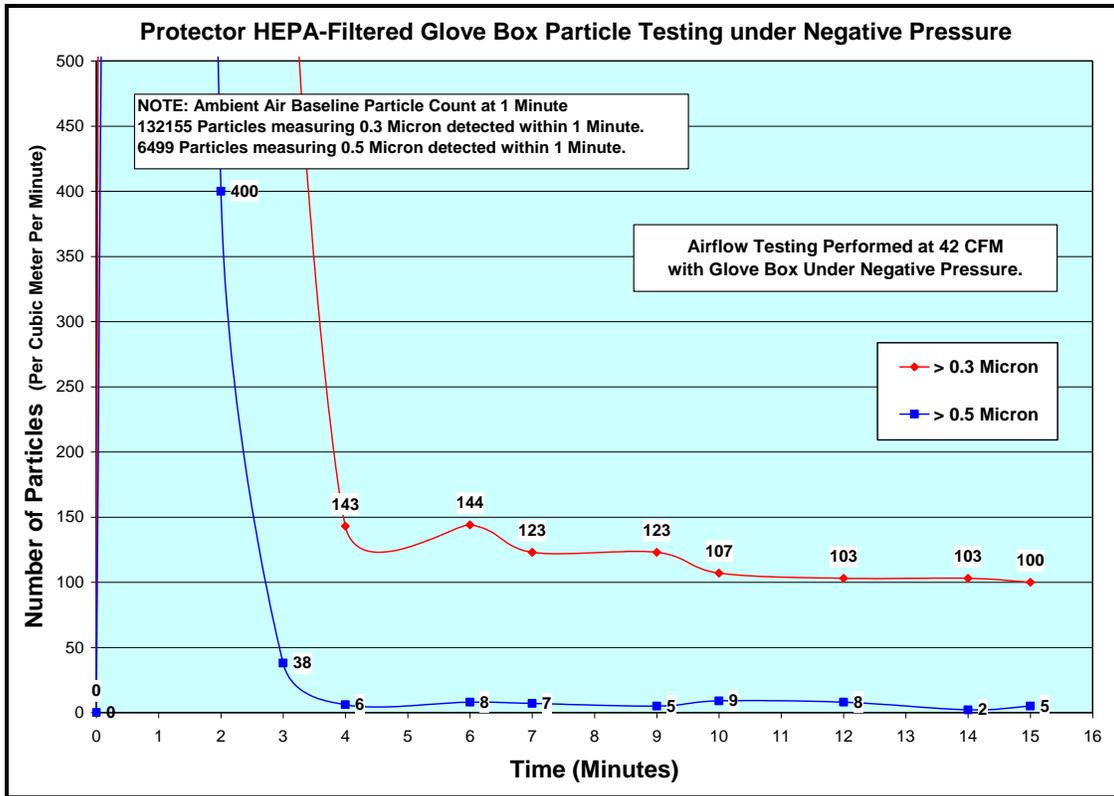
The Protector Filtered Glove Box, as manufactured, uses an integral motorized impeller to pull room air through the inlet filter and exhaust the air through the outlet filter to discharge the clean air back into the laboratory. This negative pressure operation mode pulls all internally-contaminated air through the exhaust filter. The filtered exhaust air is then forced out the top of the glove box. An optional FilterMate™ Portable Exhauster with a carbon filter may be installed downstream of the exhaust to adsorb low levels of organic fumes, formaldehyde, or ammonia gases.

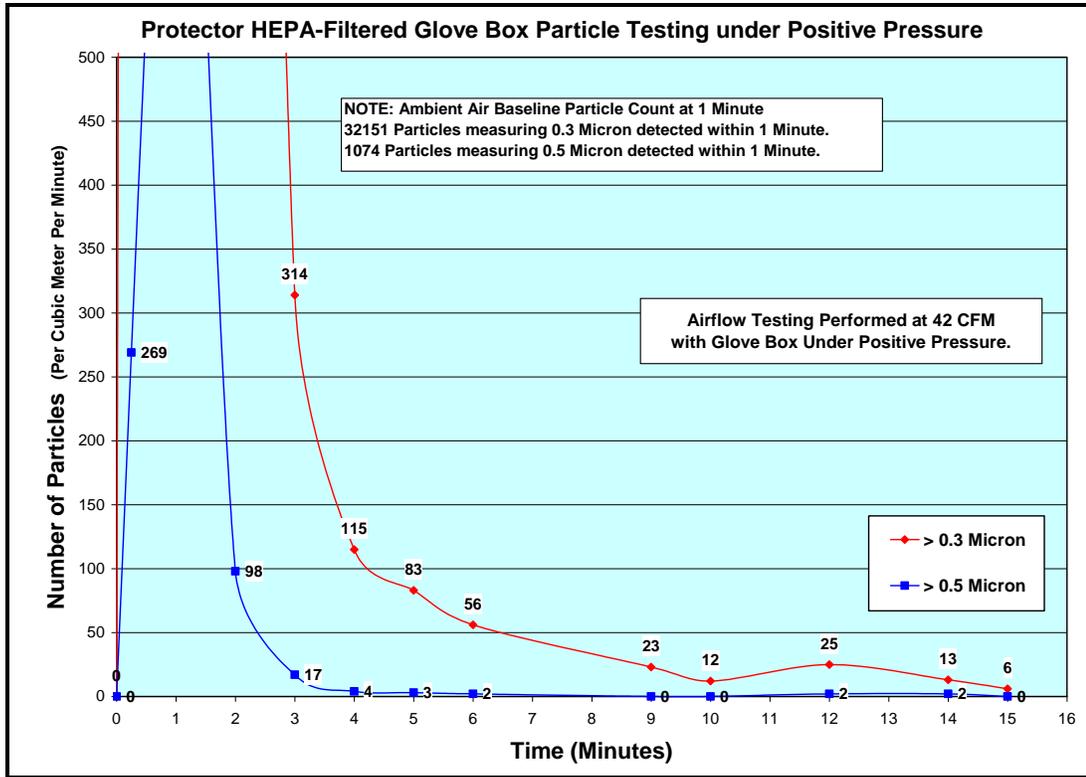
The filtered exhaust air from the glove box can be exhausted to the outside with the installation of a thimble exhaust connection kit and remote blower listed in Chapter 7.

Labconco does not recommend a hard duct connection using the built-in motorized impeller as the source of airflow out of the facility. This can create a positive pressure in the exhaust duct and is harder to maintain.

Labconco does not recommend hard-ducting of a filtered glove box to a remote blower when the internal glove box blower is enabled. When ducting a filtered glove box, a canopy/thimble connection must be used if the blower is enabled. A canopy/thimble connection eliminates the potential for positive pressurization of exhaust ductwork. If a hard-ducted connection is necessary, the glove box impeller must be turned off and ideally removed. Please note that reliance on an external exhaust blower does not provide airflow control at the glovebox.

If a positive internal pressure clean air ISO Class 3 condition (ISO 14644-1) is desired, the motorized impeller can be rotated to work in positive pressure mode (see Figure 3-2). See Chapter 7 for the Positive Pressure Conversion Kit. See the following Negative and Positive Pressure Particle Test data in the charts below. Both charts show the fast dilution rates of the glove boxes.





ISO Class 3 Definition

Airborne particulate cleanliness inside any clean air glove box or enclosure is designated by ISO Class 3, which is equivalent to 35 particles 0.5 µm or larger per cubic meter of air per minute as defined by ISO Standard 14644-1. ISO Class 3 cleanliness is illustrated in the table below and is equivalent to Class 1 air conditions as defined by Federal Standard 209E or 1 particle 0.5 µm or larger per cubic foot of air per minute.

Table 1-1 Selected airborne particulate cleanliness classes for cleanrooms and clean zones.

ISO classification number (N)	Maximum concentration limits (particles/m ³ of air/minute) for particles equal to and larger than the considered sizes shown below (concentration limits are calculated in accordance with 3.2 of Standard 14644-1)					
	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1 µm	5 µm
ISO Class 1	10	2				
ISO Class 2	100	24	10	4		
ISO Class 3	1 000	237	102	35	8	
ISO Class 4	10 000	2 370	1 020	352	83	
ISO Class 5	100 000	23 700	10 200	3 520	832	29
ISO Class 6	1 000 000	237 000	102 000	35 200	8 320	293
ISO Class 7				352 000	83 200	2 930
ISO Class 8				3 520 000	832 000	29 300
ISO Class 9				35 200 000	8 320 000	293 000

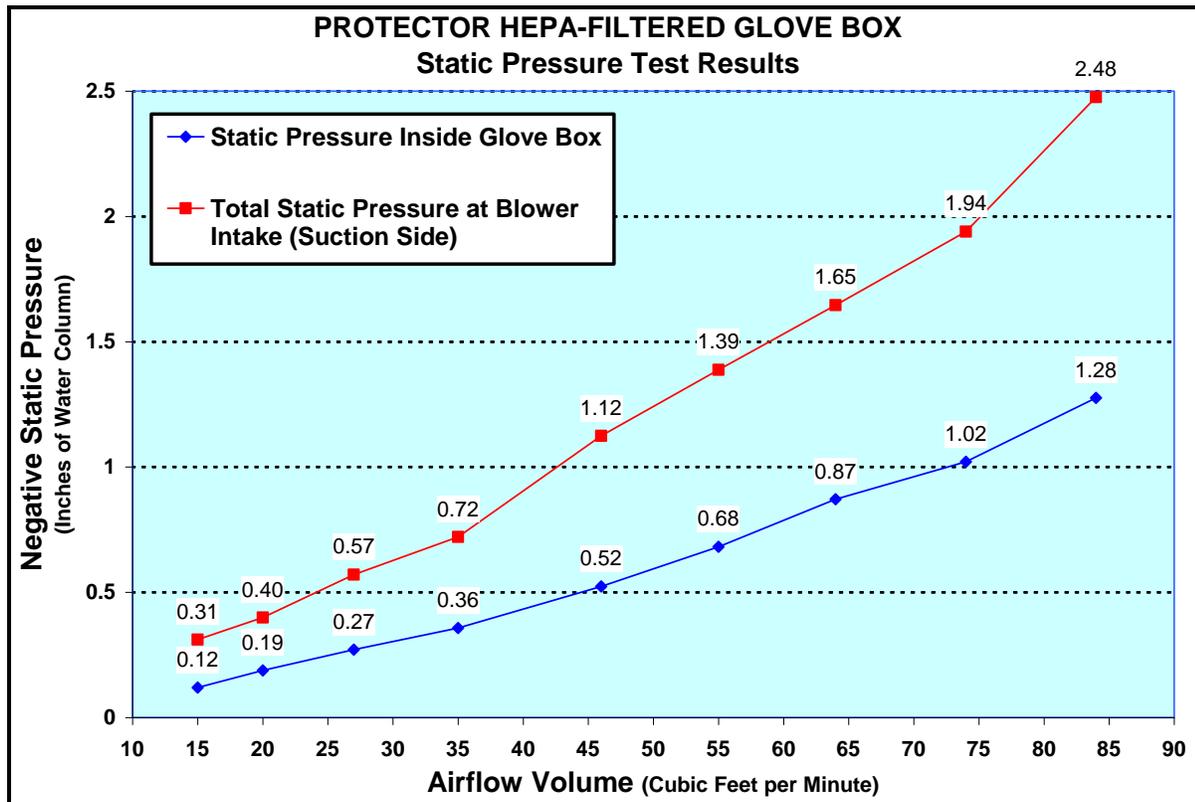
Table 2-1 ISO Classification Number (N)

Chapter 2: Prerequisites

Additionally, the motorized impeller can also be used in a full recirculation mode providing the operator with some control of the atmosphere chemistry within the glove box. See Chapter 7 for the Recirculation Conversion Kit.

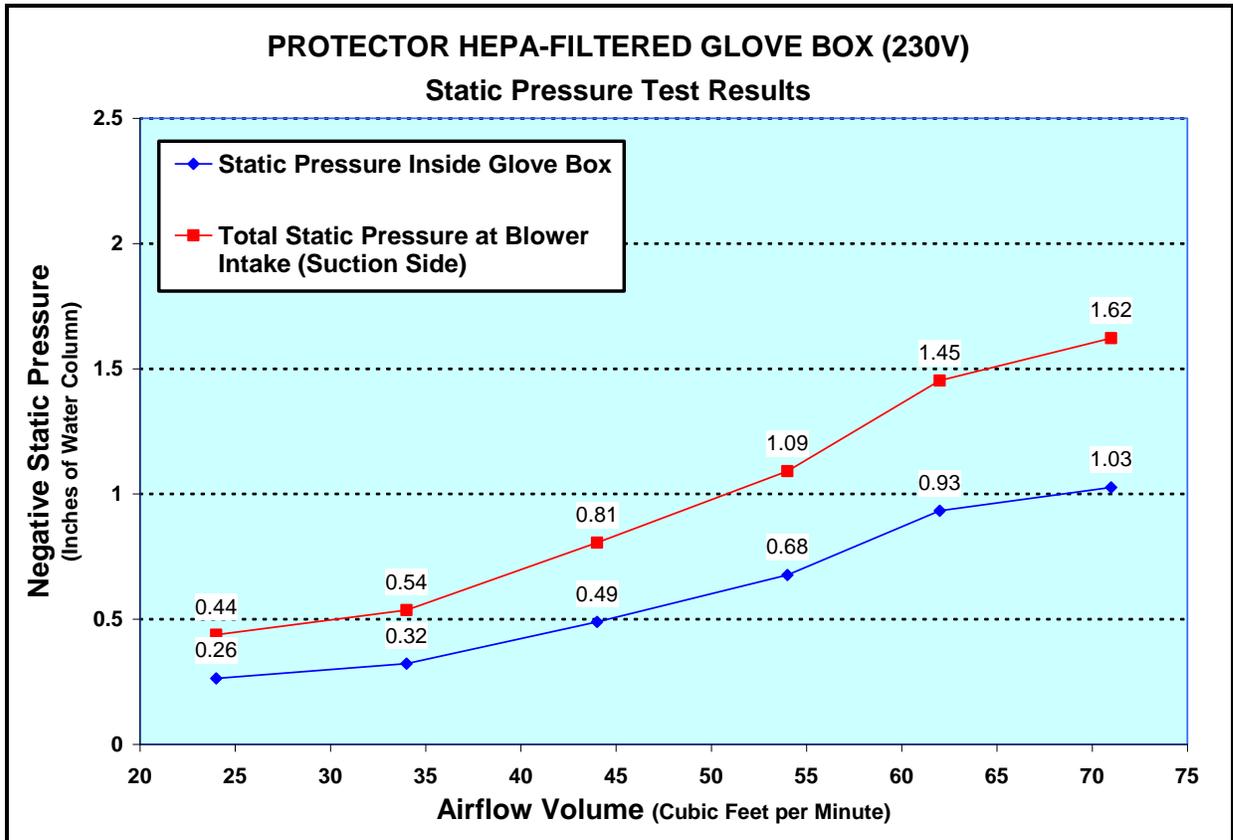
The airflow charts below represents typical operational data including air changes per minute, exhaust volume, noise levels, main chamber static pressures, and total system static pressures measured at the blower intake (suction side). Exhaust volumes are reduced by 17% for products operating at 230V. Exhaust volumes are reduced by 22% for ULPA filters. Exhaust volumes are reduced by 17% for products operating on 100V, 60 Hz and reduced 34% for 100V, 50 Hz products.

