



LABCONCO CORPORATION

8811 Prospect Avenue
Kansas City, MO 64132
(800) 821-5525, (816) 333-8811
(816) 363-0130 fax
labconco@labconco.com

User's Manual

XPert[®] Nano Enclosures

Models

38872 Series
38873 Series
38874 Series
38875 Series
38876 Series
38885 Series
38886 Series

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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The warranty for XPert® Nano Enclosures 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.

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

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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 XPert® Nano Enclosure. Your enclosure provides personnel protection through superior containment while conserving energy at OSHA approved velocities as low as 60 feet per minute. It is the result of Labconco's more than 50 years of experience in manufacturing fume hoods and more than 30 years of experience in manufacturing filtered enclosures.

These enclosures will effectively contain toxic or noxious particulates when properly installed and operated. Each Nano Enclosure uses an ULPA filter, which is rated at least 99.999% efficient for 0.12-micron particles. The XPert Nano Enclosures offer many unique features to enhance safety, performance, and energy savings. To take full advantage of them, please acquaint yourself with this manual and keep it handy for future reference. The XPert Nano Enclosures include a true bag-in/bag-out ULPA filter to properly protect personnel during filter changing operations.



If the unit is not operated as specified in this manual it may impair the protection provided by the unit.

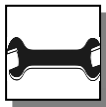
Si l'unité n'est pas utilisée comme spécifié dans ce manuel il peut diminuer la protection fournie par l'unité.

Typographical Conventions

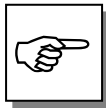
Recognizing the following typographical conventions will help you understand and use this manual:

- Steps required to perform a task are presented in a numbered format.
- Comments located in the margins provide suggestions, reminders, and references.
- Critical information is presented in boldface type in paragraphs that are preceded by the exclamation icon. Failure to comply with the information following an exclamation icon may result in injury to the user or permanent damage to the enclosure.





- Critical information is presented in boldface type in paragraphs that are preceded by the wrench icon. Only a trained certifier or contractor should only perform these operations. Failure to comply with the information following a wrench icon may result in injury to the user or permanent damage to your Clean Bench.



- Important information is presented in capitalized type in paragraphs that are preceded by the pointer icon. It is imperative that the information contained in these paragraphs be thoroughly read and understood by the user.



- CAUTION – See Manual. When this symbol is on the unit it indicates a caution that is detailed in this manual.
- ATTENTION - Voir manuel. Lorsque ce symbole est sur l'unité, il indique une mise en garde qui est indiqué dans ce manuel.

Chapter 2:

Prerequisites

Before you install the filtered enclosure, 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 filtered enclosure. Additionally, the enclosure should be strategically placed in the lab to provide efficient workflow.

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

- The support, vibration and movement requirements.
- The temperature variation requirements.
- The humidity and static electricity requirements.
- The location and air current requirements.
- The exhaust and blower requirements.
- The electrical power requirements.
- The space requirements.

Refer to Appendix B: Dimensions for complete enclosure dimensions.

Refer to Appendix C: Specifications for complete filtered enclosure electrical and environmental conditions, specifications and requirements.

Support, Vibration and Movement Requirements

At a minimum, the supporting structure usually consists of a base cabinet or stand.

For weighing applications the ability for analytical balances to accommodate vibration varies with type and brand. More advanced balances have improved tolerance, however in the preparation of a balance enclosure site, please consider the following:

- Avoid tubular stands or mobile benches that have the potential of moving when touched.
- A bench that is rigidly mounted to the floor or fixed to the wall, but not both, may be appropriate.

- The corners of a building typically have less vibration than the center.
- The bench with the balance enclosure should not contain any vibration-producing equipment, such as shakers or pumps.
- Marble slabs with dampening pads placed within the enclosure are also an effective low cost means of controlling vibration.
- The balance should be calibrated and verified at least annually; for best results, the balance should be calibrated inside the enclosure while running at the desired face velocity.

Temperature Variation Requirements

The extent the balance readings are influenced by temperature variations is a function of the balance design. Most manufacturers would suggest that a temperature drift of 1-2°C is generally tolerable. Only validation through your Operational Qualification protocol can define what is acceptable. To minimize the potential for temperature variations:

- Never install balances near heating sources such as radiators and hot plates.
- Do not place the balance and enclosure on a bench that would receive direct sunlight.

Humidity and Static Electricity Requirements

Electrostatics can be troublesome in a balance enclosure. It is important to understand and, to the extent possible, control static charges. An electrostatic charged vessel, sample or enclosure can apply forces and lead to errors in weighing. The repulsion or attraction can be detected with micro, semi micro and analytical balances. Static charges can also lead to particulates being attracted to surfaces within the balance enclosure. Containment of harmful powders, prevention of cross-contamination and clean-up is enhanced when static attraction of powders is minimized. The construction of the XPert Nano Enclosure avoids the use of plastics, which are highly insulative.

To correct or ensure against electrostatic issues, the following additional measures may be prescribed to improve weighing operations.

- Maintain a humidity level between 45 and 60%. The ability to sustain this humidity range can be challenging depending upon the regional climate and HVAC system.
- The XPert Nano Enclosure is offered with a factory installed ionizer which will neutralize surface charges.

Background on Electrostatics or Static Electricity

Electrostatic charges on a surface such as the wall of a balance enclosure are not created by moving air. Impurities within the air impinging upon surfaces dictate the polarity and magnitude of the charge. The process, triboelectrification, occurs when the dust particles contact the surface, creating friction and electrons move across the interface.

The ability of a material to become polarized is a property known as permittivity. On highly insulative materials like acrylic, ions or charged molecules are strongly bound to the surface by polarization forces. The higher the force, the higher is the permittivity value of the material. It is suggested by balance manufacturers that the use of high permittivity materials, such as plastic be avoided.

Since static electricity is a surface phenomenon, materials can also be classified by their surface resistivity measured in ohms per square. The table below lists the surface resistivity of various classes of material.

Surface Resistivity Table

Material	Surface Resistivity	Example
Conductive	$0 \rightarrow 10^5 \Omega$ per square	Skin, Metals
Static dissipative	$10^5 \rightarrow 10^9 \Omega$ per square	Glass
Antistatic	$10^9 \rightarrow 10^{12} \Omega$ per square	Polyethylene bag
Insulative	$10^{12} \Omega$ per square \rightarrow	Acrylic, Packing foam, Styrofoam

Location and Air Current Requirements

The XPert line of Filtered Enclosures have been designed to contain hazards by negating typical cross drafts and turbulence within the opening. Air movement does not affect most modern balances with draft shields. However, as a precautionary safety measure and a higher level of control, it is recommended that the enclosure be placed in an area to avoid:

- High traffic areas where walking might cause an air disturbance or be a nuisance to balance readings.
- Overhead or wall HVAC diffusers, fans, radiators or other lab equipment producing air currents.
- Next to doorways or windows that may be opened.



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

Ne placez pas l'appareil de sorte qu'il est difficile de faire fonctionner le dispositif principal de déconnexion.

Exhaust and Blower Requirements

The XPert Nano Enclosure uses an integral motorized impeller to draw room air past the operator and through the enclosure. This contaminated air is then pushed through the ULPA filter. The ULPA-filtered exhaust air is then forced out the top of the enclosure.