% Blower Speed Control Setting	Air Changes per Minute (ACM)	HEPA Exhaust Volume (CFM)	Noise Pressure dB (A)	Static Pressure Inside Glove Box (inches of water)	Total System Static Pressure (inches of water)
Min. 18%	0.9	15	52	0.12	0.31
35%	1.8	30	54	0.30	0.62
55%	2.8	48	59	0.54	1.14
75%	3.8	65	63	0.87	1.65
Max. 100%	5.0	85	68	1.28	2.48
Dial OFF	0	0	37	0	0

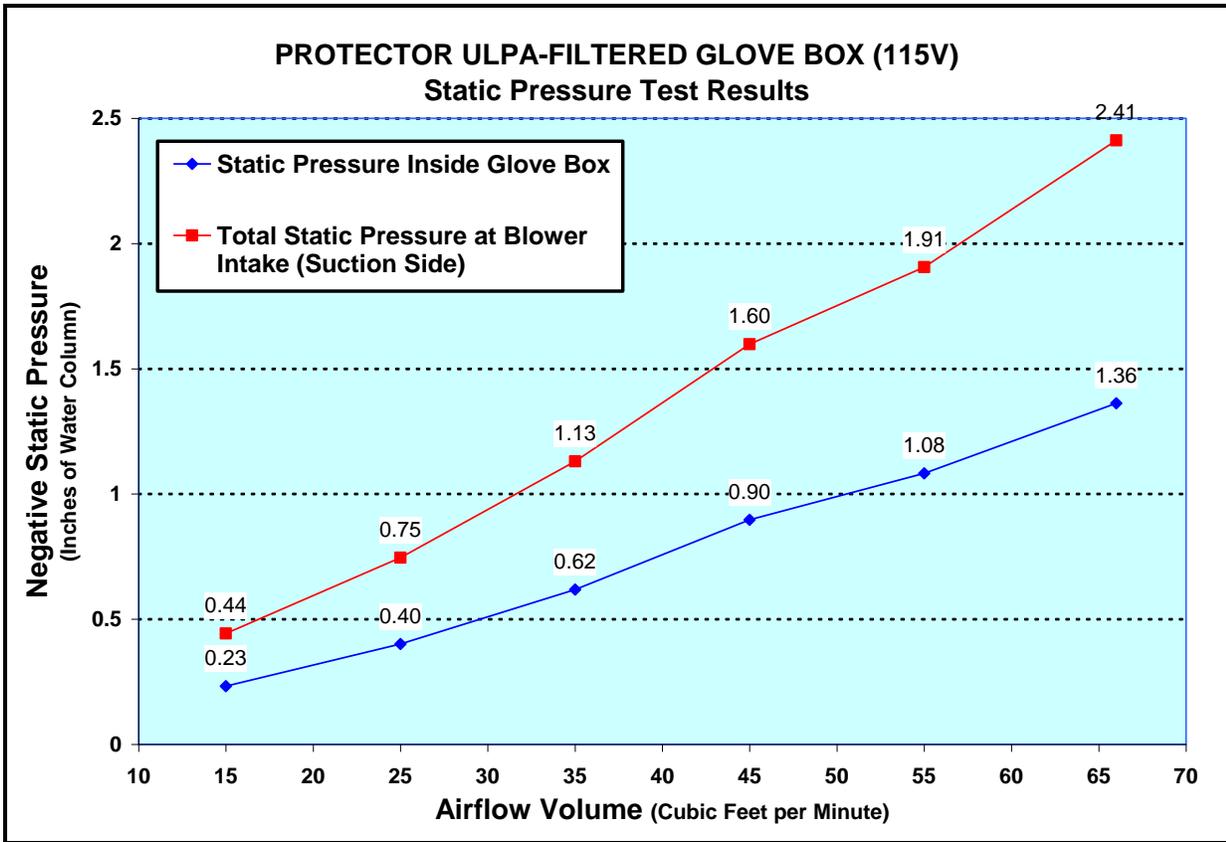


Static Pressure test results on the Protector HEPA-Filtered Glove Box

Note: Test results are approximately the same for positive pressure application

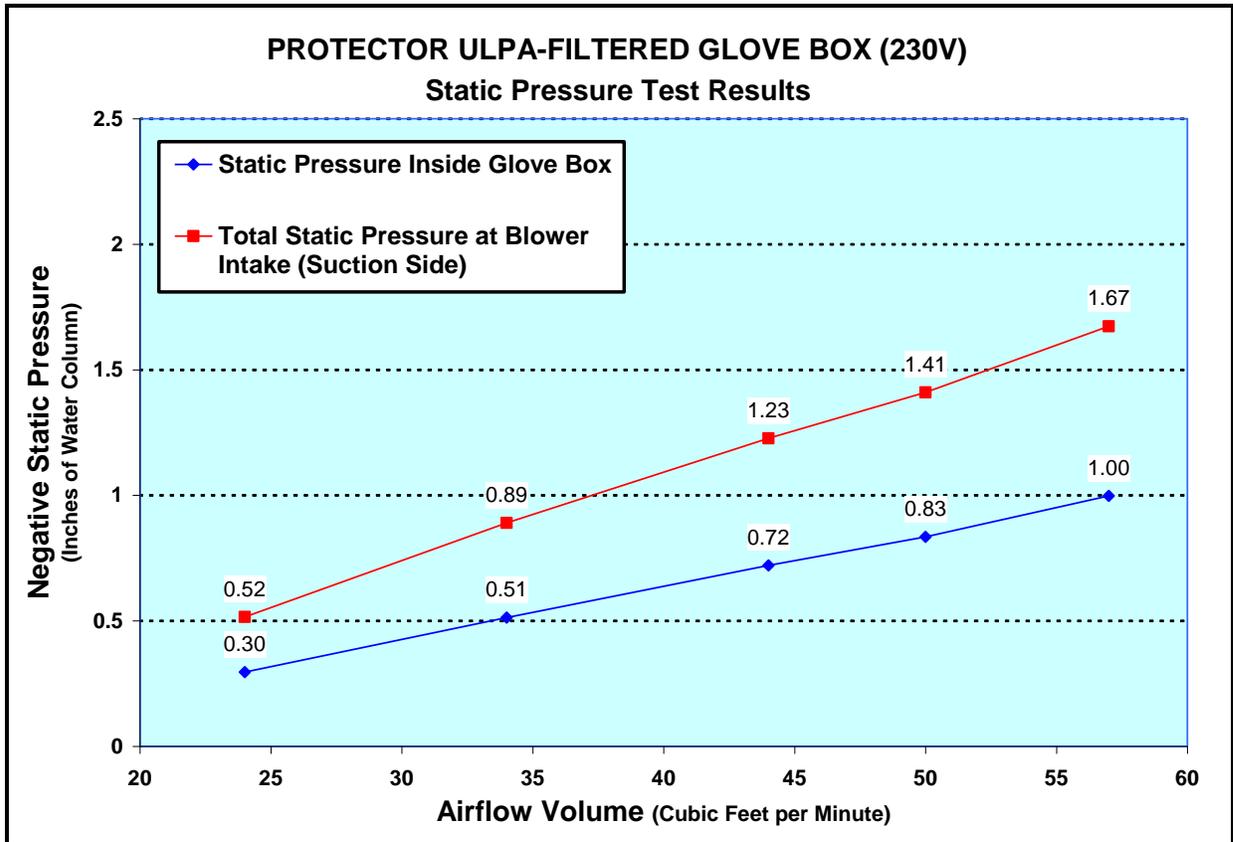


Static Pressure test results on the Protector HEPA-Filtered Glove Box
Note: Test results are approximately the same for positive pressure application



Static Pressure test results on the Protector ULPA-Filtered Glove Box

Note: Test results are approximately the same for positive pressure application.



Static Pressure test results on the Protector ULPA-Filtered Glove Box
Note: Test results are approximately the same for positive pressure application

For thimble-ducted glove boxes, the proper remote blower selection can be determined from these exhaust requirements as the remote blower only needs to be sized for the static pressure loss of the ductwork system. The thimble ducted exhaust blower should be sized for 25% additional airflow. When exhausting a glove box to the outside, it should be connected to a dedicated remote blower.

Labconco offers accessory remote blowers listed in Chapter 7. Contact Labconco for blower sizing assistance.



When a glove box is connected to a remote blower exhaust system, an adjustable damper (or valve) should be installed in the duct to control the airflow volumes properly. See Chapter 7 for Exhaust Dampers.

Electrical Requirements

Electrical service should be nearby for connecting the glove box cords, and accessory equipment. Single width units require one line cord and double width units require two line cords. Line cords are each rated at 100-115V, 15A or 230V, 12A. The glove box is rated 115V, 12A or 230V, 12A or 100V, 12A. A convenience outlet is located inside the glove box and is rated for 115V, 12A or 230V, 6A or 100V, 12A. Additional power strip accessories are available for connection to the outlet and are listed in Chapter 7.

Space Requirements

The dimensions are shown in *Appendix B: Dimensions*. Adequate space to the right of the transfer chamber is required for loading and unloading.

Chapter 3: Getting Started

Once the site for your Protector Glove Box is properly prepared, you are ready to unpack, inspect, install, and validate your system. Read this chapter to learn how to:

- Unpack and move the glove box.
- Set up the glove box with the proper supporting structure and work surface.
- Connect to an exhaust system if applicable.
- Install the gloves.
- Connect the electrical supply.
- Set the exhaust volume with the speed control adjustment.
- Reset the calibration program if applicable.
- Arrange validation for the glove box.



Each Protector Glove Box weighs 350 lbs. (158 kg) for fiberglass models, 500 lbs. (225 kg) for single width stainless steel models, and 1000 lbs. (450 kg) for double width stainless steel models. The shipping container allows for lifting with a mechanical lift truck or floor jack. If you must lift the enclosure manually, follow safe-lifting guidelines. Do not lift by the upper sheet metal façade and front panel as damage can occur.

Unpacking the Glove Box

We recommend that you do not remove the glove box from its shipping container until it is ready to be placed into its final location. Move the unit by placing a flat, low dolly under the shipping skid, or by using a floor jack.

Carefully remove the shrink-wrap and crating on the glove box and inspect it for damage that may have occurred in transit. **If damaged, notify the delivery carrier immediately and retain the entire shipment intact for inspection by the carrier.**



THE UNITED STATES INTERSTATE COMMERCE COMMISSION RULES REQUIRE THAT CLAIMS BE FILED WITH THE DELIVERY CARRIER WITHIN FIFTEEN (15) DAYS OF DELIVERY.



DO NOT RETURN GOODS WITHOUT THE PRIOR AUTHORIZATION OF LABCONCO. UNAUTHORIZED RETURNS WILL NOT BE ACCEPTED.



IF ENCLOSURE WAS DAMAGED IN TRANSIT, YOU MUST FILE A CLAIM DIRECTLY WITH THE FREIGHT CARRIER. LABCONCO CORPORATION AND ITS DEALERS ARE NOT RESPONSIBLE FOR SHIPPING DAMAGES.

Do not discard the packing material until you have checked all of the components and tested the glove box.

Installing the Glove Box on a Supporting Structure and Work Surface

Exercise caution when lifting or moving the glove box.

When installing the glove box onto a work surface or benchtop, ensure that the structure can safely support the combined weight of the glove box and any related equipment. The work surface should be as wide as the glove box to properly support it. The front of the glove box should be aligned with the front of the work surface for optimal comfort. A height of 35"-40" (889mm-1016mm) is appropriate for standing operation. Adjustable Height Base Stands listed in Chapter 7 may be adjusted from 33"-40" (838mm-1016mm).

Connecting to the Exhaust System (If Applicable)



WARNING: The weight of any exhaust ductwork system must be supported independently of the glove box superstructure or damage may occur.



The exhaust system should be installed by a qualified HVAC contractor.

The Protector Filtered Glove Box has been manufactured to exhaust into the laboratory in its standard configuration. To remove chemical fumes and odors not trapped by the HEPA or ULPA filter, the glove box can be exhausted to the outside (see Figure 3-1), or connected to an accessory FilterMate Portable Exhauster with carbon filters. See Chapter 7 for accessories including: Thimble Exhaust Connection, FilterMate Portable Exhauster and separate Exhaust Kit, Positive Pressure Conversion Kit, Recirculation Kit, or Hard Duct Connection Kit.

Consult Labconco Customer Service if you require help sizing a remote blower for the exhaust volume and the duct work system (static pressure loss listed in Chapter 2).



To ensure compatibility, the selected exhaust duct material should match the enclosure, procedures and chemical applications.

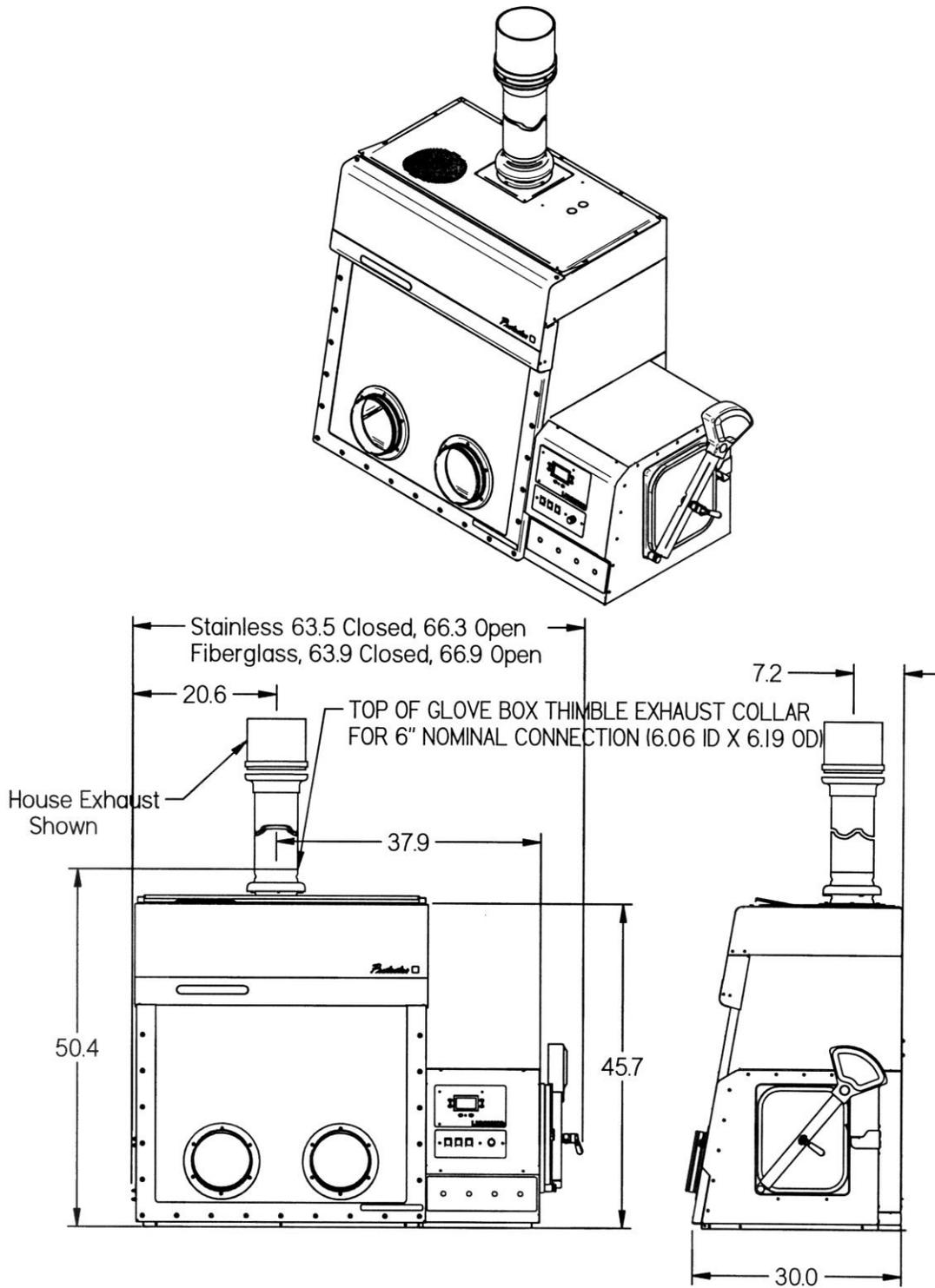


Figure 3-1
6" Thimble Exhaust Connection to Outside
 (all dimension in inches)

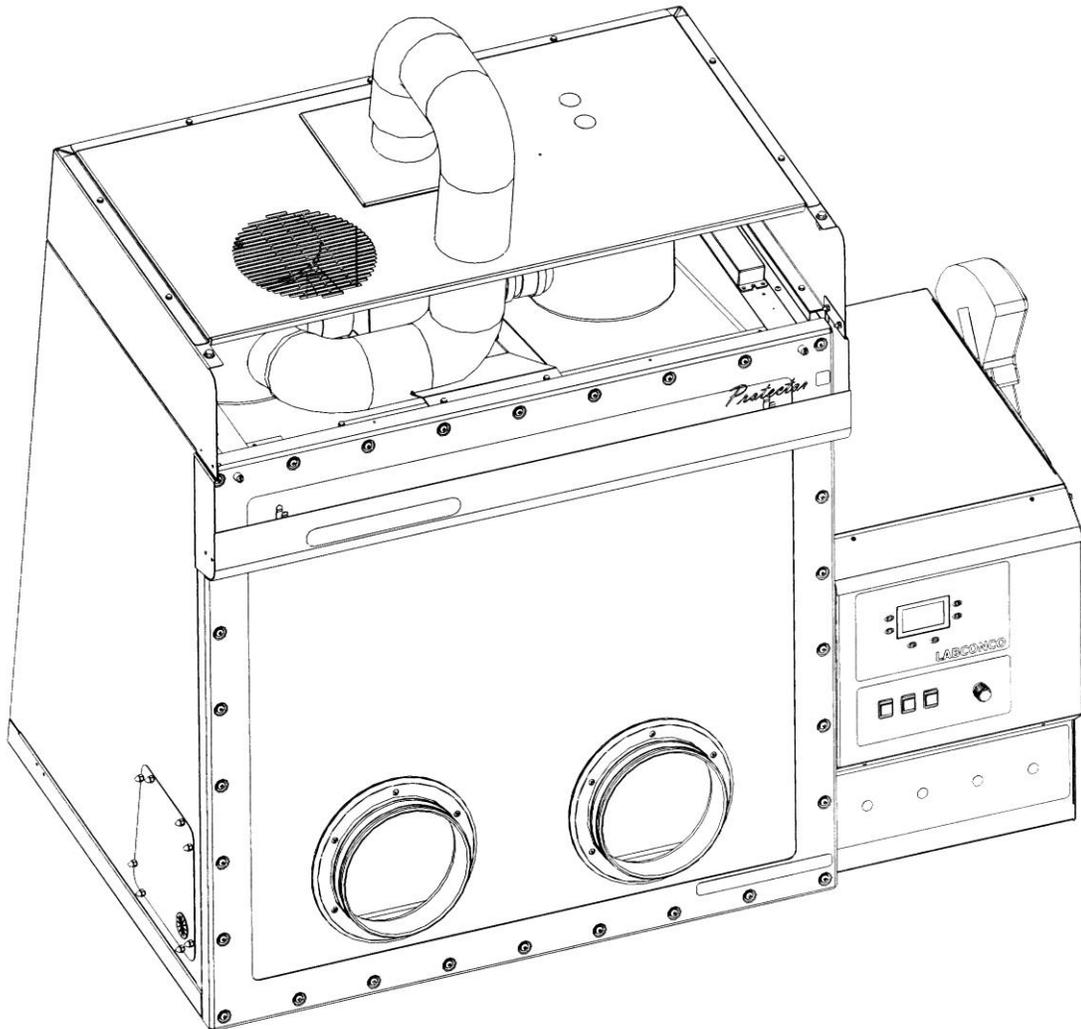


Figure 3-2
Positive Pressure Glove Box Configuration
(shown with a portion of the front panel removed)

Installation of Gloves to the Glove Ports

With thumbs up and right/left orientation, secure the gloves in place on the glove ports by stretching the beaded cuff into the groove nearest the window. Install the separate 8" diameter O-ring over the gloves and into the outer groove of the glove port surface. Stainless steel band clamps are provided for securing the separate O-ring into the glove port groove. Replacement gloves and parts are listed in Appendix A with a description in Chapter 7.