The ULPA-filtered exhaust air can be recirculated into the laboratory or exhausted outside with the addition of the Canopy Exhaust Connection and remote blower listed in Chapter 7. Electrical connections are covered in Chapter 2 for this configuration. Consult your local regulations or guidelines for ventilation of the filtered exhaust in nanoparticle applications.

If external exhaust is required, data for the exhaust volume, noise pressure and enclosure static pressure loss is listed for each filtered enclosure model at face velocities of 60, 80, and 100 fpm. Weighing and handling nano materials is best done with lower flow rates (60-70 fpm or 0.31-0.36 m/s).

Enclosure Width and Sash Opening	Face Velocity (fpm)	Exhaust Volume (CFM)	XPert Station Initial Static Pressure Loss with HEPA filter (in w.g.)	XPert System Noise Pressure db (A)	Xpert System Max. Equivalent Resistance (Ft)	Xpert System Max. External Static Pressure
2' 9.4" Sash	60	85	.35" - .41"	48-53	400	.20"
	80	115	.48" - .57"	50-56	200	.18"
	100	145	.62" - .72"	53-58	80	.13"
3' 9.4" Sash	60	130	.37" - .43"	48-53	130	.15"
	80	175	.53" - .62"	53-57	50	.11"
	100	220	.68" - .79"	58-61	25	.08"
4' 9.4" Sash	60	175	.40" - .46"	49-54	100	.20"
	80	235	.57" - .66"	58-61	50	.18"
	100	295	.76" - .87"	62-66	25	.13"
5' 12" Sash	60	290	.38" - .46"	52-56	450	.22"
	80	385	.55" - .67"	58-63	230	.20"
	100	480	.72" - .85"	63-67	120	.15"
6' 12" Sash	60	350	.46" - .56"	55-57	300	.20"
	80	465	.67" - .81"	61-63	150	.18"
	100	580	.87" - 1.03"	67-69	70	.13"

Proper blower selection can be determined from these exhaust requirements and the total system static pressure loss. For outside exhaust, the enclosure must be connected to either a dedicated blower or a house exhaust system. Labconco offers accessory remote blowers listed in Chapter 7. Contact Labconco for blower sizing assistance.



If the enclosure is connected directly to a house exhaust system, an adjustable damper (or valve) must be installed to control the airflow properly. This is equally important when a house exhaust system is controlling multiple filtered enclosures. See Chapter 7 for accessory adjustable damper ordering information.

Electrical Requirements

Standard duplex electrical receptacles should be nearby for connecting the filtered enclosure, or other equipment, such as a balance for weighing operations. The enclosures include iris pass-thru to allow electrical cords through the back of the enclosure without leaving a large hole for contaminants to escape.

Space Requirements

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

Chapter 3:

Getting Started

Now that the site for your XPert Nano Enclosure 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 enclosure.
- Set up the enclosure with the proper supporting structure and work surface.
- Connect to an exhaust system if applicable.
- Connect the electrical supply.
- Set the face velocity with the speed control adjustment.
- Arrange validation for the enclosure.

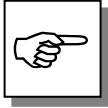
Depending upon which model you are installing, you may need common mechanical and electrical installation tools in addition to wrenches, ratchets, sockets, a nut driver set, a large flat-blade screwdriver, a power drill or screwdriver, and a carpenter level to complete the instructions in the chapter.



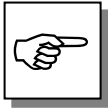
Each enclosure model weighs between 173 to 443 lbs. each (78.47 to 200.94 kg). The shipping container allows for lifting with a mechanical lift truck or floor jack. If you must lift the enclosure manually, follow safe-lifting guidelines. Do not lift by the front air foil.

Unpacking the Enclosure

Carefully remove the shrink-wrap or carton on the enclosure 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.



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.

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

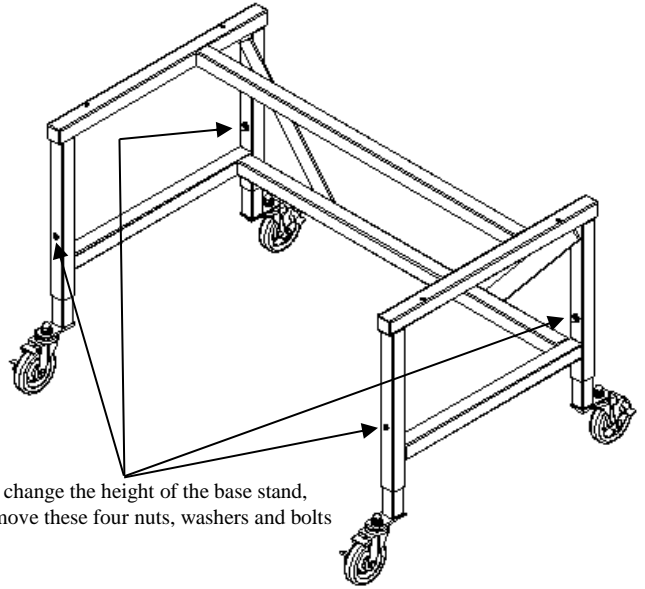
Do not discard the packing material until you have checked all of the components and tested the enclosure. We recommend that you do not remove the enclosure from its shipping container until it is ready to be placed into its final location. Move the unit by placing a flat, low dolly under the shipping skid, or by using a floor jack.



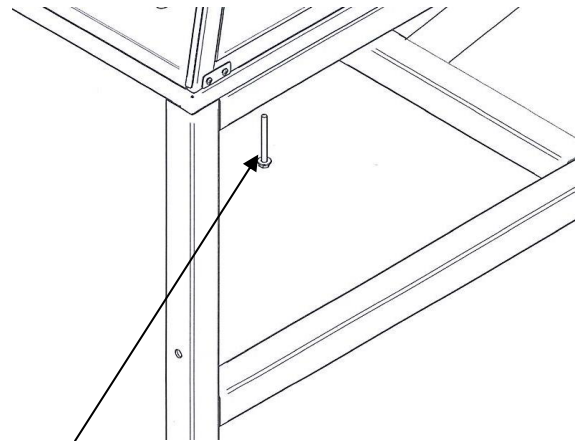
Do not move the enclosure by tilting it onto a hand truck.

Stand and Cabinet Installation

1. The top surface of a base stand can be adjusted from 27.5 to 34.50 inches (698mm to 876mm), in 1 inch (25mm) increments. Choose your optimum working height from the floor to the work surface.
2. Slide (4) leg extensions into base stand corner posts and attach with larger diameter 5/16"-18 x 2-1/4 inch (57mm) long bolt, flatwasher, lockwasher and acorn nut. Ensure that the same height hole is selected for each leg. Tighten the leg bolts securely.
3. Move the base stand into its final location. For stands with leveling feet, use a carpenter level to adjust in both planes as shown in figure below.
4. XPert Nano Enclosures have an integral stainless steel work surface with mounting holes on the underside. Hardware is provided with the stand. Set the enclosure and work surface onto the stand with the front edge of the work surface flush (even) with the front edge of the stand. Loosely attach each of the four mounting locations of the work surface with the smaller diameter 1/4"-20 x 2.5 inch (63mm) long hex head bolts, nuts and washers. Tighten when all four bolts have been started.



To change the height of the base stand, remove these four nuts, washers and bolts

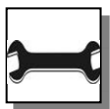


Install four bolts and flat washers into base of cabinet

Connecting to the Exhaust System (Optional)



ATTENTION: The weight of the exhaust ductwork system must be supported independently of the enclosure superstructure or damage may occur.