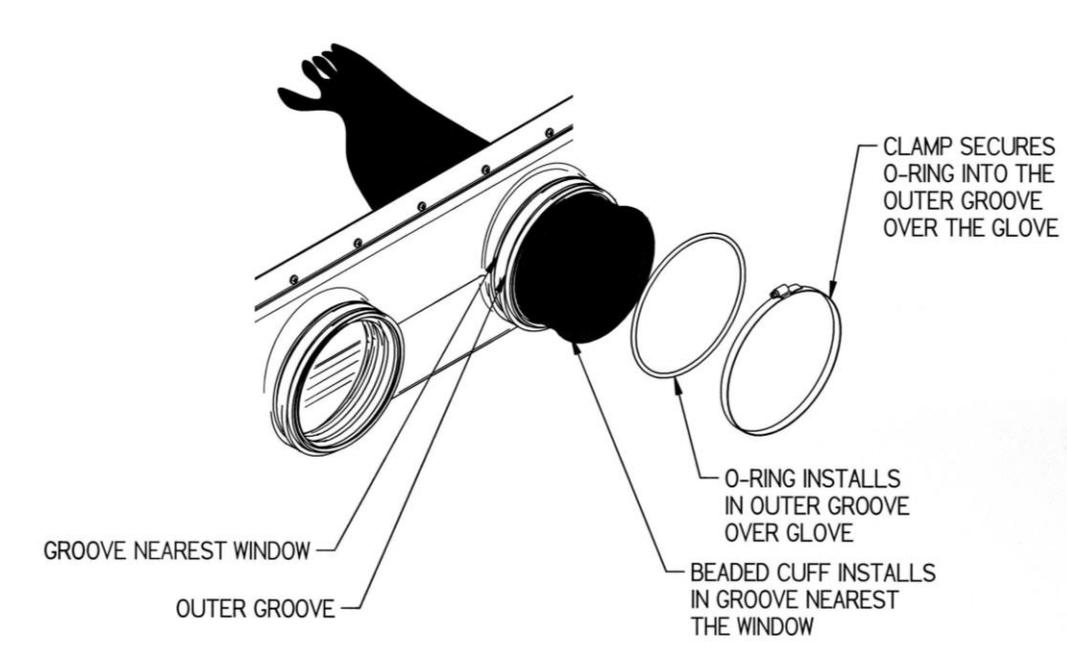


Figure 3-3
Glove Installation

Connecting the Electrical Supply to the Glove Box

115V, 60 Hz; 100V, 50 Hz or 100V, 60 Hz Models

Connect the power cord supplied to the IEC electrical supply plug on the back of the glove box. Double width models utilize two power cords. 115V or 100V models are rated at 12 amps total.

The maximum circuit load for the interior electrical duplex is 10 amps.

230V, 50 Hz or 230V, 60 Hz Models

The same procedure applies for the 230V models. Install the power cord per local requirements. The 230V, 50 Hz or 230V, 60 Hz models are both rated at 12 amps total. **The interior electrical duplex is rated at 10 amps.**

Setting the Exhaust Volume with the Speed Control Adjustment

For Protector Filtered Glove Boxes, the speed control located on the front panel of the transfer chamber adjusts the exhaust air volume. The exhaust air volume should be adjusted to the lower settings for weigh operations.

(Consult your Safety Officer for airflow recommendations for your application). Working at the lowest exhaust volume appropriate for the application will give the quietest operation. To increase the dilution rate of air volume changes after working in the glove box and to ensure proper cleaning, the speed control should be maintained at a higher setting above 35-40 CFM for 5 to 10 minutes as recommended by the operator's predetermined protocol. The exhaust volume is increased by turning the speed control counterclockwise.

Resetting the Calibration Program

With the gloves installed and transfer chamber doors closed, the maximum airflow volume (CFM) for the glove box has been preset between 50–85 CFM with a main chamber maximum pressure above 0.7" water gauge.

Important Note: Transport, altitude and temperature differences may require a reset of the "Calibration Program" as outlined in Chapter 5. When "Calibration" is reset, it is best to try the previously calibrated values shown in "Diagnostics" as outlined in Chapter 5 and the test report form that shipped with the glove box.

Validating the Glove Box

The Protector Filtered Glove Box has been leak tested at the factory for filter and main chamber pressure integrity. The HEPA or ULPA filters should be leak checked upon start-up and annually thereafter per the procedure in Chapter 6. **Upon start up, the main chamber pressure should be greater than 0.7" w.g. at full blower speed to validate proper blower operation; if not, contact Labconco for service.**



NOTE: Main chamber pressure and smoke removal tests should be performed frequently, per your established quality system, to ensure safe performance.

Summary of Performance Testing Results

Labconco's test results show that the Protector Filtered Glove Box meets all the performance criteria when operated at 50% airflow volumes (50% inflow corresponds to 42 CFM or less for weighing with an analytical balance or handling powders; and 35-42 CFM or above for safe air clean up). In cases where insufficient performance was observed, the lack of performance occurred under adverse test conditions or at airflow volumes below minimum recommended airflow volume for the specific operation. Contact Labconco or visit www.labconco.com for complete performance test data. The following provides a brief summary of the findings:

- Smoke purge tests were conducted at airflow volumes of 15-CFM to 84-CFM. The time required to visibly purge the main chamber of smoke varied from approximately 360 seconds at 15-CFM to 60 seconds at 84-CFM.
- Tracer gas was not detected in the breathing zone of the mannequin during tracer gas containment tests with the glove box vented to the outside. Perimeter scans were also conducted during tracer gas testing of the Protector Filtered Glove Box, and under normal laboratory conditions testing surpassed ASHRAE 110 standards (0.10 PPM average or less) and achieved Labconco standards (0.05 PPM average or less).
- Surrogate naproxen sodium test results were conducted with three different operators of varied skill level and stature. Each operator weighed 20, one gram samples over a period of 30 minutes or greater. In each case, the operator cleaned up after weighing and no detectable levels of naproxen sodium occurred at the operator, transfer chamber, or in the room. Detection limits were less than 2 ng/cassette or less than 20 ng/cu. meter. The Protector Filtered Glove Box clearly showed excellent repeatability and containment of naproxen sodium powder during typical weighing operations. Test results validated by Safebridge Consultants, Inc.
- Noise Pressure (Sound levels) varied from 51.8 dB(A) at 15-CFM to 68.5 dB(A) at 84 CFM. These sound levels will be much less if the exhaust air from the glove box is ducted to the outside.
- Airborne particulates (measured under positive and negative pressure) within the main chamber of the glove box exceeded ISO Class 5 conditions (equivalent to Class 100) and achieved ISO Class 3 conditions (equivalent to Class 1).
- Glove box fluorescent lamp light levels (illumination) measured across the work surface averaged above 80 foot candles for stainless steel models and above 120 foot candles for fiberglass models.

- Static pressure measured inside the glove box varied from negative .12 inches of water column at 15-CFM to negative 1.28 inches of water at 84-CFM. The total system static pressure as measured between the exhaust filter and the blower varied from negative 0.31 inches of water column at 15-CFM to negative 2.48 inches of water at 84-CFM.
- Displacement (vibration level) measured on the work surface is negligible at minimum through maximum airflow volume settings. The measured level of displacement ranged from 0.07×10^{-5} meters to 0.38×10^{-5} meters.
- Balance stability test results were excellent with no detectable instability of an analytical balance to five decimal places and a top loader to three decimal places. Test results were confirmed with the glove box operating at various airflow volume settings and with various sample weights.

Chapter 4: Performance Features and Safety Precautions

Performance Features

The Protector Filtered Glove Box is designed to provide superior particulate containment. The filtered glove boxes have been tested to effectively contain toxic and noxious materials when properly installed and operated. Labconco engineered the filtered glove boxes to minimize the effects of turbulence. The concentrations of particulate materials in the main chamber are determined by the frequency of main chamber air volume changes. See Figure 4-1 to refer to a detailed description of the main performance features.

1. **Fiberglass-lined models feature:**

- Inlet and outlet HEPA filters, 99.99% efficient on 0.3 micron particulates.
- Illumination exceeds 120 foot candles.
- One-piece molded fiberglass liner.
- Clear acrylic inner and outer transfer chamber doors.

2. **Stainless steel-lined models feature:**

- Inlet and outlet ULPA filters, 99.999% efficient on 0.12 micron particulates.
- Illumination exceeds 80 foot candles.
- Type 304 stainless steel liner.
- Type 304 stainless steel inner and outer transfer chamber doors.
- Type 304 stainless steel front panel.
- Doublewide models include 4 glove ports with main chamber volume of 34 cu. ft.

All models feature:

3. Particulate containment <20 nanograms per cubic meter as confirmed by SafeBridge Consultants, Incorporated.
4. Fast “clean up time.” 0.05 ppm average tracer gas levels or less detected during perimeter scan testing (surpasses ASHRAE 110 standards) after 5 minute dilution.
5. Airborne particulate cleanliness (measured under positive and negative pressures per ISO 14644-1 test method) exceeds ISO Class 5 conditions (equivalent to Class 100) and achieves ISO Class 3 conditions.
6. Factory leak-tested with a mass spectrometer while pressurized with helium at 1 inch of water gauge. No detectable leaks greater than 1×10^{-6} ml/sec.
7. Test port for challenging HEPA or ULPA filter integrity.
8. True Bag-In/Bag-Out Filter Disposal System for safe filter removal and replacement.
9. LCD display provides real time monitoring of volume dilution rates in cubic feet per minute (CFM), air changes/minute (ACM), and main chamber pressure (inches of water).
10. Built-in blower with speed control capable of airflow from 15 CFM to 85 CFM.
11. Large viewing area, 36" w x 27.6" high provides maximum visibility. Viewing window is 3/8" thick, laminated safety glass. Double width models have double the viewing area.
12. Space-saving inner and outer transfer chamber doors that pivot upward, are counterbalanced and equipped with quick-latches.
13. Interior right-handed side wall-mounted electrical duplex receptacle with 10 amp maximum (100/115 volt models) or 10 amp maximum (230 volt models) circuit load.
14. Interior left hand side wall-mounted pass-through plug for on-site installation of an optional accessory: electrical outlet, RS-232 port, gas/liquid port, or port for oxygen or moisture monitor.
15. Pair of neoprene gloves, 0.015" thick, 30" long, size 9 ¾. Two pair for double width models.
16. Switches for light, blower and electrical duplex.
17. Two 8" ID, epoxy-coated aluminum, double-grooved glove ports mounted 17" apart, with neoprene gaskets. Double width models have four glove ports.
18. Two 25-watt fluorescent lights. Double width models have four lights.

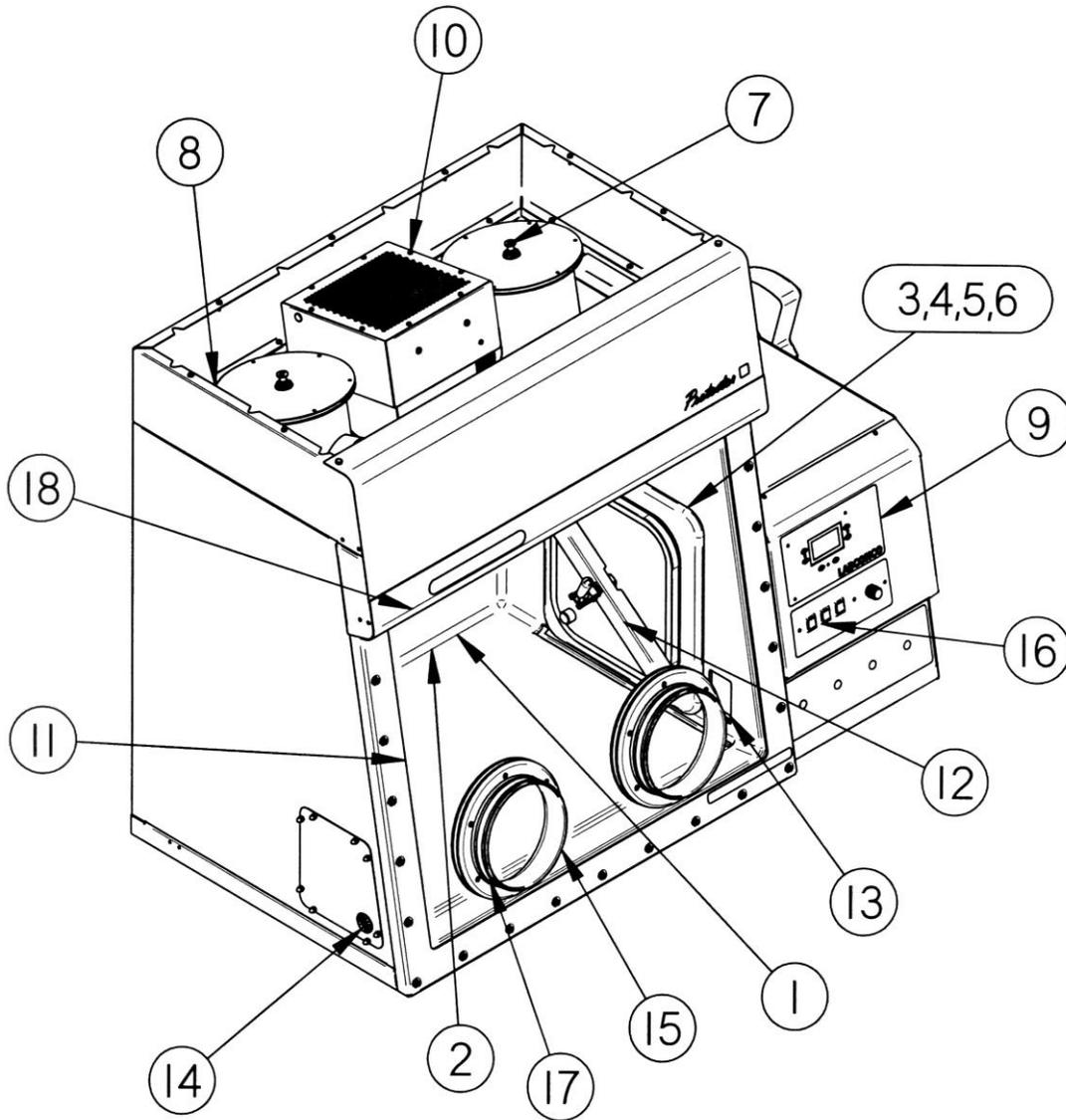


Figure 4-1
Performance Features

Safety Precautions

1. It is the responsibility of the user to determine the suitability of this product for the intended applications. Consult your Safety Officer.
2. Prior to using the glove box, check to make sure that the exhaust blower is operating and that air is entering the glove box by observing the static pressure gauge.
3. Use good housekeeping in the glove box at all times. Clean up spills immediately. Periodically clean glove box interior.
4. **This product is NOT designed or intended to be explosion proof.** It is the responsibility of the user to determine and avoid lower explosive limits and flammability of any enclosed chemicals or gases. The user is also responsible for taking proper precautions to prevent equipment damage or injury due to explosion or combustion.
5. The use of flammable gases or solvents in the glove box should be limited. Care must be taken to ensure against the concentration of flammable or explosive gases or vapors. Use of an open flame or exposure to high heat should be avoided in the glove box as heat can damage the fiberglass liner. Heat may harm the filter and damage the filter's adhesive.
6. Perchloric acid use in this enclosure is prohibited.
7. Radioisotope usage in the glove box should be cleared with your Safety Officer.
8. A qualified certification technician should test the integrity of the filters before the box is initially used.
9. The glove box should be recertified whenever it is relocated or serviced and at least annually thereafter.
10. The use of safety goggles, protective clothing, and any other personal protective equipment recommended by your Safety Officer should be employed.
11. The HEPA or ULPA filter provides personnel and environmental protection from particulate matter. Should the blower be reversed to positive pressure inside, this glove box may be used for operations requiring product protection from environmental particulate contamination.
12. HEPA or ULPA filters are only effective for entrapment of particulate matter. Manipulations that generate gases or vapors from toxic chemicals or radionuclides are not captured by the HEPA or ULPA filters.

13. The surface of the HEPA or ULPA filter is fragile and should not be touched. Care must be taken to avoid puncturing the filter during installation or normal operation. If you suspect that a filter has been damaged **DO NOT** use the glove box; contact a local certification agency or Safety Officer.
14. The filters in the glove box will gradually accumulate airborne particulate matter from the room and from work performed in the glove box. The rate of accumulation will depend upon the cleanliness of the room air, the amount of time the glove box is operating and the nature of work being done in the glove box. With normal usage, the filters will last two to five years before requiring replacement (see Chapter 6).
15. Ensure that the filtered glove box is connected to an electrical service in accordance with local and national electrical codes. Failure to do so may create a fire or electrical hazard. Do not remove or service any electrical components without first disconnecting the glove box from electrical service.
16. Used HEPA or ULPA filters may be hazardous waste. The user is responsible for recording chemicals used and disposal of used filters.
17. Ensure only trained operators use the glove box. New users **must** review the User's Manual with emphasis on Routine Daily Work Procedures in Chapter 5 and become familiar with the safe operation of the glove box.
18. Only powders and particulates removed by HEPA or ULPA filters are appropriate for use in this glove box. Vapors and other gases should be exhausted to the outside or adsorbed with the use of an accessory FilterMate Portable Exhauster equipped with carbon filters. See Chapter 7.
19. Leave the impeller on for at least 5-10 minutes at 50%-100% speed after work in the glove box has been completed to purge the interior of containments.
20. If a chemical, powder or particulates are spilled on the work surface, **DO NOT** switch off the blower until all traces have been removed.
21. Tag glove box with appropriate warning if filters have been removed or the glove box requires servicing.
22. If the blower fails during use, processes should cease and the area should be vacated. Inform your Safety Officer immediately.
23. Consult your Safety Officer before removing any tubing that monitors pressure and airflow or exhaust hoses as they may be contaminated.