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

The exhaust connection on the 2', 3' and 4' XPert Nano Enclosure have been designed to accept 6" diameter ductwork as shown in Figure 3-2. The 5' and 6' models have been designed for 10" diameter ductwork as shown in Figure 3-3. For the 2', 3' and 4' sizes, the exhaust connection ships uninstalled on the top and needs to be fastened with the screws provided. See Chapter 7 for ordering Canopy Exhaust Connection. Canopy Exhaust Connection aids in the removal of chemicals or applications where a higher degree of powder and particulate removal is required. Review Chapter 2 for exhaust prerequisites and review Chapter 7 for ordering blower exhaust equipment.

Consult Labconco Customer Service should you require help sizing your blower for the exhaust volume and system static pressure loss.



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

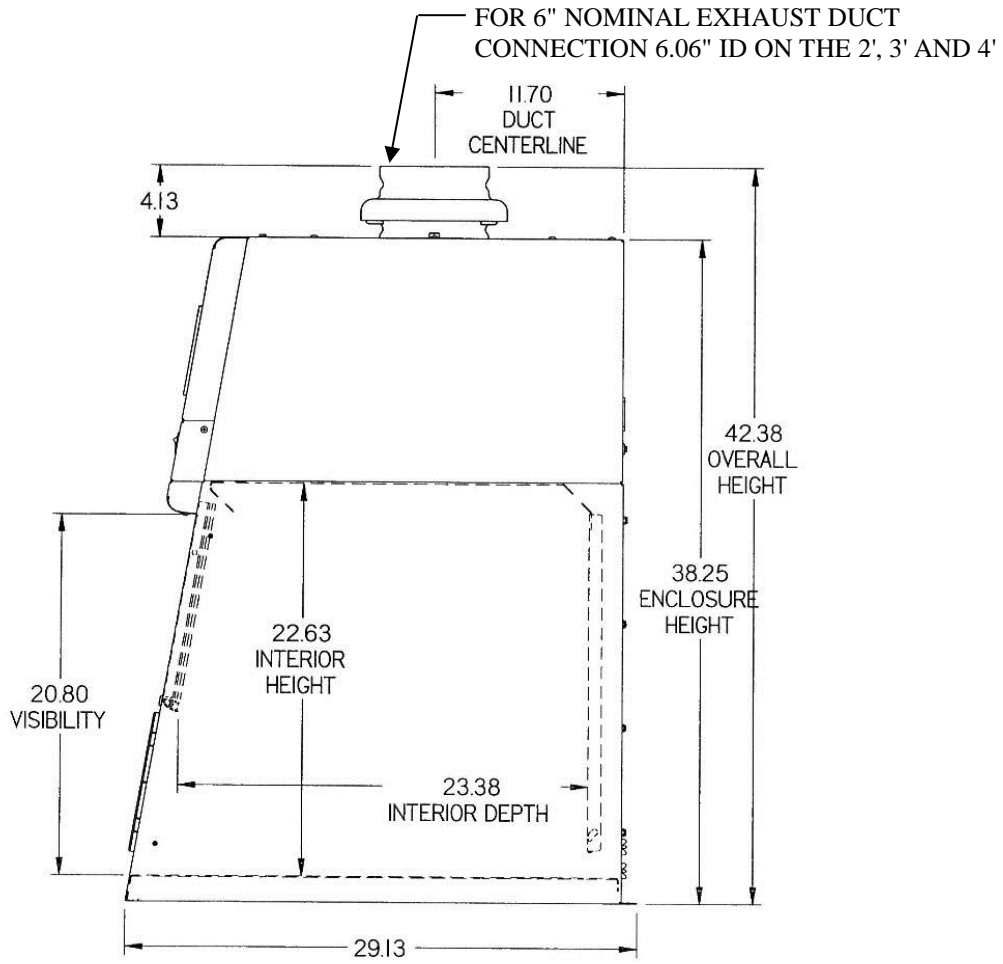


Figure 3-2

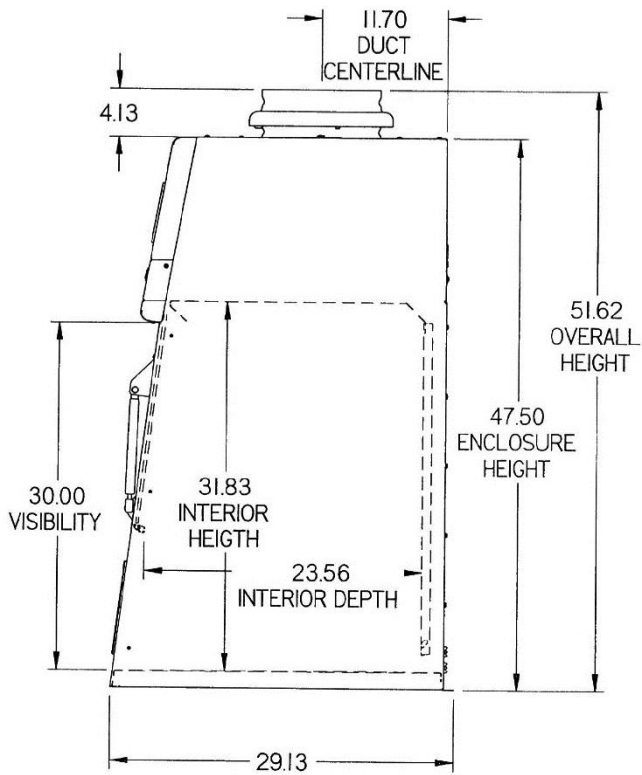
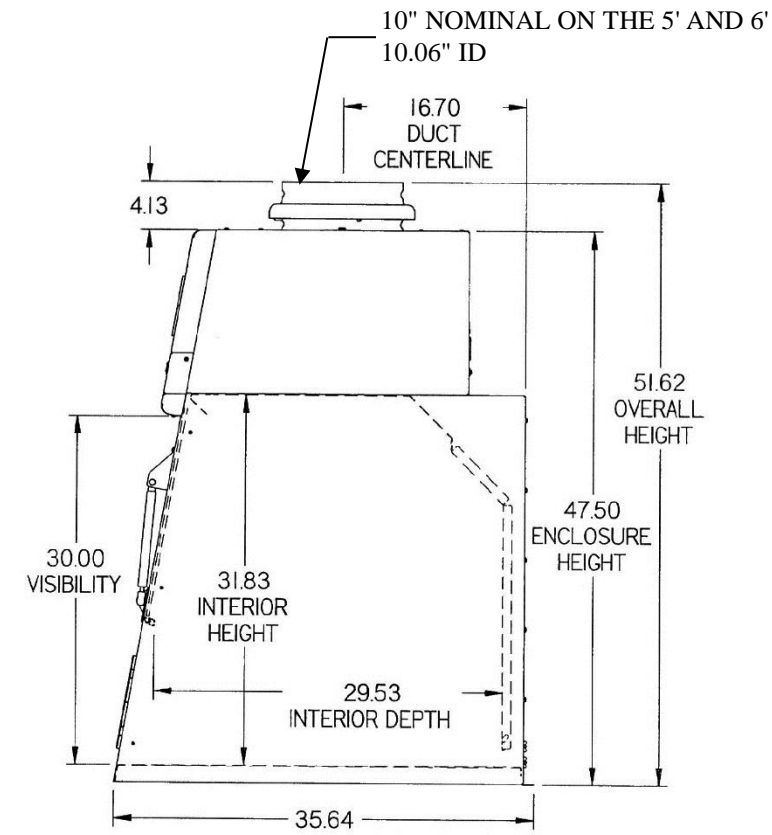


Figure 3-3

Connecting the Electrical Supply Source to the Nano Enclosure

Simply connect the 115V power cord supplied to the IEC electrical supply plug on the back of the enclosure. If using at 50 Hz operations, blower performance maximum airflow will be reduced by 17%.

The same procedure applies for the 230V except it is shipped without a plug. Install the appropriate plug for your electrical specifications per local codes. All models use less than 5 amps.

All wiring for the XPert Nano Enclosure should be performed by a licensed electrician and conform to local codes.



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

Ne pas utiliser un fil électrique amovible qui n'est pas du tension nominale de l'appareil.

Set the Face Velocity with the Speed Control Adjustment

Adjustment of the speed control gives the correct face velocity and is located behind the front panel. The face velocity should be adjusted from 60 to 100 fpm. (Consult your Safety Officer for airflow recommendations for your application). Containment is maximized at a setting within this range. Working at the lowest face velocity permissible for the application will give the least turbulent, quietest operation. Face velocity measurements are made using an anemometer. An electric anemometer can be obtained from your laboratory supply dealer.

To determine the actual face velocity at the sash opening, airflow velocity readings are taken. This should be done across the sash opening of the enclosure in accordance with the *Industrial Ventilation Manual*. (See Appendix E) The “average face velocity” is achieved by taking readings in two rows across the enclosure with the readings 6" from the ends and evenly spaced every 12"; the first row is 3" down from the upper sash foil and the second row is 3" up from the work surface. Refer to Chapter 2 for proper airflow volumes for your particular model.

The XPert enclosures have been tested at Labconco's airflow test facility per ASHRAE 110-1995. All enclosures achieve an “as manufactured rating” of less than 0.05 part per million (ppm) at 4 liters per minute (lpm); AM <0.05 (Consult Labconco for individual ratings). For “field use” ASHRAE testing contact Labconco for a certified on-site contractor. For particulate powder validation, Labconco performed containment testing to validate the enclosures for sodium naproxen powders. The XPert enclosures demonstrated excellent containment when used by an operator using excellent technique and good containment when used by an operator using marginal technique. While no enclosure can compensate for improper technique, these tests confirm that the XPert Nano Enclosures provide a safe working environment.



NOTE: Face velocity profiles and smoke testing should be performed frequently per your organization's quality system to ensure safe performance.

Chapter 4: High Performance Features and Safety Precautions

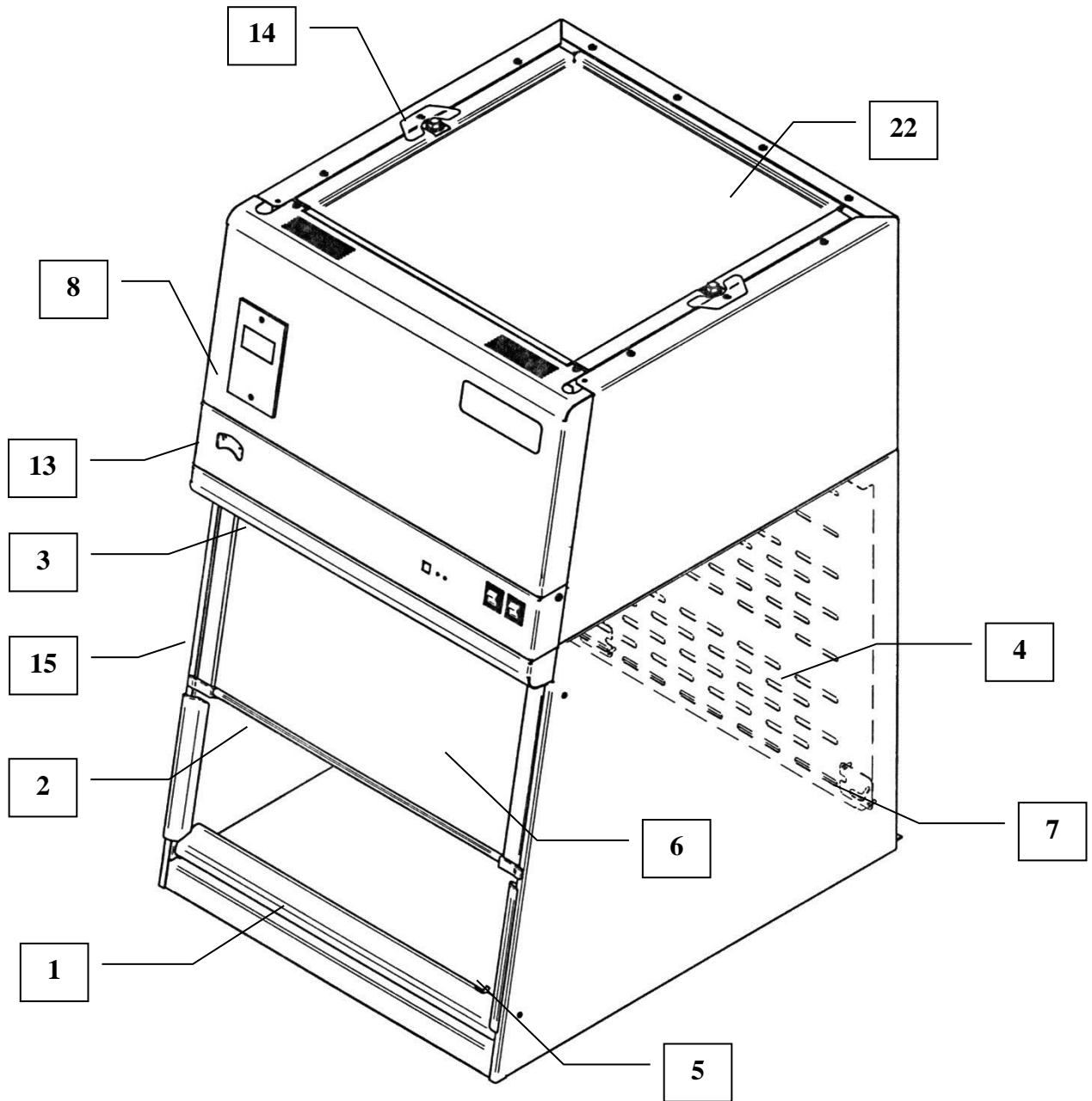
High Performance Features

The patented¹ XPert Nano Enclosure is designed to meet the needs of the laboratory scientist, and provide superior containment while conserving energy at OSHA approved “low flow” velocities as low as 60 feet per minute. The filtered enclosures have been tested to effectively contain toxic and noxious materials when properly installed and operated. What makes the Labconco line of enclosures so unique is the revolutionary way they direct air into and through the contaminated air chamber. Labconco engineered them to minimize the effects of turbulence. The containment-enhancing and aerodynamic designs of the upper sash foil, side air foils, lower air foil, upper dilution air supply, and rear perforated baffle all work in concert to produce horizontal airflow patterns that significantly reduce powder, chemical and particulate concentrations through the work area.

These concentrations of materials are predominantly removed on the “first pass” of airflow through the chamber resulting in high performance containment. The plenum and the ULPA filter are jacketed by negative pressure. Should a leak occur in the filter gasket or the plenum, the contaminated air is recaptured and refiltered.