Chapter 5: Using Your Glove Box

Now that the installation of your glove box is completed, you are ready to use your Protector Filtered Glove Box.

Read this chapter to learn about:

- Starting the Filtered Glove Box
- Control Panel Touch Pad
- All Program Screens
- Routine Daily Work Procedures
- Appropriate HEPA Filter Applications, Suitability and Guidelines
- Definition of Terms
- Appropriate Chemicals for Carbon Filters
- Acid Use

Starting the Filtered Glove Box

1. To start the glove box blower, turn the “Blower” switch to on and adjust the “Airflow” speed control.
2. To turn the fluorescent light on, turn the “Light” switch to on.

Note: The glove box doors must be completely closed before performing work.

Control Panel Touchpad

The touchpad of the Protector Filtered Glove Box is shown below. Take a moment to get familiar with the buttons, their location and function. Also familiarize yourself with the display located on the front. The display will report system functions, such as airflow status, pressure status, timer displays, low airflow alarm messages, and low pressure alarm messages.



Figure 5-1

Menu Button – This button toggles the display between menu modes. When in the menu mode, this button returns you to the previous menu.

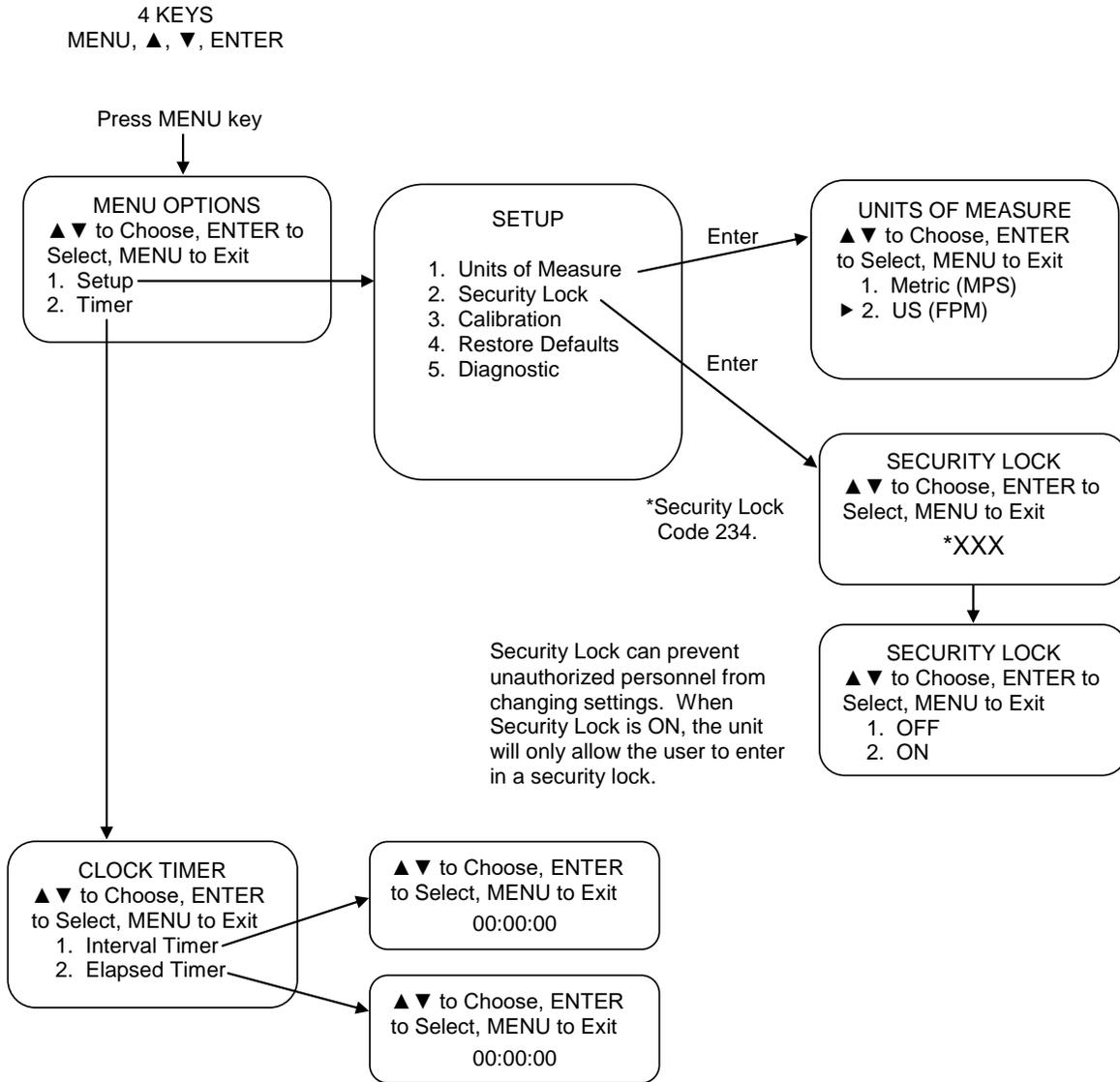
Mute Button – Allows you to temporarily mute an alarm.

Select Up/Down Yes/No Buttons – Allows you to change options and values in the menu mode.

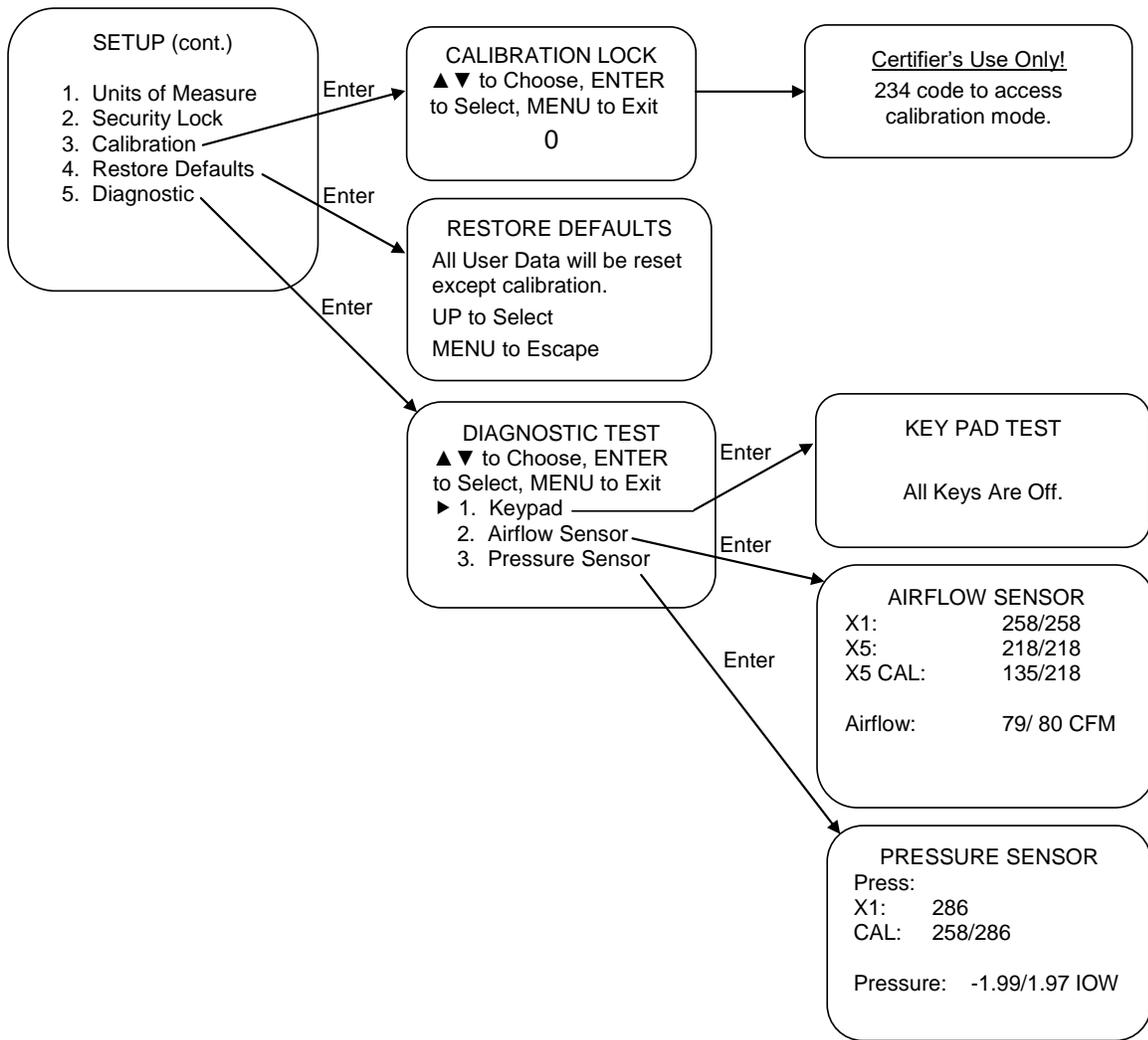
Enter Button – Allows you to enter or select a value or select an option in menu mode.

Timer Button – Allows you to select either a repeating interval timer or an elapsed timer.

All Program Screens

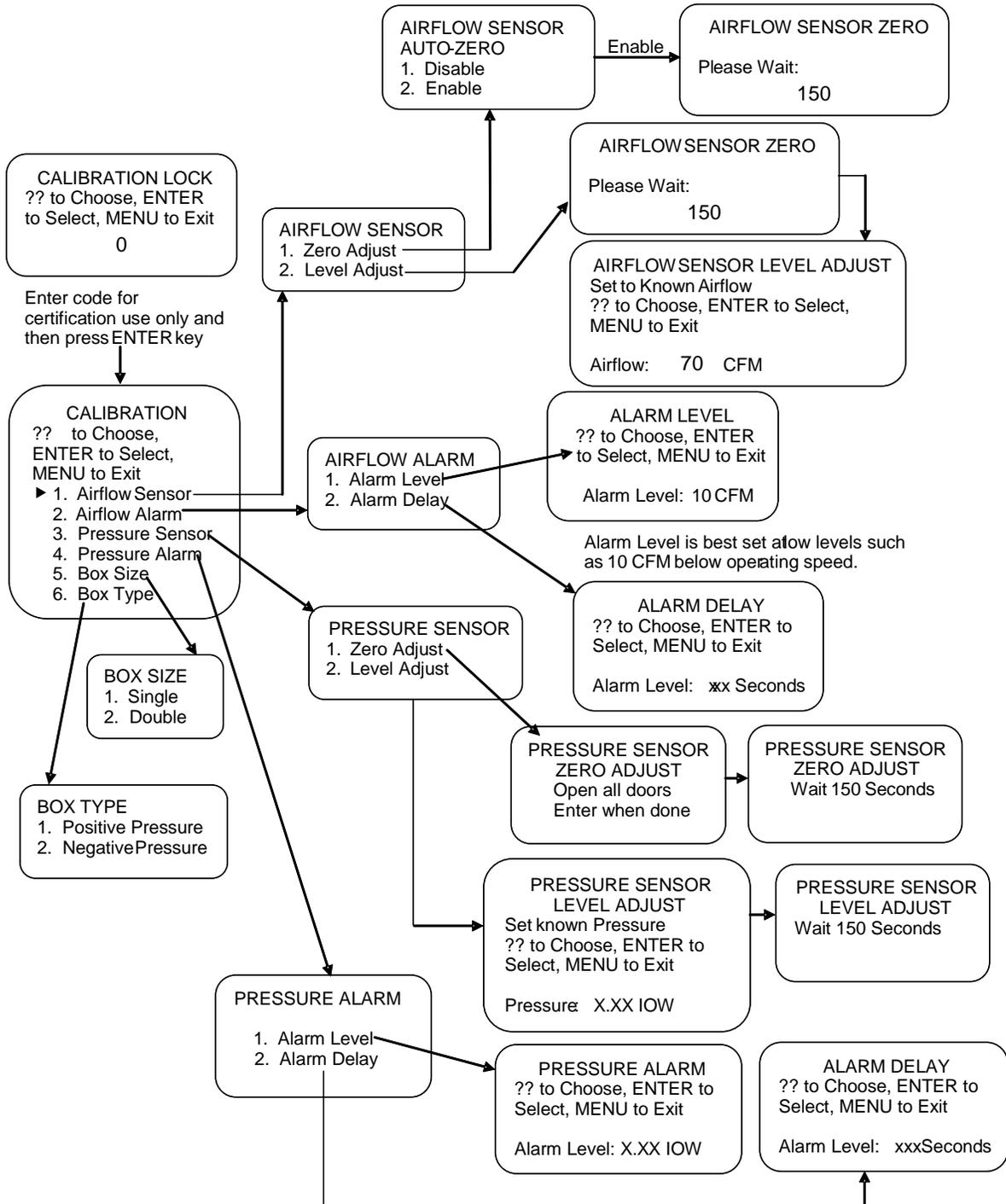


Main Setup Screens



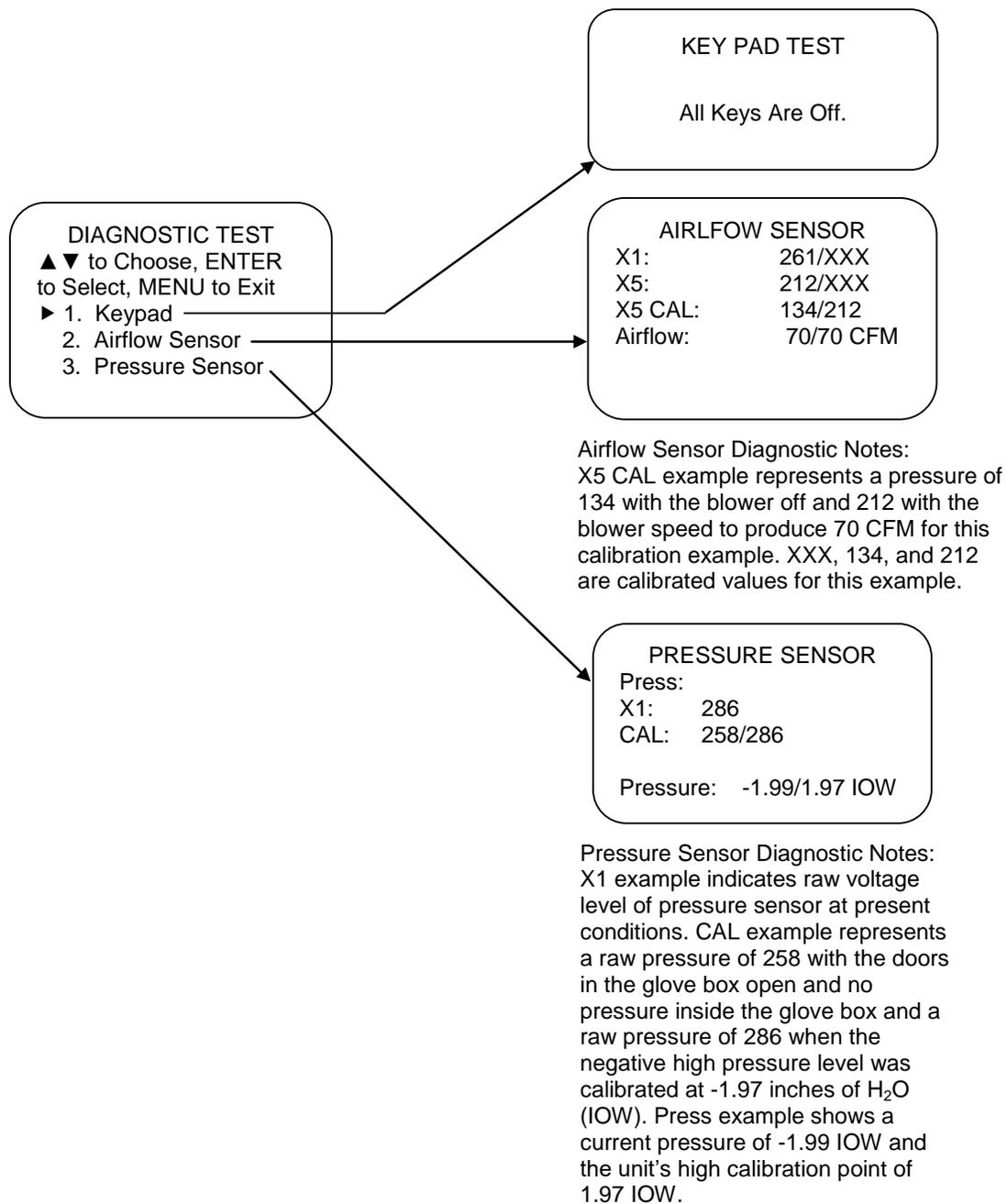
See "Diagnostics Program Screens" for more info.

Calibration Program Screens



Pressure Sensor Auto-Zero Note: Every time blower is shut off, wait 100 seconds and then take zero data for 30 seconds. Auto-Zero occurs while the blower is off for the entire time span. The "span" or difference between zero airflow and 70 CFM is saved from "Pressure Sensor" calibration in step 2. Also, flash icon on LCD to shut AutoZero.

Diagnostic Program Screens



Routine Daily Work Procedures

Planning

- Thoroughly understand procedures and equipment required before beginning work.

Start-up

- Consult your Safety Officer for personal protective equipment recommendations.
- Turn on exhaust blower and light.
- Allow the enclosure to operate for 2-5 minutes at 50-100% blower speed.