The XPert Nano Enclosure includes a true bag-in/bag-out ULPA filter disposal system to protect the worker from contact with hazardous powders and particulates. Users are encouraged to routinely check airflow with the use of the airflow monitor.

¹ U.S. Patent No. 6,461,233 and U.S. Patent No. D538,941



Not Shown 9, 10, 11, 12, 17, 18, 19, 20, 21, 23, 24

Figure 4-1

1. **Aerodynamic Clean-Sweep™ Air Foil** has a unique shape that allows air to sweep the work surface for maximum containment. The Clean-Sweep™ openings create a constant protective barrier from contaminants. Should the operator inadvertently block the airflow entering the air foil, air continues to pass under the air foil and through the Clean-Sweep openings. See Figures 4-1 and 4-3. The air foil is easily removable for cleaning. Do not operate the enclosure without the air foil installed.

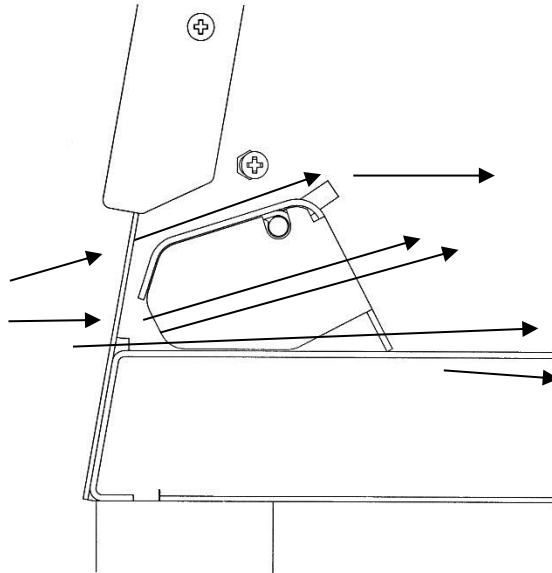


Figure 4-3

2. **Containment-Enhancing Upper Sash Foil** includes an open air passage directly atop the sash foil to bleed air into the hood chamber and direct chemical, powder and particulate materials away from the sash opening. The radiused sash foil sweeps airflow into the hood with minimal turbulence. See Figures 4-1 and 4-4.

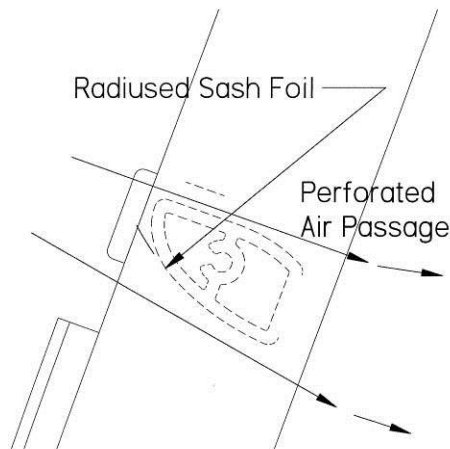


Figure 4-4

3. **Upper Dilution Air Supply** provides bypass air from above the work area. This feature constantly bathes the inside of the sash with clean air and reduces powders, particulate materials and chemical fumes along the sash plane, near the critical breathing zone. Five to seven percent of the required air volume is introduced through the upper dilution air supply. The upper dilution air supply also reduces stagnant pockets of air in the upper interior.
4. **Zoned Rear Perforated Baffle** directs horizontal laminar air streams to the three-zoned sections of the perforated baffle. The three-zoned sections have increasingly more open area at the bottom that help form laminar airflow. This minimizes the potential for air to roll forward preventing contaminants from moving toward the sash opening. The majority of contaminants are highly diluted, captured and removed on the first pass through the enclosure. The rear perforated baffle may be tilted or removed for ease in cleaning.
5. **Side-Entry Air Foils** allow turbulence-free air to enter the enclosure from the sides and allow clean air to sweep the interior walls of the enclosure.
6. **Safety Glass Sash** has a wiping seal to contain contaminants and features a spring-loaded latch to secure sash open for loading and cleaning. The sash must be down for normal operation. The 5' and 6' units utilize a gas spring assist in place of the latch.
7. **Utility Ports** allow electrical cords and data cords to pass through the back of enclosure without leaving a large hole for contaminants to escape.
8. **Accessory Guardian Airflow Monitor or Guardian™ 1000 Digital Airflow Monitor** continuously monitors airflow. An audio/visual alarm alerts the user to low airflow conditions. The Guardian 1000 Digital Airflow Monitor also displays a face velocity value, provides an RS232 output, a night setback mode and several auxiliary relay ports.
9. **Inherently Safe Plenum** has a negative pressure plenum that surrounds the positive pressure impeller so that if a leak should occur, the unfiltered air is captured and refiltered.
10. **Vibration-Isolated Motorized Impeller** has vibration isolation supports, which eliminates transfer of vibration to the work surface. The impeller wheel is also dynamically balanced.
11. **Speed Control** regulates the speed of the motorized impeller and is used by the certifier to adjust the inflow velocity. Located behind the front panel.
12. **Fluorescent Lamp** is located above the work area, out of contact with contaminated air. A safety glass window beneath the lamp distributes the light evenly across the work surface.
13. **Filter System Pressure Gauge** indicates the total system pressure across the filter and pressurized plenum to help predict filter loading.
14. **Filter Clamping Bolt** evenly seals the filter to the frame of the enclosure.

15. **ULPA Filter Access Port** to access the ULPA filter during filter changing procedures. For harmful powders and particulates, the true bag-in/bag-out procedure is used to properly dispose of the contaminated ULPA filter.
16. **Control Panel.** The control panel, which is located above the sash, contains the filter system pressure gauge, control switches and the electronics.
17. **ULPA (Ultra Low Penetration Air) Filter** is rated to remove 99.999% of all particles 0.12 micron in size.
18. **Lamp Ballast (not shown)** for the fluorescent lamp is located behind the control panel.
19. **Optional XPert Exhaust Collar (not shown)** provides a 6" (2', 3' and 4') or 10" (5' and 6') diameter transition to a remote blower or house exhaust system.
20. **Optional Accessory Canopy Exhaust Connection (not shown)** is available to duct the XPert Nano Enclosure to the outside. The Canopy Exhaust Connection affords the operator additional protection from hazardous particulates, fumes or vapors. Each Canopy Exhaust Connection includes an epoxy-coated steel exhaust transition adapter designed for 6" diameter nominal duct on 2', 3' and 4' sizes. The 5' and 6' sizes use 10" nominal duct.
21. **Optional Ionizer (not shown)**, when activated, floods the work area with positive and negative ions to neutralize static charges on the surface of non-conductive items. Ionizer cannot be installed after manufacture.
22. **Upper Diffuser Screen** provides protection for the ULPA Filter and (LED) airflow sensor. See Figure 4-1.
23. **Optional Utility Shelves (not shown)** allow the user to hold utensils and printers on shelves inside the enclosure. See Chapter 7.

Safety Precautions

1. A qualified certification technician should test the enclosure before it is initially used. The enclosure should be validated whenever it is relocated. The use of an airflow monitor is recommended to alert the user to a problem with airflow.
2. Use good housekeeping in the enclosure at all times. Clean up spills immediately. Periodically clean enclosure interior.
3. Do not overload the work surface with apparatus or work material. The safe operation of the enclosure is based upon having proper airflow through the structure. Do not place large objects directly on the work surface. Instead, elevate the object 3/4" on blocks to allow a flow of air under the object and into the rear baffle exhaust slots.

4. Blocking large portions of the rear baffle will change the airflow pattern in the enclosure causing turbulence. (Do not store containers or supplies against the rear baffle.)
5. Always work far back into the enclosure as possible. Keep all powders, chemicals and apparatus inside the lower air foil.
6. Perchloric acid use in this enclosure is prohibited.
7. Radioisotope materials are prohibited in this enclosure. Consult your Safety Officer.
8. The enclosure should be recertified whenever it is serviced or at least annually thereafter.
9. Use safety goggles, protective clothing, gloves and any other personal protective equipment recommended by your safety officer.
10. The sash must remain in the down position while using the enclosure.
11. The ULPA filter provides personnel and environmental protection from particulate matter. Because room air is drawn over the work surface during operation, this enclosure should not be used for operations requiring product protection from environmental contamination.
12. Avoid the use of flammable gases or solvents in the enclosure if possible. Care must be taken to ensure against the concentration of flammable or explosive gases or vapors. Use of an open flame should be avoided in the enclosure as they may disrupt the airflow patterns in the cabinet. Gases under high pressure should not be used in the enclosure as they may disrupt the airflow patterns of the cabinet.
13. ULPA filters are only effective for entrapment of particulate matter. Manipulations that generate gases or vapors from toxic chemicals or radionuclides, must be evaluated carefully and vented in compliance with applicable regulations.
14. The surface of the 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 enclosure; contact a local certification agency or Labconco.
15. The ULPA filter in the enclosure will gradually accumulate airborne particulate matter from the room and from work performed in the enclosure. The rate of accumulation will depend upon the cleanliness of the room air, the operating time and the nature of work being done.
16. Ensure that the filtered enclosure 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 filtered enclosure from electrical service.

17. Increase the face velocity by adjusting the speed control of the motorized impeller on the XPert Nano Enclosure. Change the filter when the face velocity falls below acceptable limits established by your Safety Officer.
18. Exhaust ULPA filters are disposed as hazardous waste. The user is responsible for recording the material and disposing properly. Filters should be disposed using the disposal bag on XPert enclosures.
19. Ensure only trained operators use the enclosure. New users should review the User's Manual and become familiar with the operation of the enclosure.
20. Proper operation of the enclosure depends largely upon the enclosure location and the operator's work habits. The enclosure should be located away from traffic patterns, doors, fans, ventilation registers, fume hoods, and any other air-handling device that could disrupt its airflow patterns (see references in Appendix D).
21. For weighing procedures, adjust face velocity between 60 and 100 FPM for effective operation.
22. Leave the blower on for at least one minute after work in the enclosure has been completed.
23. If a chemical, powder or particulates are spilled on the work surface, **DO NOT** switch off the blower until all traces have been removed.
24. Tag enclosures with appropriate warning, if the enclosure has been disabled for service.
25. If the blower fails during use, processes should cease and the area should be vacated and ventilated.

Chapter 5:

Using the Nano Enclosure

Now that the installation of your Nano enclosure is completed, you are ready to use your Nano enclosure.

Read this chapter to learn about:

- Routine Daily Work Procedures
- Appropriate ULPA Filter Applications, Suitability and Guidelines
- Optional Ionizer
- Prohibited Acid Use

Routine Daily Work Procedures

Planning

- Arrange for minimal disruptions, such as room traffic or entry into the room while the enclosure is in use.

Start-up

- Turn on exhaust system and light.
- Only raise the sash for loading and cleaning.
- Check the baffle air slots for obstructions.
- Allow the enclosure to operate unobstructed for 1 minute.
- Wear a long sleeved lab coat and rubber gloves. Use protective eyewear. Wear a protective mask if appropriate. Consult your Safety Officer for additional personal protective equipment recommendations.

Loading Materials and Equipment

- Load only the materials required for the procedure. Do not overload the enclosure.
- Do not obstruct the air foil, or rear baffle slots.
- Large objects should not be placed close together and should be elevated above the work surface to permit airflow to sweep under the equipment.
- After loading, wait one minute to purge airborne contaminants from the work area.

Work Techniques

- Keep all materials inside the lower air foil, and perform all contaminated operations as far to the rear of the work area as possible.
- Segregate all clean and contaminated materials in the work area.
- Avoid using techniques or procedures that disrupt the airflow patterns of the enclosure.

Final Purging

- Upon completion of work, the enclosure should be allowed to operate for two to three minutes undisturbed, to purge airborne contaminants from the work area before shutting down the blower.

Unloading Materials and Equipment

- Objects in contact with contaminated material should be surface decontaminated before removal from the enclosure.
- All open trays, weigh vessels or containers should be covered before being removed from the enclosure.

Shutdown

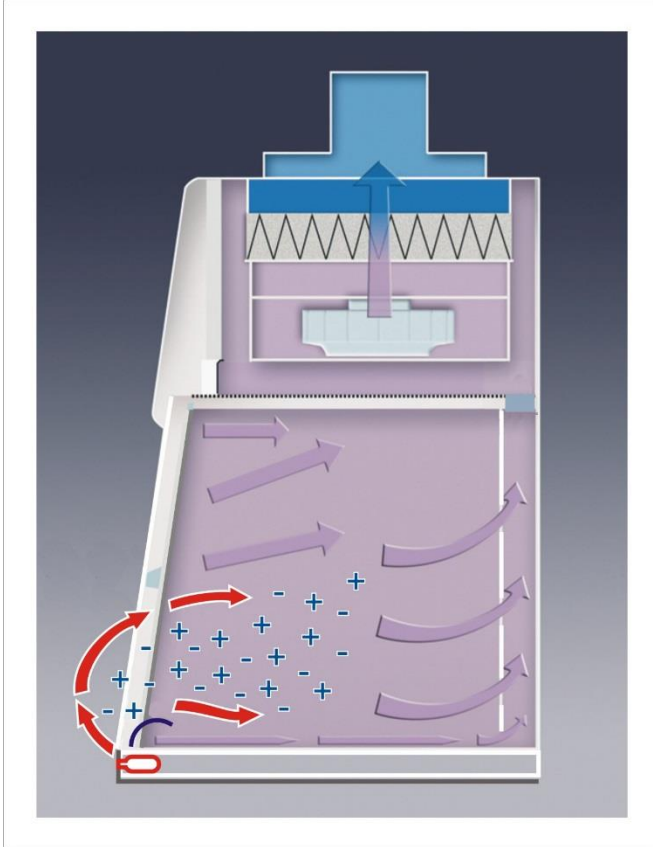
- Turn off the exhaust system and light.

ULPA Filter Applications, Suitability and Guidelines

- Weighing and handling of powders.
- Release of nonvolatile particulates appropriate for use with a ULPA filter.
- The ULPA filtered enclosure provides personal and environmental protection from particulate matter, hazardous powders and biohazardous materials. Because room air is drawn through the enclosure during operation, this enclosure should not be used for operations requiring sample protection from environmental contamination.
- ULPA filters are only effective for entrapment of particulate matter, hazardous powders and biohazardous materials. Manipulations that generate gases or vapors, i.e., toxic chemicals or radionuclides, require ventilation to the outside of the building. The surface of the filter is fragile and should not be touched. Care must be taken to avoid puncturing the ULPA filter during installation. If you suspect that a ULPA filter has been damaged, DO NOT use the enclosure. See Chapter 6 for replacing the ULPA Filter or using a Bag-In/Bag-Out Disposal Bag.
- The ULPA filter will gradually accumulate airborne particulate matter from the room and from work performed in the enclosure. The rate of accumulation will depend upon the cleanliness of the room air, the operating time, and the nature of work being performed.
- Each Nano Enclosure is provided with a ULPA filter. For powders and particulates follow the ULPA Filter Bag-In/Bag-Out procedure in Chapter 6 for disposal instructions. For biohazardous materials, follow the Decontamination Procedure in Chapter 6 for disposal instructions.