Loading Materials and Equipment

- Load only the materials required for the procedure. Do not overload the glove box.
- Be aware that gloves will inflate when the glove box is operated under negative pressure. Ensure items in the glove box will not obstruct the movement of the gloves.
- After loading, wait 2-5 minutes at 50-100% blower speed to purge airborne contaminants from the work area before beginning procedures.

Work Techniques

- Segregate all clean and contaminated materials in the work area.

Final Purging

- All open trays, weigh vessels or containers **must** be sealed before being removed from the glove box.
- Objects in contact with contaminated material **must** be surface decontaminated before removal from the glove box.
- The interior surfaces should be cleaned per user's protocol.
- Upon completion of work, the glove box should be allowed to operate for 5 minutes undisturbed at 100% speed or 10 minutes at 50% speed to purge and dilute airborne contaminants from the work area.
- After purging the main chamber, the transfer chamber should also be purged for 5 minutes at 100% speed or 10 minutes at 50% speed with the inner door open, before removing sealed material.

Shutdown

- Turn off the exhaust blower and light.
- Keep both doors closed when not in use.

Appropriate HEPA or ULPA Filter Applications, Suitability and Guidelines

- Microbiological materials and hazardous solids containment protecting only the operator and the surrounding environment.
- Weighing of powders.
- Containment of hazardous particulates using a HEPA or ULPA filter.
- Powder or particulate procedures traditionally performed on an open bench.
- The filtered glove box provides personal and environmental protection from particulate matter, hazardous powders and microbiological materials.
- This glove box can be used for sample protection by reversing the blower airflow direction, causing the main chamber to be under positive pressure. Positive Pressure Conversion Kit is required (see Chapter 7).
- Manipulations that generate gases or vapors, i.e., toxic chemicals or radionuclides, require the use of a HEPA or ULPA and carbon filter in combination. Otherwise the glove box should be ducted to the outside.
- Each filtered glove box is provided with two HEPA or ULPA filters. Follow the Filter change procedure in Chapter 6 for disposal instructions. For microbiological materials, follow the Decontamination Procedure in Chapter 6 for disposal instructions.

Definition of Terms

NIOSH – National Institute for Occupational Safety and Health/Mine Safety and Health Administration. (U.S.A.)

TWA – Recommended Exposure Limits expressed as a Time Weighted Average. The exposure limit for that chemical for up to a 10-hour workday, 40 hours a week. Expressed in units of parts per million or milligrams per cubic meter.

Odor Threshold – The value in parts per million or milligrams per cubic meter for which one might expect to smell a chemical's presence in the air. This value is very subjective and detection will vary with the sensitivity of one's nose. The period of time until the odor threshold is reached in the exhaust stream can be estimated from Labconco exclusive computerized filter modeling program. Contact Labconco on carbon filter life for specific applications. See Chapter 6.

Saturation Level or Time – There is a limit to the amount of chemical that can be adsorbed by activated carbon, or neutralized by chemically-treated carbon. Once the capacity of the carbon is reached, it is considered to be saturated and will adsorb (or neutralize) no further material; the outlet concentration of the chemical will equal the inlet concentration from that point until the filter is replaced. (Note that the capacity of activated carbon is

not a constant, but varies with the inlet concentration). Labconco Technical Specialists can determine with the computerized carbon-modeling program the estimated time saturation for a particular chemical. When using a HEPA or ULPA filter in all filtered glove boxes or in combination with a carbon filter, the speed control will need to be increased to allow for filter loading.

IDLH (Immediately Dangerous to Life and Health). An atmosphere that poses an immediate hazard to life or produces immediate irreversible health effects. IDLH concentrations should not be approached in the glove box.

Appropriate Chemicals for Carbon Filters

Below is a general set of rules to determine appropriateness of chemical usage. See Chapter 7 to attach and order an accessory FilterMate Portable Exhauster equipped with carbon filters.



Selected organic chemicals considered to be occupational carcinogens by NIOSH can be used in the filtered glove box with carbon filters under rigid restrictions. See separate discussion on carcinogens for special instructions.

Organics must have time weighted exposure limits (TWA) of 1 PPM or greater.

Chemicals must have a detectable odor at concentrations below the TWA for the chemical.

Chemicals must be designated by NIOSH guidelines as acceptable for use with chemical cartridge-type respirators (the exception is formaldehyde and ammonia/amines, which use impregnated carbon). Chemicals not listed by NIOSH in the Pocket Guide must be approved by Labconco Product Specialist (or Engineering).

Inlet concentration must never exceed the IDLH (Immediately Dangerous to Life and Health) concentrations.

Chemicals having a recommendation by NIOSH of at least “Escape GMFOV” (Gas Mask Full-Face Respirator).

When evaporating a mixture of chemicals, the chemical having the lowest TWA will be used to determine if the mixture meets the guidelines.

Call a Labconco Product Specialist at 1-800-821-5525 for assistance in chemical appropriateness and use of an accessory FilterMate Portable Exhauster with your glove box.

Prohibited Acid Use

The Protector Stainless Steel Filtered Glove Box and internal metal parts **must** not be exposed to mineral acid use. No exceptions are permitted, as the glove box life span will be limited with mineral acid use. The door latch metal components and other metal parts inside the Protector Fiberglass Filtered Glove Box are susceptible to mineral acid use. However, the fiberglass liner by itself has superior chemical resistance over the stainless steel liner.

NOTE: If mineral acids are used with the Protector Stainless Steel Filtered Glove Box, Labconco makes no claims about corrosion resistance and warranties will become void.

Chapter 6: Maintaining Your Glove Box

Review this chapter on maintenance for the following:

1. Routine maintenance.
2. Decontamination.
3. Determining when to replace the filters.
4. How to install new filters.
5. HEPA or ULPA filter leak test.
6. Initial certification.
7. Re-certification.
8. Fluorescent light replacement.
9. Window replacement.
10. Motorized impeller replacement.
11. Speed control replacement.
12. Airflow/Pressure monitor circuit board replacement.

Routine Maintenance Schedule

Weekly

- Wipe down the interior surfaces of the glove box with a disinfectant or cleaner, depending upon the application.
- Using a damp cloth, clean the exterior surfaces of the glove box, particularly the front and top, to remove any accumulated dust.
- Operate the exhaust system, noting the airflow through the glove box to effectively remove a source of visible smoke.

Monthly (or more often as required)

- Chart the operating static pressure at a typical speed control setting. Change filters when the static pressure increases two-fold or airflow decreases two-fold.

Annually

- Replace the fluorescent lamps.
- Have the glove box re-certified by a qualified certification technician. See Certification and Recertification in Chapter 6.

Decontamination

When used in conjunction with microbiologicals, the glove box should be decontaminated with formaldehyde gas before:

- Performing maintenance work in contaminated areas
- Filter changes
- Moving the glove box to a new location
- Changing research programs

The procedures for performing a gaseous decontamination are thoroughly outlined in the U.S. Department of Health, Education and Welfare booklet entitled *Formaldehyde Decontamination of Laminar Flow Biological Safety Cabinets*, available from NIH, Division of Safety, Bethesda, MD 20892, call 301-496-2801.

Determining When to Replace Filters

The HEPA or ULPA filters in the filtered glove boxes gradually accumulate airborne particulate matter and powders from the enclosure and room. The rate of accumulation will depend upon the cleanliness of the room air, the amount of time the enclosure is operating, and the nature of work being done in the enclosure. In typical installations and usage, the filters will last two to five years before requiring replacement. Replace filters if the speed control is adjusted to full speed and the airflow is half its normal starting point. Replace filters if it fails the HEPA or ULPA Filter Leak Test in Chapter 6.

How to Install New Filters

The Protector Filtered Glove Boxes include a true bag-in/bag-out filter disposal system for safely removing the filter and protecting the worker from toxic powders and particulates (see Figure 6-1, Filter Changing Diagram). The accessory bags can be ordered from Labconco (see Chapter 7). Two bags will be required for each HEPA or ULPA filter for a total of 4 each to complete the change process. For your safety, wear appropriate personal protective equipment during the change of filters. If working with micro-biologicals, use the decontamination procedure referenced above. (Consult your Safety Officer before performing filter changes).

1. Turn the glove box OFF. Refer to Appendix A for replacement parts and Appendix B for dimensions. Remove the top metal cover.
2. Loosen the six filter nuts that secure each filter.
3. Place the accessory bag over the filter and seal to the filter housing.
4. Place both arms in the rear gloves of the bag, and carefully draw the filter out of the glove box. Rest the filter on the floor, table or cart. Remove arms from bag gloves.
5. Create two seals between the glove box filter housing and the old filter. Seals can be heat sealed or sealed with tie wraps. Cut off the bag between the two seals and leave the bag stub on the filter housing port to the glove box.
6. Place the new filter in another new bag. Then place the new bag with the new filter over the old bag stub and onto the glove box filter housing.
7. Carefully remove the old bag from the filter housing using the single glove near the access port. Draw the old bag and stub into the single glove and turn the glove inside out. Double seal this glove on the contaminated bag stub inside. Remove the bag and dispose of properly.
8. Carefully install the new filter and uniformly tighten the six filter nuts until the filter gasket is compressed 50%. Then roll up the second filter bag, secure with strap and leave in place for the next filter replacement procedure.

9. Turn the glove box ON and proceed to the Filter Leak Test in Chapter 6.
10. Reinstall the top metal cover.

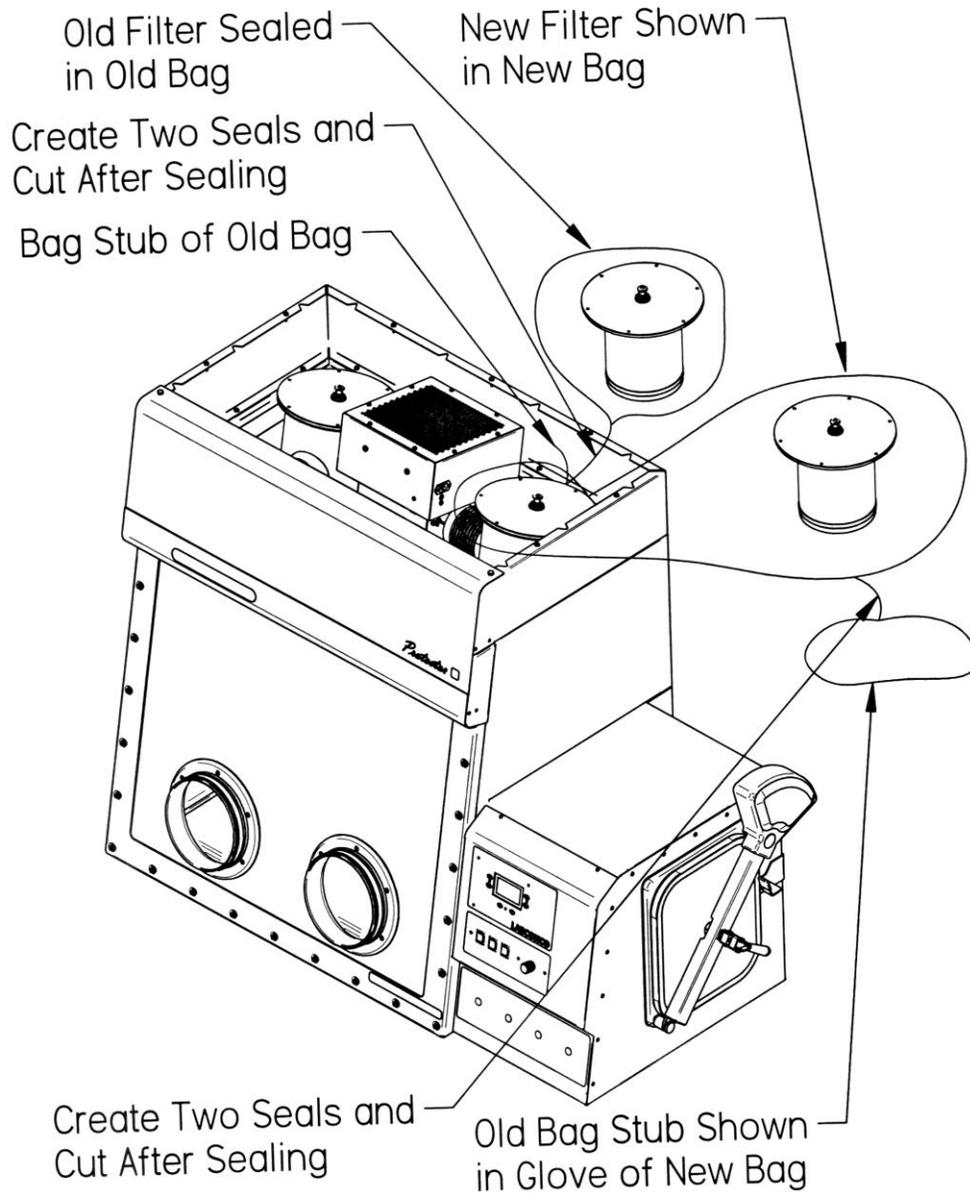


Figure 6-1
Filter Changing Diagram

HEPA or ULPA Filter Leak Test

Purpose

This test is performed to determine the integrity of the filter(s), the filter housing, and the filter mounting frames. The leak test is to be done by a qualified technician with calibrated equipment. Reference Leak Testing and Photometer scanning from the Institute of Environmental Services (IES-RP-CC001.3)

Equipment Required

1. **An aerosol photometer ATI model 2D, 2E, 2G or equivalent.** Air Techniques Hamilton Associates Inc. 11403 Cron Ridge Dr., Owings Mills, MD 21117
2. **One aerosol generator of the Laskin nozzle(s) type.** An aerosol of mineral oil or suitable liquid shall be created by flowing air through it. The compressed air supplied to the generator should be adjusted to a pressure as indicated in the procedure. Air Techniques Inc. Model TDA-4A or equal.
3. **Mineral oil** (Labconco P/N 1491400).
4. **Sampling Nozzle, Rectangular 1/2" x 3-1/4"**, Air Techniques, Inc.

Procedure

When Using the ATI 2G Photometer

NOTE: Because the downstream side of the HEPA or ULPA filters cannot be scanned, a downstream average must be taken.

1. Turn on the photometer and allow it to operate for a minimum of 5 minutes. Leave the valve in the "CLEAR" setting.
2. Press the "ENTER" keypad. Press the "REF" keypad.
3. The display will show "P1" or "P2" for approximately 1 second, and then display a numerical value.
4. Using the "▲" or "▼" keypads, increase or decrease the numerical value, respectively, until it equals 68. (Set for 100 CFM, adjust for other airflows.)
5. Press the "ENTER" Keypad. The photometer will scan for 15 seconds, and then the "0" keypad will flash. Press the "Enter" keypad. The unit will scan for 5 seconds, the display will read "0000," and the unit will sound a confirming tone.
6. Set the valve to "DOWNSTREAM." Place the palm of your hand over the sampling port of the pistol. There should be a strong vacuum at this port. If the vacuum is weak, contact Air Techniques Hamilton Associates.
7. Ensure that the glove box speed control is adjusted to the maximum setting and the blower is exhausting 55-100 CFM through the glove box.
8. Position the aerosol generator discharge near the internal opening of each filter. Check both filters.

9. Start the aerosol generator. Ensure that the generator is operating with 1 nozzle on at 10 PSIG.
10. Allow the generator to operate for a minimum of 15 seconds. Place a 1/4" OD sampling tube in the exhaust downstream of the filters. The inlet filter can be checked from the test port on the exhaust filter and the exhaust filter can be checked from the blower inlet (suction side) test port. Connect this tube to the "downstream" sampling port of the photometer.

Acceptance

The downstream average penetration shall not exceed 0.005 percent as measured by the photometer.

Procedure When Using the ATI 2-D or 2-E Photometer

NOTE: Because the downstream side of the HEPA or ULPA filters cannot be scanned, a downstream average must be taken.

1. Turn on the photometer and allow it to operate for a minimum 5 minutes. Leave the range switch at "100%" and the valve in the "CLEAR" setting.
2. Use the screw on the face of the gauge to adjust the meter to 0 if necessary.
3. If the "INT REF" switch is a square button, depress it. The switch will remain depressed and illuminated. If the switch is a toggle type switch, push and hold the switch to the "ON" position. Keep this switch in the "ON" position through step 4.
4. Turn the "GAIN" knob until a value of 15 is obtained. (Set for 100 CFM, adjust for other airflows.)
5. Turn the range switch to 0.1. Turn the Stray Light knob until the meter reads "0."
6. Turn the valve to the "DOWNSTREAM" setting. Place the palm of your hand over the sampling port of the pistol. There should be a strong vacuum at this port. Return the valve to the "CLEAR" setting.
7. Ensure that the glove box speed control is adjusted to the maximum setting and the blower is exhausting 100 CFM through the glove box.
8. Position the aerosol generator discharge near the opening of each filter. Check both filters.
9. Start the aerosol generator. Ensure that the generator is operating with 1 nozzle on at 10 PSIG.
10. Allow the generator to operate for a minimum of 15 seconds. Place a 1/4" OD sampling tube in the exhaust downstream of the filters. The inlet filter can be checked from the test port on the exhaust filter and the exhaust filter can be checked from the blower inlet (suction side) test port. Connect this tube to the "downstream" sampling port of the photometer.

Acceptance

The downstream average penetration shall not exceed 0.005 percent as measured by the photometer.

Initial Certification

The Protector Filtered Glove Box has been leak tested at the factory with helium gas at positive 1" w.g. pressure; leaks cannot exceed 1×10^{-6} cc/sec. The Filter Leak Test has been performed at the factory on both filters with no particulate leaks greater than .005 percent. The filtered glove box should be certified before use for the three tests listed under Re-Certification below. It is also recommended to perform the Filter Leak Test again should there be any damage caused during transport.

Re-Certification

Under normal operating conditions, the glove box should be re-certified at least annually if serviced. The certifier should perform the following tests.