Optional Ionizer

The XPert Nano's optional built-in ionizer is designed to control static charge on surfaces within the enclosure. The discharge of the ionizer is uniquely located at the front face of the work surface, safe from the contaminants and cleaning within.



The emitters within the ionizer have a finite life and therefore there may be times when one might choose to use the enclosure with the ionizer OFF. The Blower/Ionizer control switch allows the blower to be operated independently of the ionizer. Push the top of the switch to activate the blower only; push the bottom to energize the ionizer along with the blower. The green light adjacent to the ionizer emitters (on the face of the work surface) will illuminate when the ionizer is active.

Refer to the Maintenance section of this User's Manual to keep the ionizer working at its full potential. Cleaning of the emitter points is recommended every two to three months (based on 8-hr daily operation).



ATTENTION: NEVER operate the enclosure in an explosive environment. The ionizer may cause detonation. NEVER operate the ionizer without the emitter points installed; damage will occur.

Prohibited Acid Use

The XPert Nano Enclosure motorized impeller and stainless steel interior should not be exposed to acids. Where applications require the use of acids, a separate ventilated enclosure or vented fume hood should be used with a remote blower ducted to the outside.

No exceptions are permitted, as the impeller life span will be limited with acid use.

Chapter 6:

Maintaining the Nano Enclosure

Monitoring airflow and changing the filters is the primary maintenance required. Decontamination may be required and is reviewed in this chapter.

Review this chapter on maintenance for the following:

- Routine Maintenance.
- Decontamination.
- Determination of when to replace the ULPA filter(s).
- How to install a new ULPA filter with the bag-in/bag-out procedure.
- Filter leak test.
- Speed control adjustment and setting the inflow face velocity.
- Operating and calibrating the airflow monitors.
- Initial certification.
- Re-certification.
- Fluorescent light replacement.
- Motorized impeller replacement.
- Speed control replacement.
- Maintenance on the Optional Ionizer.

Routine Maintenance Schedule

Weekly

- Wipe down the interior surfaces of the enclosure with a disinfectant or cleaner, depending upon the application.
- Using a damp cloth, clean the exterior surfaces of the enclosure, particularly the front and top to remove any accumulated dust.
- Operate the exhaust system, noting the airflow velocity through the enclosure using a source of visible smoke. Airflow monitors are recommended for constant monitoring.



Monthly (or more often as required)

- Determine the actual face velocity through the sash opening of the enclosure where the average reading should be at the specified velocity. (Use calibrated thermal anemometer or other approved apparatus). Airflow alarms are recommended for constant monitoring.
- The enclosure rear baffle should be checked for any blockage to ensure that the enclosure is maintaining proper airflow.
- All weekly activities.
- Check face velocity. Increase speed control or change ULPA filter when face velocity of the enclosure drops below the recommended speed for your facility or if the airflow alarm monitor alerts you. Airflow monitors are recommended.
- If equipped with optional Ionizer, clean and inspect emitter points.

Annually

- Replace the fluorescent lamps.
- Have the enclosure validated by a qualified certification technician. See Certification and Recertification in this chapter.
- All monthly activities.

Decontamination

When used in conjunction with biohazards, the XPert Nano Enclosure should be decontaminated with formaldehyde gas before:

- Maintenance work in contaminated areas
- Filter changes
- Moving the cabinet to a new location
- Changing research programs
- After a gross spill of biohazardous material

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, or from Labconco Corporation.

Determination of When to Replace ULPA Filters

The ULPA filters in the filtered enclosures gradually accumulate airborne particulate matter and powders from the enclosure and room. Replace filter(s) when face velocity drops below the recommended 60-80 fpm velocity, and the speed control is adjusted to full speed. Replace ULPA filter(s) if it fails the Filter Leak Test in this chapter.

How to Install a New ULPA Filter with the Bag-In/Bag-Out Procedure

The XPert line of enclosures include a true bag-in/bag-out filter disposal system for safely removing the ULPA filter and protect the worker from toxic powders and particulates. See Figures 6-1 for the Bag-In/Bag-Out Procedure. For your safety, wear appropriate personal protective equipment during the change of filters. If working with biohazardous materials, use the decontamination procedure outlined in this chapter. (Consult your Safety Officer before performing filter changes).



Do NOT contact blower wheel while still in motion.

NE PAS être en contact avec la roué du ventilateur tant qu'il est en marche.

1. With the enclosure OFF, remove the front panel secured by two screws on top of the enclosure.
2. Remove the bungee cords and retaining strap on the bag and extend it out. The retaining strap provides an extra level of safety even though the enclosure is under negative pressure when the blower is on. Do not remove the black trim seal on leading edge of access port flange.
3. Loosen the two filter clamp bolts with a 9/16" socket securing the HEPA filter. See Figures 4-1 and 4-2.
4. Place both arms in the rear gloves of the bag, and carefully draw the HEPA filter out of the enclosure. Rest the HEPA filter on the floor, table or cart. Remove arms from bag gloves.
5. Create two seals between the enclosure bag access port and the old HEPA 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 access port to the enclosure.
6. Place the new HEPA filter in the new bag. Slide the shock cord of the old bag forward against the back edge of the black trim seal. Place the new bag and new HEPA filter over the old bag stub and onto the enclosure access port. The new bag shock cord should be located past the old bag shock cord, and against the access port mounting flange. The new bag should be oriented on the access port with one glove down and two gloves centered on the upper part of the bag.
7. Carefully remove the black trim seal and old bag stub using the single glove near the access port. Reattach the retaining strap on the perimeter of the new bag at the enclosure access port. Draw the black trim seal and old bag stub into the single glove and turn the glove inside out. Double seal this glove and cut off the glove with the contaminated bag stub inside.
8. Carefully install the new HEPA filter and uniformly tighten the two filter clamp bolts until the HEPA filter gasket is compressed 50%.

- Carefully fold and roll the new bag in four-inch pleats and push the bag into the access port. Install the new black trim seal with the inside barb located to inside of the access port. Install the bungee cords. Turn the enclosure ON to draw a vacuum on the bag. Reinstall the front panel.