- Record airflow volume and glove box static pressure. Replace filters if pressure doubles or airflow is reduced to half the original volume.
- Perform Filter Leak Test.
- Perform a Smoke Test to determine proper dilution rate inside the glove box. Smoke removal should be completely purged in less than two minutes at full blower speed.

Fluorescent Light Replacement

1. Disconnect the power. Refer to Figure 6-2 for replacement.
2. Locate the upper front panel.
3. Remove the front panel by removing two screws located at the bottom of the front panel on each side.
4. Remove the old fluorescent lamps.
5. Reinstall the new fluorescent lamps and front panel by reversing the steps above.



THE LAMP(S) IN THIS PRODUCT CONTAIN MERCURY

Manage in accordance with local disposal laws. DO NOT place lamps in trash. Dispose as a hazardous waste. For information regarding safe handling, recycling and disposal, consult www.lamprecycle.org

CETTE LAMPE DANS CE PRODUIT CONTIENT DU MERCURE

Éliminez ou recyclez conformément aux lois applicables. Pour de l'information concernant des pratiques de manipulation sécuritaires et l'élimination sécuritaire et le recyclage, veuillez consulter www.lamprecycle.org

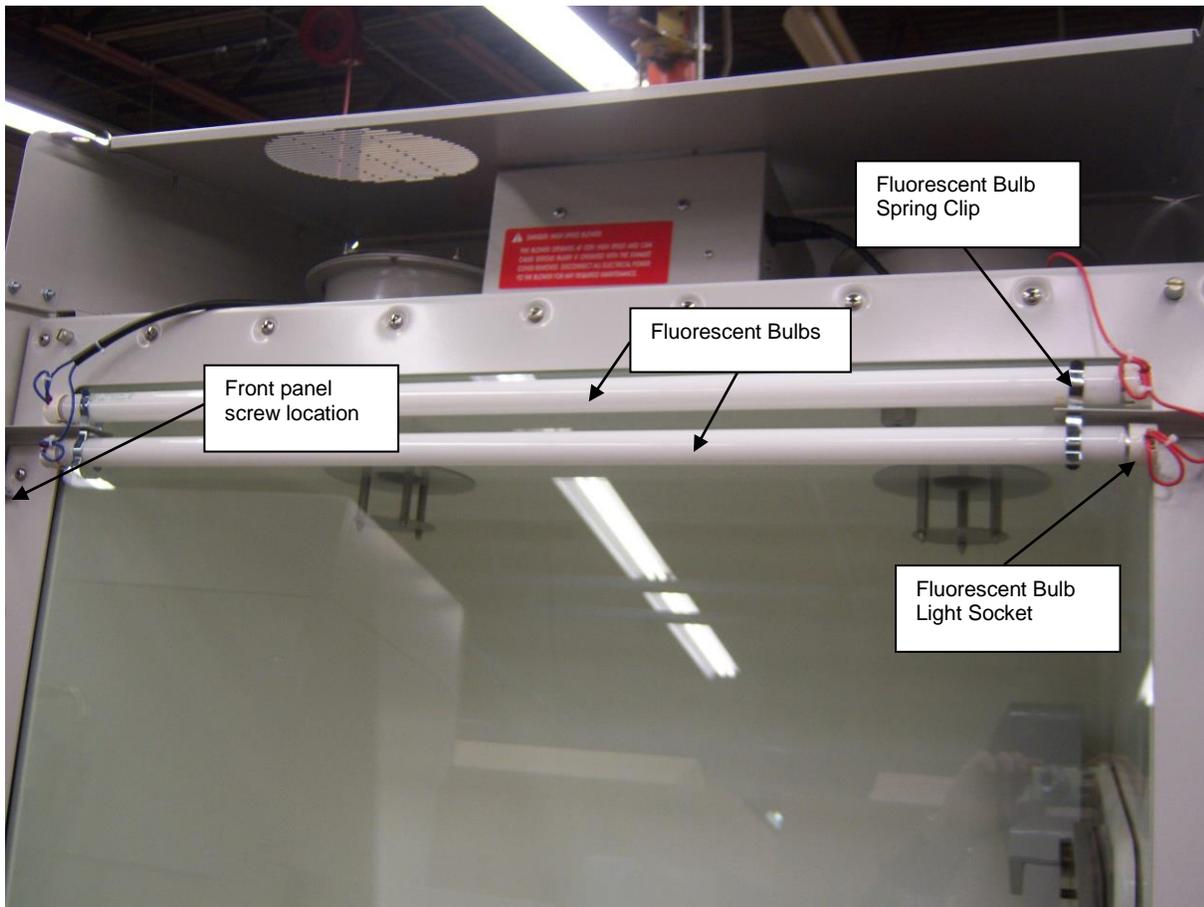


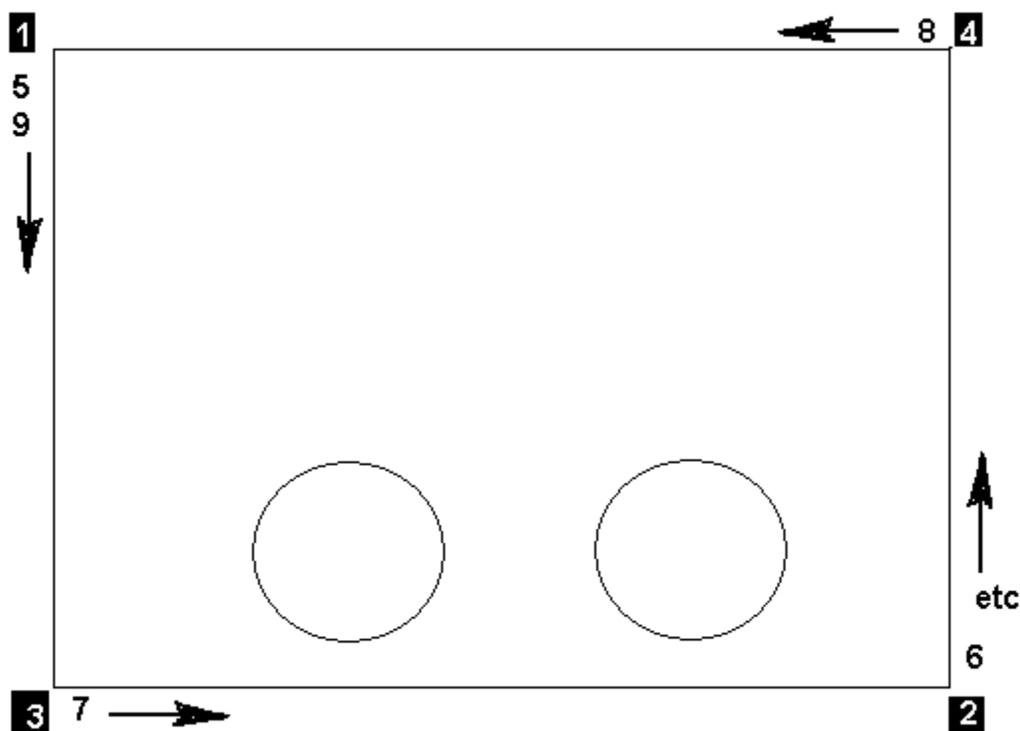
Figure 6-2
Lights Replacement

Window Replacement

- It is recommended to decontaminate before opening the glove box and to check with your safety officer.
- Remove 30 screws on outer cover plate by using minor turns and across from each other diagonally to reduce pressure evenly. Be careful as the screws have stainless steel lube that will stain clothing. Hold lower frame in and see if top frame will come off without glass. Frame plate may come off with window, but do not depend on gasket material to hold glass. To prevent injury to your feet or toes, do not let glass slide to floor. Glass sits on a 1/4 inch ledge and should stay as long as it is not pulled out, but do not depend on it. Clean inside of window after removal.
- If you change gasket(s), clean old glue off frame. Apply new glue to frame and gasket (check old gasket when taking off so you will know which side is up). Allow glue to be tacky before putting together. Start gasket at corners and work to middle. Squeeze on to gasket track if it appears to be too long. Don't wait to the last 3-5 inches to

compress what may appear to be excess. It may help to set glass in place, install cover rail in place and install 4-6 screws in place. Just have screws barely touching frame and do not tighten for overnight cure (drying). In the morning, take off frame and glass, checking gasket for good seal. If there is a loose place, put acetone in a spray mist bottle and pull loose area slightly away and mist. The acetone will reactivate glue and reseal back together. Let set an hour or two and reassemble glass and frame.

- Place a small amount of vacuum grease on top edge of gasket and wipe off excess. Replace glass, install cover plate, then start one screw in each corner and add one screw on each side as you go around, adding one screw to a side at a time (only starting each one, do not tighten). When all screws are started, tighten screws to only touch the cover frame. Start in each corner and only snug each screw (1/4 to 1/2 turn) carefully and do not over tighten. In same pattern as starting screws, slightly snug a screw on each side, one at a time, all the way around (follow numerical pattern below) in a diagonal pattern. Continue to do this until all screws are tight, but not overly tight. This procedure is important so glass does not crack with too much tension in one spot. Evenly tighten all screws.



- Glove ports should be removed and retightened in similar procedure. Use a thin film of vacuum grease on port gasket, do not use excess amount. Clean old vacuum grease off port area before assembly.

Motorized Impeller Replacement

The motorized impeller must be replaced as a complete unit. See Appendix A for replacement parts diagram. **Consult your Safety Officer for proper decontamination or sealing of tubing before replacing the blower.**

1. Unplug the motorized impeller from the electrical outlet. Refer to Appendix A for replacement parts.
2. Remove the hose connecting the exhaust filter to the motorized impeller.
3. Remove the motorized impeller and support braces.
4. Label and remove the tubing as shown in Figure 6-3.
5. Reassemble the new motorized impeller by reversing the steps above.



WARNING: High-speed blower. Never operate impeller with housing off.

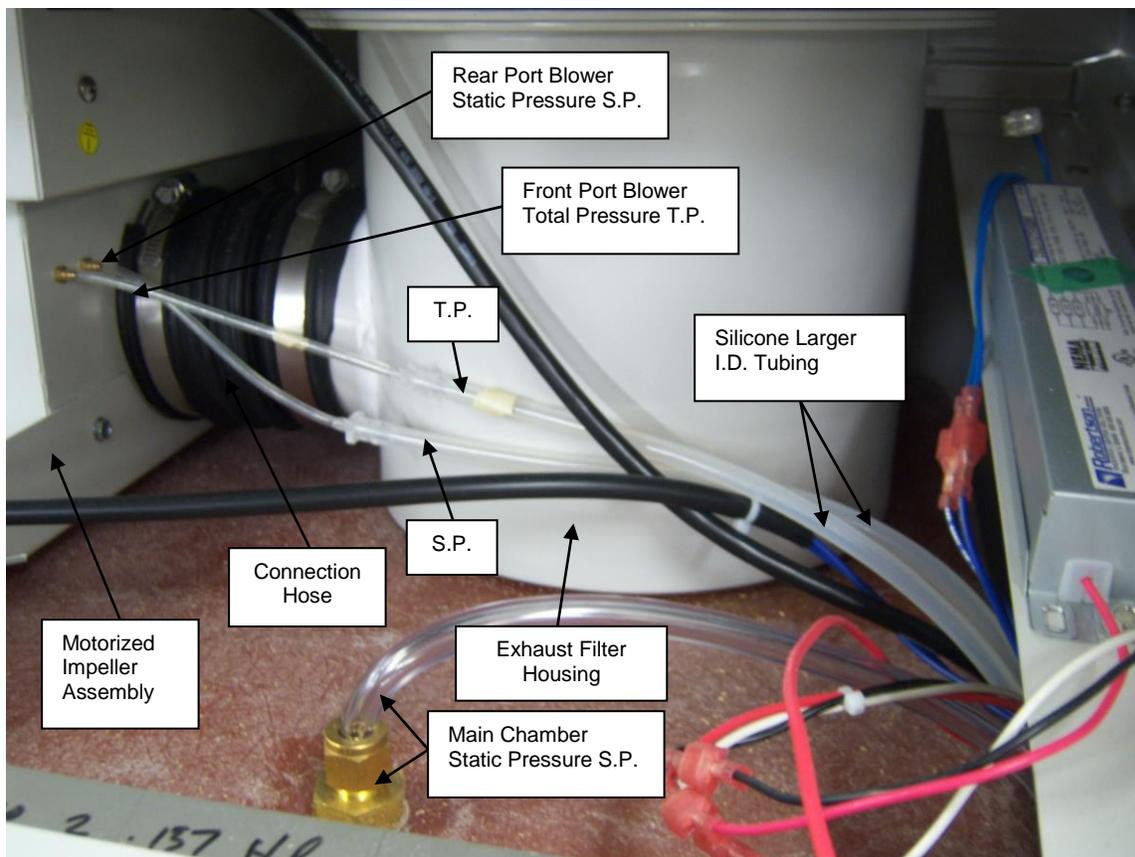


Figure 6-3
Motorized Impeller & Tubing

Speed Control Replacement

1. Disconnect the power and remove the front control panel where the speed control is located.
2. Remove the two fasteners holding the speed control. Refer to Appendix A for replacement parts.
3. Disconnect all wires leading to the speed control as shown in Figure 6-4. Connect wires on new speed control in the same position as the old speed control.
4. Reassemble to the system in the same position and with the same fasteners that were removed earlier.

Airflow/Pressure Monitor Circuit Board Replacement

1. Disconnect the power. Refer to Figure 6-4.
2. Remove the control panel supported by four screws.
3. Remove the circuit board from the control panel and replace with the new circuit board.
4. Replace all the tubing as shown in Figure 6-4.
5. Reinstall the control panel with the new circuit board.
6. Calibrate the glove box airflow and pressure per the Calibration procedure in Chapter 5.

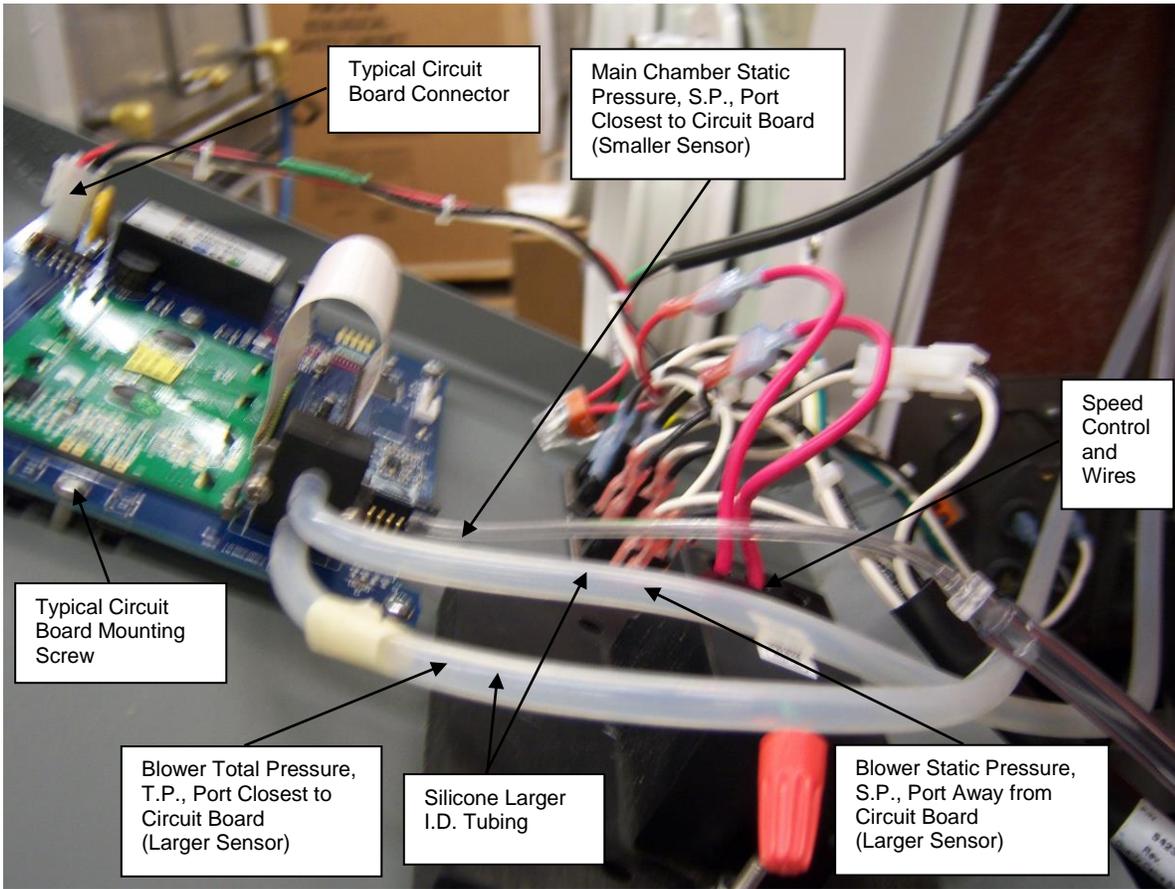


Figure 6-4
Airflow/Pressure Monitor Circuit Board and
Speed Control Replacement

Chapter 7:

Accessorizing Your Glove Box

There are many ways to accessorize and modify the glove box for your individual requirements. These include many different accessories listed in this chapter.

- 1. Black Epoxy Flat Work Surface (Part #4882807)**
A solid epoxy resin 60" x 30" x 1.25" work surface is available to support the glove box.
- 2. 30" Standard Base Cabinet (Part #9900200)**
Two optional base cabinets may be ordered to support the 60" x 30" work surface and glove box. Contact Labconco for additional sizes.
- 3. Adjustable Height Base Stands with Attached Work Surface (Part #5235500 w/casters, Part #5235501 w/adjustable feet, Part #5062020 Double Mobile Base Stand)**
These stands, 60" x 31", with attached black laminate work surfaces have an adjustable height range from 33" to 40" and include a lower shelf for supporting accessory equipment. See Appendix B for dimensions of Double Mobile Base Stand for double width glove boxes.
- 4. Blower Foot Switch (Part #5441300)**
Provides a hands-free means to shut off power to the built-in blower.
- 5. Bag Set for Bag-in/Bag-out HEPA Filter Replacement (Part #5241700)**
Set of two convenience bags and two safety straps for changing and disposing of one filter safely with a bag-in/bag-out procedure.
- 6. Anti-Static Ionizer Fan (Part #5234400, 100/115V or Part #5234401, 230V)**
Used for weighing operations. The ionizer fan circulates ionized air inside the glove box to reduce static charge. Ionizer Replacement Points (set of 8 emitter electrodes) are ordered separately (Part #5235100). See Appendix D for additional information.

7. Balance Vibration Isolator (Part #5234600)

Isolates building vibration and aids with balance weighing. Includes a 20" x 13" x 2 1/4" marble slab with isolator pads and type 304 stainless steel top cover to protect the porous marble.

8. Add-A-Valve Kit (Part #5442600 for Transfer Chamber and Part #5442700 for Main Chamber)

Includes the two valves, tubes, instructions and nuts to supply the main chamber or the transfer chamber to purge vacuum, fill gas, connect a drying train, or connect filtration components.

9. Vacuum Aspirator Kit

Includes the valve, hose, canister, and vacuum pump for evacuating fluids around the work surface.

Part #	Descriptions
5241800	Vacuum Aspirator Kit, 115V
5241801	Vacuum Aspirator Kit, 230V

10. Electrical Power Strips

These convenience electrical power strips are available in US and international versions and plug into the interior receptacle of the glove box.

Part #	Descriptions
5211500	US Power Strip 115V, 4 Position, 10A
5210601	UK Power Strip 250V, 6 Position, 10A
5290401	European Power Strip 250V, 4 Position, 10A
5332601	Australian Power Strip 250V, 6 Position, 10A

11. Electrical 9 Pin Sealed Pass-Through Kit (Part #5075619)

Includes sealed 9 pin (D-subminiature with male pins on one side and female pins on the other) connector and cord for data transfer to a typical printer outside the glove box from the balance. Note: Order the 9 pin installation kit separately which includes all the drill bits and hole saws for field installation (Part #5241100).

12. Mechanical or Electrical Straight Pass-Through Kit (Part #5240700)

Provides three ID pass-through ports with sizes of .230/.395, .230/.530, and .450/.705. Order the installation kit with drill bits separately (Part #5240800). Useful for sealing cords and plumbing.

13. FilterMate Portable Exhausters and Filters for Secondary Filtration (see models and filters below)

The FilterMate Portable Exhauster can successfully adsorb low level organic vapors, formaldehyde, ammonia, and secondary particulates via another HEPA filter.

Part #	Descriptions
3970000	115V FilterMate (HEPA only included)
3970020	230V FilterMate (HEPA only included)
3970001	115V FilterMate (Carbon Filter sold separately)
3970021	230V FilterMate (Carbon Filter sold separately)
3970002	115V FilterMate w/thimble (HEPA included)
3970022	230V FilterMate w/thimble (HEPA included)
3970003	115V FilterMate Combination HEPA/Carbon (order Carbon Filter separately)
3970023	230V FilterMate Combination HEPA/Carbon (order Carbon Filter separately)
3970004	115V FilterMate (Two Carbon Filters Sold separately)
3970024	230V FilterMate (Two Carbon Filters sold separately)
3707900	HEPA Filter for FilterMate
3923400	Organic Carbon Filter for FilterMate, 12 lbs.
3923401	Formaldehyde Carbon Filter for FilterMate, 14 lbs.
3923402	Ammonia Carbon Filter for FilterMate, 16 lbs.
3776002	Replacement Bag to Bag-In/Bag-Out HEPA Filter

14. 5" Thimble Exhaust Connector for Connection to the FilterMate (Part #5441000)

Connects to the top of the blower on the glove box for attaching the FilterMate Portable Exhauster. The thimble is necessary for balancing the blower in the glove box with the FilterMate Portable Exhauster.

15. 6" Thimble Exhaust Connection to Building Exhaust (Part #5440900)

Provides a 6" exhaust thimble connection to the blower on the glove box for exhausting to the outside. The thimble is necessary for balancing the blower on the roof with the glove box blower.

16. 6" Hard Duct Connection to House Exhaust (Part #5440800)

Provides a 6" hard duct connection for using a roof-mounted blower and by-passing the blower on the glove box.

17. Remote Wall-Mount Blower Kit (Part #5229800)

Provides a wall-mount bracket, 4" dia. x 6' long hose, hose clamps, and 8' power cord for moving the blower from the glove box and remotely mounting it to a wall within 5'.

18. 6" Exhaust Dampers

Exhaust dampers allow airflow adjustments to be made, maintaining proper airflow to roof-mounted remote blowers or building exhaust.

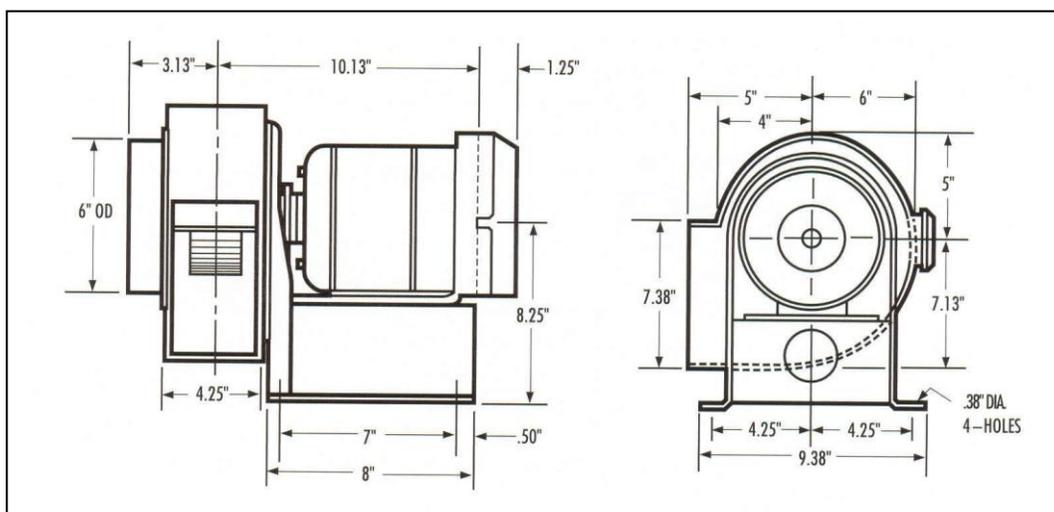
Part #	Descriptions
3924000	6" Epoxy-Coated Steel In-Line Adjustable Damper
4724200	6" PVC In-Line Adjustable Damper

19. Remote Blowers

Has a 1/4 hp direct drive motor and corrosion-resistant epoxy-coated steel housing and wheel with blower inlet of 6.00" ID. Outlet dimensions are 4.25" x 7.38" OD.

CFM @ Static Pressure-Inches of H ₂ O						
S.P.	0.0"	0.125"	0.25"	0.50"	0.75"	0.87"
CFM	595	560	515	420	300	167

Part #	Description
4863500	Remote Blower, 115 V, 60 Hz. 4.4 amps
4863501	Remote Blower, 115/230 V, 50 Hz, 5.6/2.8 amps



All dimensions in inches

20. Positive Pressure Conversion Kit (Part #5441200)

Converts integral glove box blower from negative pressure operation to positive pressure.

21. Recirculation Kit (Part #5441100)

Allows the blower exhaust to be connected to the HEPA inlet filter for recirculation of the exhaust air. Useful with drying train components on the main chamber.

22. Filtration Components for Moisture and Fume Removal

The following components are useful in removing organics, acids, ammonia, moisture, and other gases as indicated. They are connected to the glove box using the #5442600 or 5442700 Add-A-Valve Kit.

Part #	Descriptions
5248200	Vacuum Pump for Circulation, 115V, 60 Hz w/switch
5248201	Vacuum Pump for Circulation, 230V, 50 Hz
7815301	Canister with Stand for Traps
7815200	Moisture & Solvent Trap Insert (molecular sieve)
7814800	Acid Vapor Trap Insert
7815000	Radioisotope Trap Insert

Part #	Descriptions
7995600	Ammonia Trap Insert
5244100	Flowmeter, Visual
5240100	Gas & Vacuum 0.2 Micron Filter

23. Polycarbonate Viewing Window with Frame (Part #5066700)

Polycarbonate window, for those users that prefer polycarbonate over the standard laminated safety glass (includes metal frame).

24. Interior Glove Port Cover (Part #5060400)

Quickly seals glove box should sudden leak occur due to glove damage. Stainless steel with molded rubber gasket and spring-loaded latches with adjustable closure knob.

25. Interior Shelves (Part #5061600)

Provide shelf space across back wall of glove box interior. Three stainless steel storage shelves are attached to epoxy-coated steel upright supports. Shelves have adjustable height and measure 30" wide x 6" deep. Installation hardware and instructions included.

26. Gloves (see Appendix A: Replacement Part numbers for other glove sizes and material types)

Neoprene gloves are the most resistant to abrasion and tearing. Butyl gloves provide higher impermeability and improved dexterity. Chlorosulfonated Polyethylene (CSM) gloves provide superior resistance to ozone and oxidizing chemicals with a natural soft feel for greater worker comfort.

27. External Glove Port Covers (Part #5242200)

Cap and clamp attaches to the glove ports to eliminate glove inflation during purging and filling operations and reduce the cycle time of the purging/filling process. Set of two.

28. Left side Sealed Electrical Plug Kit (see Part #'s below)

Part #	Descriptions
5075622	115V single outlet
5075623	230V IEC single outlet

29. DOP Test Kit for Filters (Part #5242400)

Includes the connections and hoses to carry out the Filter Leak Test documented in Chapter 6 of this manual.

30. Drying Train Tubing Kit

Includes the (FEP) tubing and plumbing fittings for connecting typical moisture, and other gas fume removal components (see item 23 above). Fluorinated ethylene-propylene (FEP) tubing has very low moisture absorption.

Part #	Descriptions
5242500	Drying Train Tubing Kit; Moisture, Solvents, and Radioisotopes

31. HEPA and ULPA Filters

Part #	Descriptions
5225105	Replacement Standard HEPA Filter, 99.99% efficient on 0.3 micron particles
5225106	Optional ULPA Filter, 99.999% efficient on 0.3 micron particles

32. Inlet-Outlet Connection Kit – No HEPA (Part #5253400)

The 3.94" OD inlet-outlet connection kit consists of two sealed flange connections that attach to the inlet and outlet vent holes of the glove box main chamber when the HEPA filter housings and HEPA filter are removed. The connection kit enables direct connection of 4.0" ID hose or ductwork to the glove box.

33. Left Side Door Option (Factory Prepared Only)

Any stainless steel glove box can be factory prepared with a large sealed left side door for use in conveniently loading large equipment. With the left side door option, the need to remove the front laminated safety glass frame is eliminated. The left side door has an opening of 16.5" (419 mm) wide x 23.2" (589 mm) high. Contact Labconco at time of order for the left side door option.

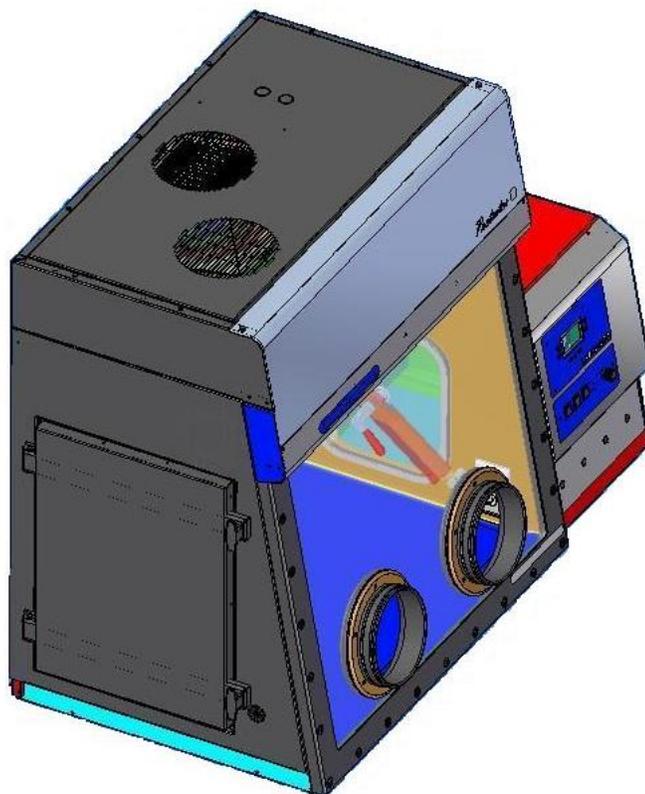


Figure 7-1
Left Side Door Option

34. Filtered Dry Glove Box Humidity Removal Kit (Part #5444500)

The Filtered Dry Glove Box Humidity Kit provides a means to reduce humidity/moisture to 5-10% in 10-20 minutes and reduce oxygen to 2-10% in 7-20 minutes. Humidity/moisture and oxygen can rapidly be reduced by filling and purging the glove box with nitrogen or argon. Best results occur with the blower setting set to OFF as the inert gas passes through to exhaust filter and out through the blower. See Labconco 5444400 instruction sheet for performance charts on moisture and oxygen removal levels.

Chapter 8: Troubleshooting

Refer to the following table if the Protector Filtered Glove Box fails to operate properly. If the suggested corrective actions do not solve your problem, contact Labconco for additional assistance.

PROBLEM	CAUSE	CORRECTIVE ACTION
Blower won't operate.	Unit not plugged into outlet.	Plug the glove box into appropriate electrical service.
	Circuit breaker(s) or Ground Fault Interrupter.	Reset circuit breaker.
	Blower wiring is disconnected.	Inspect blower wiring per wiring diagram on unit.
	Blower switch is defective.	Replace switch if no voltage at blower.
	Motorized impeller or blower is defective.	Replace motorized impeller or blower. See Chapter 6.
Blower and lights won't operate.	Unit not plugged into outlet.	Plug unit into appropriate electrical service.
	Circuit breaker(s) tripped.	Reset or replace circuit breaker.
Lights do not work.	Lamp not installed properly.	Inspect lamp installation.
	Lamp wiring disconnected.	Inspect lamp wiring.
	Defective lamp.	Replace lamp.
	Light switch is defective.	Replace light switch.
	Defective electronic ballast.	Replace ballast.
No power to electrical receptacle.	Unit not plugged in.	Plug unit into electrical service.
	Circuit breaker(s) tripped.	Reset or replace circuit breaker.
	Receptacle switch is defective.	Replace receptacle switch.
	Receptacle is defective.	Replace receptacle.
Airflow/Pressure Monitor will not operate.	Unit not plugged into outlet.	Plug unit into appropriate electrical service.
	Circuit breakers tripped.	Reset or replace circuit breaker.
	LCD Display is defective.	Replace circuit board.
	Alarms, airflow, or pressure not calibrated.	Calibrate the monitor per the menus and procedure in Chapter 5.

Appendix A: Replacement Parts

The components that are available for your glove box are listed. The parts shown are the most commonly requested. If other parts are required, please contact Product Service.

Item	Qty.	Part Number	Description
			Window Components
1A	1	5066600	Window, Glass Viewing
1B	1	5066700	Window, Polycarbonate Viewing
2A	1	5067200	Window, Gasket, Fiberglass Models
2B	1	5098400	Window, Gasket, Stainless Steel Models
2C	0.01 quart	1576800	Adhesive, Plyobond, Fiberglass Models
2D	0.01 quart	1594800	Adhesive, 3M #4799, Stainless Steel Models
3A	1 pair	1640600	9 ¾ size Neoprene Glove (standard)
3B	1 pair	1640601	9 ¾ size Butyl Gloves
3C	1 pair	1640602	9 ¾ size Chlorosulfonated Polyethylene (CSM) Gloves
3D	1 pair	1640500	8 ½ size Neoprene Gloves
3E	1 pair	1640501	8 ½ size Butyl Gloves
3F	1 pair	1640502	8 ½ size Chlorosulfonated Polyethylene (CSM) Gloves
3G	2 each	1640000	O-rings
3H	2 each	1965600	Clamp – O-Ring Gloves
			Transfer Chamber Components
4A	1	5410800	Complete Door Assy., Fiberglass Inner
4B	1	5098500	Complete Door Assy., Stainless Steel Inner
5A	1	5422700	Inner Acrylic Door Only, Fiberglass Models Only
5B	1	5064200	Door Gasket, Inner and Outer, Fiberglass Models Only
5C	0.1 tube	1594800	Gasket Sealant, Fiberglass Only
6	1	5410000	Outer Acrylic Door Only, Fiberglass Models Only
7A	1	5098300	Door Gasket, Inner and Outer, Stainless Models Only
7B	0.1 tube	1594800	Gasket Sealant, Stainless Steel Models Only, 3M #4799
8	1	5414000	Complete Door Assy., Fiberglass Outer
9	1	5098600	Complete Door Assy., Stainless Steel Outer
10A	1	5068601	Clamp, Door Plated Steel, Fiberglass Models
10B	1	5068600	Clamp, Door Stainless Steel Models
11	1	5064600	Door Adjustment Screw
12	1	5410000	Outer Acrylic Door Only
			Blower and Filter Components
13A	1	5422300	Blower Assy., 115V Complete
13B	1	5422301	Blower Assy., 230V Complete
13C	1	5229100	Motorized Impeller ONLY 115V
13D	1	5229101	Motorized Impeller ONLY 230V
13E	1	1306600	Capacitor, 15 MFD-115V
13F	1	1306800	Capacitor, 4 MFD-230V
13G	4	1601800	Stud Mount Vibration Isolator
13H	1	5232700	Internal Harness Blower Assy.
14A	2	5225105	HEPA Filter
14B	2	5225106	ULPA Filter
14C	1	5241700	Bag-In-Bag-Out Kit
14D	12	1930200	Nut, Nylon #10-24
15	2	6962801	Airflow Silicone Tube Assy.
16	1	6962802	Main Chamber Pressure Tygon Tube Assy.

Appendix A: Replacement Parts

Item	Qty.	Part Number	Description
			<u>Electrical Components</u>
17A	1	1307000	Switch, 2 Position
17B	1	3823600	Retainer, Switch
18	1	5410600	Control Board, Airflow/Pressure Monitor
19A	1	1327201	Circuit Breaker, 10A
19B	1	1327200	Circuit Breaker, 3A, 115V
19C	2	1327205	Circuit Breaker, 2A, 230V
20	1	1333800	Inlet Power, IEC Connector
21A	1	1230700	Duplex Receptacle, Interior 100-115V, N. America
21B	1	1295200	Receptacle, UK 230V
21C	1	1295300	Receptacle, Schuko 230V
21D	1	1295100	Receptacle, China/Australia 230V
21E	1	1283900	Duplex Receptacle, Interior 230V, N. America
21F	1	5233400	Gray Duplex Wallplate, 100-115V or 23V, N. America
21G	1	1294900	Wallplate, UK or Schuko
21H	1	1295000	Cover, China/Australia
22A	1	1305800	Power Cord 100-115V, N. America
22B	1	1332600	Power Cord 230V, UK
22C	1	1336100	Power Cord 230V, Schuko
22D	1	1332700	Power Cord 230V, China/Australia
22E	1	1338000	Power Cord 230V, N. America
23	2	9721901	Lamp, Fluorescent F25T8-SP41, 25 watt
24	2	3836800	Lampholder, Push On
25	1	3838100	Ballast Assembly, Fluorescent
26A	1	5423000	Wiring Diagram, G.B. 115V
26B	1	5423100	Wiring Diagram, G.B. 230V
27A	1	5437400	Wiring Diagram, Doublewide 115V (Left Side)
27B	1	5437401	Wiring Diagram, Doublewide 230V (Left Side)
28A	1	3704400	Blower Speed Control, 115V
28B	1	3704401	Blower Speed Control, 230V (adjust potentiometer)
28C	1	1931500	Knob, Speed Control
28D	1	5229400	Extension, Speed Control
28E	1	1890302	Set Screw, Extension #8-32 x .12"
			<u>Miscellaneous</u>
29A	1	5413900	Panel Access, Left
29B	8	1909217	Acorn Nut, #10-24
30	1	1934601	Heyco Bushing, Pass-Through
31A	1	5413601	Front Panel, Painted Fiberglass Models
31B	1	5413600	Front Panel, Stainless Steel, Stainless Steel Models
31C	2	1889308	Screw, #10-24 x 0.50 Phillips
32	1	5424700	Top Cover Assy.

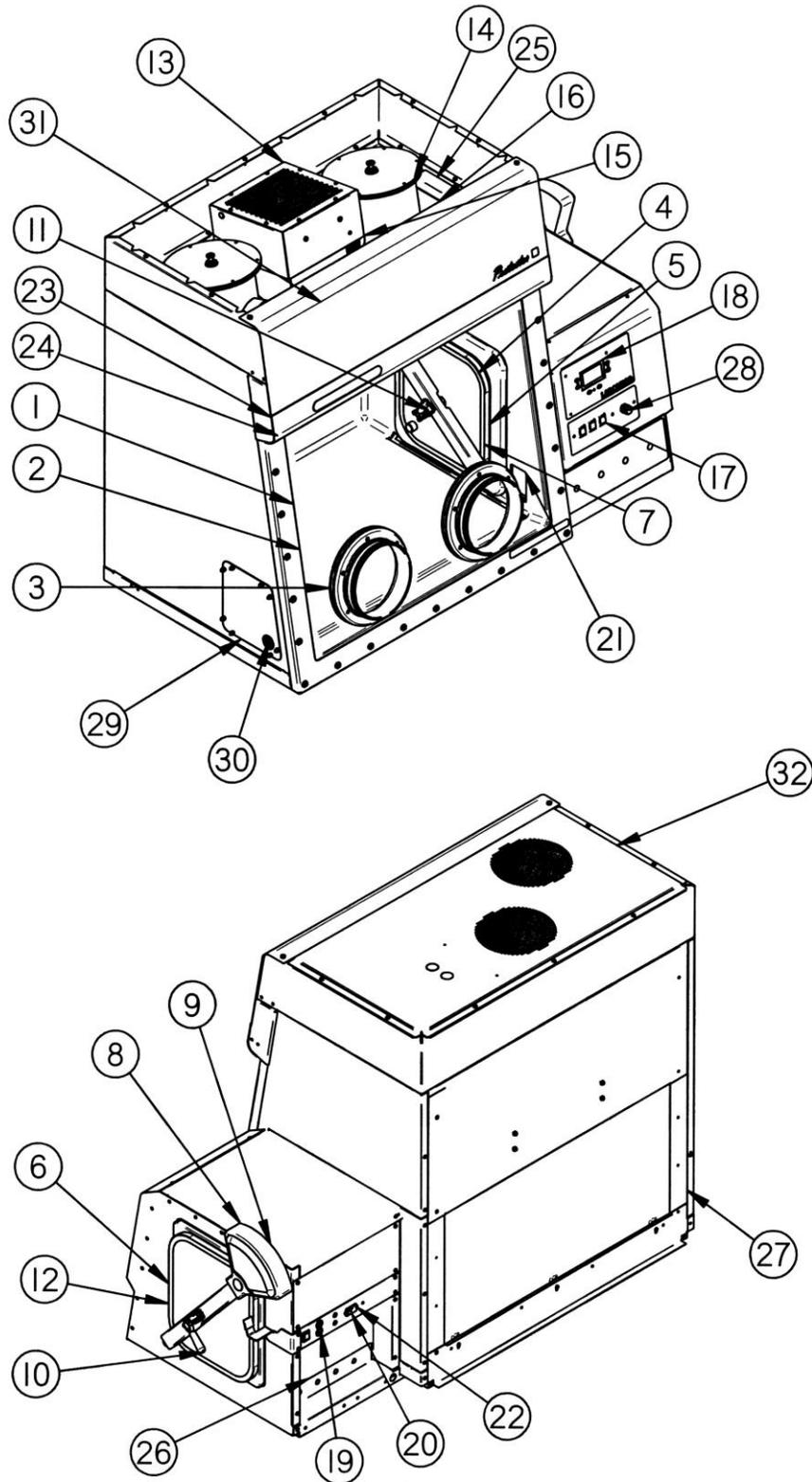
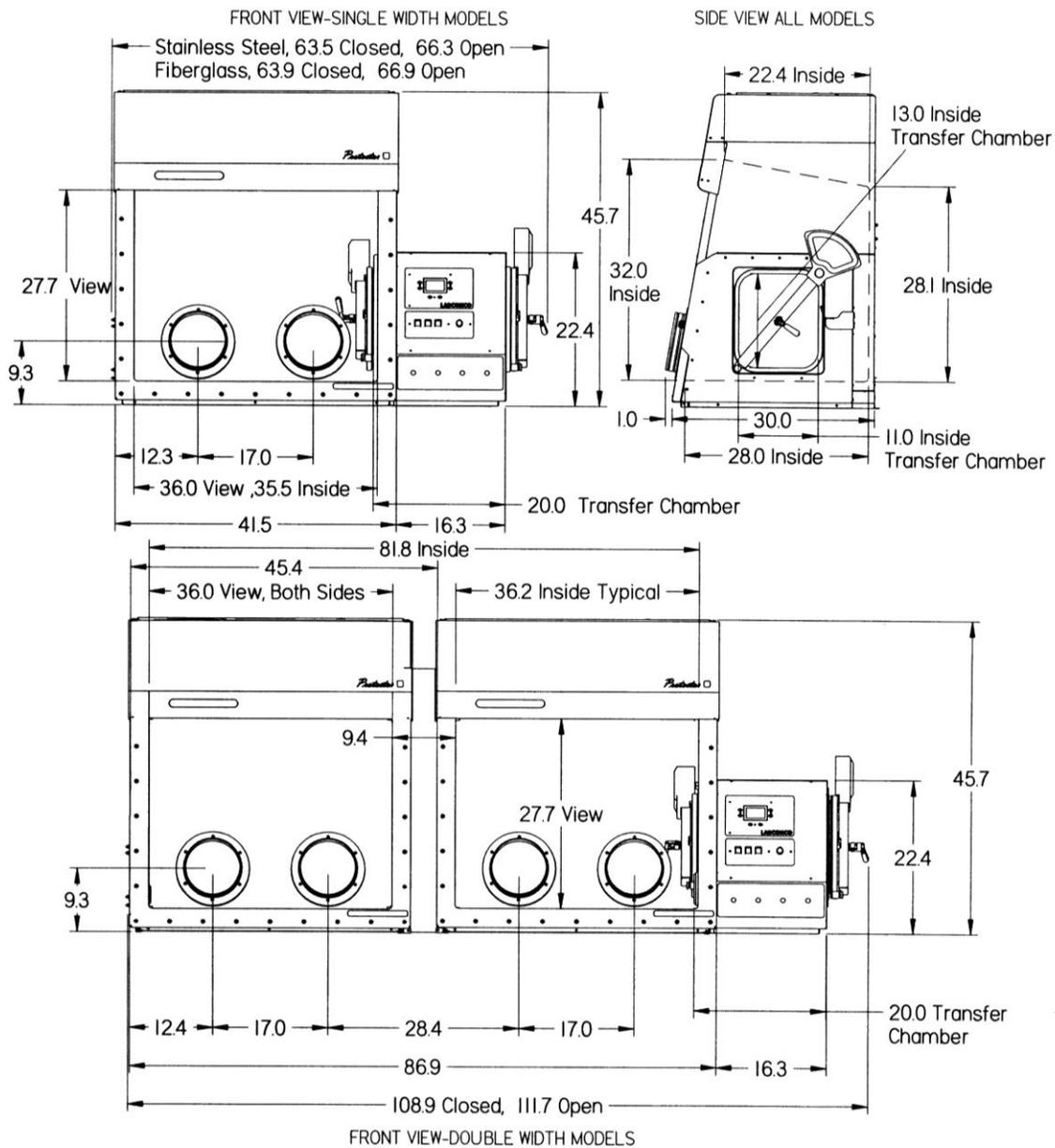


Figure A-1
Replacement Parts

Appendix B: Dimensions

See the following for all dimensions of the glove boxes. For conversion, 1" equals 25.4 mm. All dimensions are in inches.



Appendix C: Specifications

This Appendix contains technical information about all the glove boxes including electrical specifications and environmental operating conditions.

- All models: 12 Amps, 100-115V or 230V, 50/60 Hz
- Single width units require one line cord and double width units require two line cords.

Environmental Conditions

- Indoor use only.
- Maximum altitude: 6562 feet (2000 meters).
- Ambient temperature range: 41° to 120°F (5° to 49°C).
- Maximum relative humidity: 80% for temperatures up to 88°F (31°C), decreasing linearly to 50% relative humidity at 104°F (40°C).
- Main supply voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage.
- Transient over-voltages according to Installation Categories II (Over-voltage Categories per IEC 1010). Temporary voltage spikes on the AC input line that may be as high as 1500V for 115V models and 2500V for 230V models are allowed.
- Used in an environment of Pollution degrees 2 (i.e., where normally only non-conductive atmospheres are present). Occasionally, however, a temporary conductivity caused by condensation must be expected, in accordance with IEC 664.

Appendix D: Ionizer Fan Performance Criteria



Static Electricity Test

The tests were performed by monitoring the level of static electricity found on the work surface and interior surfaces within the glove box. Static electricity levels were measured with an AlphaLab Surface DC Voltmeter http://scientificmeter.com/surface_dc.htm. A DESCO Emit Mini Zero Volt Ionizer <http://www.descoemit.com/ViewProduct.aspx?pid=50661&h=1323> was installed in the glove box. The DESCO ionizer is a dual steady state DC auto balancing bench top ionizer. The ionizer helps to neutralize static electricity on surrounding surfaces. The time required by the ionizer to neutralize static electricity will be the shortest when objects are within 12" to 36" directly in front of the ionizer. The time for neutralization increases as the distance from the ionizer increases. The time required for sufficient electrostatic decay will also vary depending upon user application, moisture levels within the supply air and the level of cleanliness within the glove box interior.

	Test Point Locations and Voltage Levels						
	Metal Housing Inlet HEPA	Metal Housing Exhaust HEPA	Metal Transfer Chamber Handle	Back Interior Surface	Left FRP Interior Surface	Right FRP Interior Surface	Center FRP Work Surface
Electrostatic with Glove Box Blower & Ionizer Fan OFF	+ 420	+ 220	+ 734	+ 375	+ 106	+ 151	+ 153
100 CFM Blower & Ionizer Fan ON After 1 Hour	+ 96	+ 114	+ 290	+ 93	+ 45	+ 52	+ 35
100 CFM Blower & Ionizer Fan ON After 2 Hours	+ 28	+ 58	+ 51	- 52	- 15	- 20	- 22

**Static Electricity Test Results (VOLTS) on the Glove Box
(Neutralization is best between +/-100V)**

The mini zero volt ionizer’s neutralization time will be shortest when objects are approximately 12" to 36" directly in front of the ionizer and will increase as the distance from the ionizer increases. Set the fan speed switch on the side of the ionizer to the LOW or HIGH position. Higher airflow will result in faster neutralization rates. Position the ionizer so that the maximum airflow is directed at the items or area to be neutralized. The LED will turn on during power up and remain GREEN during normal operation. The ionizer has a grounding jack and must have a good earth ground to maintain proper balance. Always plug the AC power adaptor into the ionizer and then into the appropriate AC power source. The ionizer has no On/Off switch so it should be running as soon as it is plugged in. The ionizer is designed to run off of 24VDC ±10% 300mA.

The balance adjustment for the ionizer can be accomplished by inserting a small screwdriver or trimmer adjustment tool into the balance adjustment hole located on the side of the unit. To increase the output in a positive direction, turn the potentiometer in a clockwise direction. Conversely, to increase the output in a negative direction, turn the potentiometer in a counter clockwise direction. It is recommended that you use a surface DC voltmeter when adjusting the balance of the ionizer.

Under normal conditions, the ionizer will attract dirt and dust (especially on the emitter electrodes). To maintain optimum neutralization efficiency and operation, cleaning with isopropyl alcohol should be performed on a regular basis. If the performance of the ionizer degrades because of dirty or corroded points, the LED on the front of the unit will turn YELLOW; the audible alarm will sound continuously. Under this condition, the unit is not able to maintain balanced ionization. The input power cord must be disconnected before the unit is opened for maintenance. The emitter electrodes should be cleaned using the alcohol cleaners included or a swab wet with isopropyl alcohol. Unscrew the 4 screws on the back of the unit and then remove the screen. After cleaning the emitter electrodes, reinstall the screen and 4 screws. The emitter electrodes should not require replacement during the life of the unit with normal handling. Verify the balance of the ionizer with a surface DC voltmeter after cleaning.

Appendix E: Conversions

Pressure Conversions

To From	mmHg	in.Hg	in.H ₂ O	ft.H ₂ O	atm	lb/in. ²	Kg/cm ²	kPa	bar
mmHg	1	.03937	.5353	.04461	.00132	.01934	.00136	.1333	.0013
in.Hg	25.40	1	13.60	1.133	.03342	.4912	.03453	3.387	.0339
in.H ₂ O	1.868	.07355	1	.08333	.00246	.03612	.00254	.2490	.0025
ft.H ₂ O	22.42	.8826	12	1	.02950	.4334	.03048	2.988	.0299
atm	760	29.92	406.8	33.90	1	14.70	1.033	101.3	1.013
lb/in. ²	51.71	2.036	27.69	2.307	.06805	1	.07031	6.895	.0689
Kg/cm ²	735.6	28.96	393.7	32.81	.9678	14.22	1	98.05	.981
kPa	7.500	.2953	4.016	.3347	.00987	.1451	.0102	1	.01
bar	750	29.53	401.6	33.47	.987	14.51	1.02	100	1

Flow Rate Conversions

To From	lit/sec	gal/min	ft ³ /sec	ft ³ /min	bbbl/hr	bbbl/day
lit/sec	1	15.85	0.03532	2.119	22.66	543.8
gal/min	0.06309	1	0.00223	0.1337	1.429	34.30
ft ³ /sec	28.32	448.8	1	60	641.1	1.54x10 ⁴
ft ³ /min	0.4719	7.481	0.01667	1	10.69	256.5
bbbl/hr	0.04415	0.6997	0.00156	0.09359	1	24
bbbl/day	0.00184	0.02917	6.50x10 ⁵	0.00390	0.04167	1

Appendix F: References

Many excellent reference texts and booklets are currently available. The following is a brief listing:

Pharmaceutical Isolators, A Guide to their application design and control.
Pharmaceutical Press 2004, Editors: Midcalf, Phillips, Neiger, and Coles.

Isolation Technology, A Practical Guide, 2004 CRC Press, 2nd Edition,
www.crcpress.com

International Standard ISO 10648-2 Containment Enclosures

- Classification according to leak tightness and associated checking methods.

International Standard ISO 14644-7 Clean Rooms and associated controlled environments

- Separate device such as glove boxes and isolators.

NIOSH Pocket Guide to Chemical Hazards

U.S. Dept of Health and Human Resources

Centers for Disease Control and Prevention

National Institute for Occupational Safety and Health