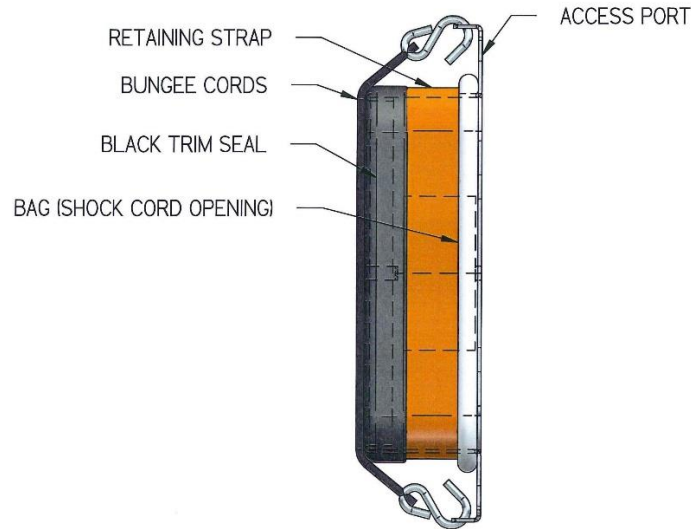


Figure 6-0

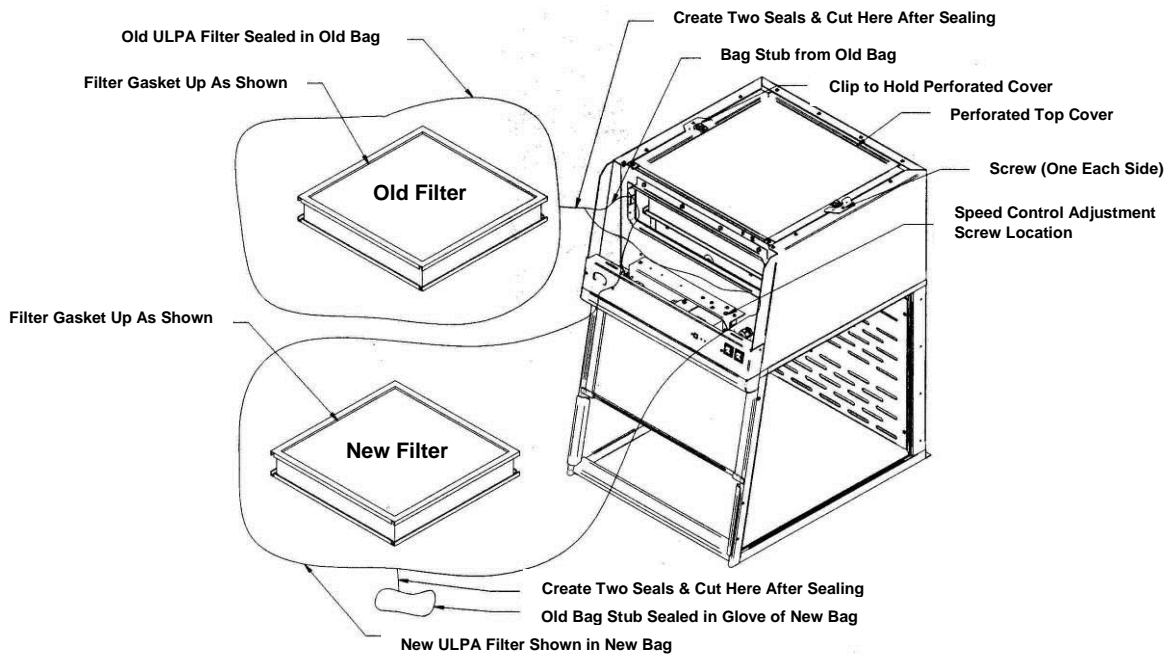


Figure 6-1
Bag-In/Bag-Out Filter Changing Procedure Diagram
& Filter Leak Test Diagram

Filter Leak Test

Purpose

After installing the new ULPA filter, the filter should be leak checked. This test is performed to determine the integrity of the ULPA filter, the filter housing, and the filter mounting frames. Leak testing is to be done by a qualified technician with calibrated equipment. Remove the top perforated exhaust cover by using a Phillips screwdriver to unfasten the (2) screws used to secure (2) clips. See Figure 6-1. The filter passes the leak test at .01% or better. Reference Leak Testing and Photometer scanning from the Institute of Environmental Services (IES-RP-CC001.3)

Apparatus

1. **An aerosol photometer ATI model 2D, 2E, 2G or equivalent.** Air Techniques Hamilton Associates Inc., 11403 Cronridge 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 of 10 ± 1 psig during operation. Air Techniques Inc. Model TDA-4A or equal. One nozzle at 10 psig is $(67.5 \text{ cfm} \times 100 \text{ ug/l}) / (\text{Vol. of air})$, For the 2' at 90 fpm or 130 cfm, one nozzle @ 10 psig is $6,750 / 130 \text{ cfm} = 52 \text{ ug/l}$. For the 3' at 90 fpm or 200 cfm, one nozzle @ 10 psig is 34 ug/l. For the 4' at 90 fpm or 265 cfm, one nozzle at 10 psig is 26 ug/l. For the 5' at 90 fpm or 215 cfm, one nozzle at 10 psig is 31 ug/l. For the 6' at 90 fpm or 260 cfm, one nozzle at 10 psig is 26 ug/l. Note 5' and 6' use two filters.
3. **Mineral oil** (Catalog #1491400).
4. **Sampling Nozzle, Rectangular** 1/2" x 3-1/4", Air Techniques, Inc.

Procedure

For the ATI 2G Photometer

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 display "P1" for approximately 1 second, and then display a numerical value.
4. Using the "^" or "v" keypads, respectively, increase or decrease the numerical value until it equals 52 (2'), 34 (3'), 26 (4'), 31 (5'), 26 (6') for the enclosure at 90 fpm inflow velocity.
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. Turn the enclosure on and let it operate for a minimum of 5 minutes.
8. If necessary, adjust the speed control of the enclosure to maintain the following airflows at 90 fpm; 2' (130cfm), 3' (200 cfm, 4' (265 cfm.), 5' (215 cfm), 6' (260 cfm). The 5' and 6' uses two filters.
9. Position the aerosol generator discharge in the intake of the baffle inside the enclosure.
10. Start the aerosol generator (Pressure to be +/- 1 psig). (10 psig). Ensure that one Laskin nozzle is in the “open” position.
11. Allow the generator to operate for a minimum of 15 seconds. For all integral motorized impeller models, scan the downstream exhaust side of the filter by passing the sampling nozzle of the gun in slightly overlapping strokes over the entire surface the filter, with the sampling port not more than 1 inch from the surface of the filter media. Scan the entire periphery of the filter and the gasket between the filter frame and the enclosure frame. Scanning shall be done at a traverse rate of not more than 2 inches per second.

NOTE: For duct connected Nano Enclosures, place the sampling nozzle in the center of the remote blower exhaust.

Acceptance

Aerosol penetration shall not exceed 0.01 percent measured by the photometer.

Setting the Inflow Face Velocity with the Speed Control Adjustment

1. Remove the front panel by loosening the (2) Phillips screws on top that secure the front panel.
2. The speed control is located on the electrical subassembly located behind the switched control panel and below the front panel. See Figure 6-1.
3. Adjust the speed control with a small Phillips screwdriver by turning the screw counterclockwise to increase blower speed or clockwise to decrease the blower speed. The speed control is very sensitive, so proceed with caution.
4. Measure the inflow velocity per the averaging technique outlined in Chapter 3 and adjust the speed control slowly for the desired speed. Allow the speed to stabilize and re-measure the inflow velocity to confirm.
5. Replace the front panel and tighten the screws.

Calibrate and Operate the Airflow Monitors

Labconco Airflow Monitor/Airflow Switch Operation:

The Guardian Airflow Monitor (LED) consists of a circuit board and an airflow switch. This switch indicates airflow as safe or low. It does not provide an actual face velocity, but a small setscrew in the back of the sensor can adjust the airflow level that it classifies as “good/safe” or “low/alert.”

The circuit board provides power to the sensor and also contains a “safe (green)” and “alert (red)” airflow LED indicators, as well as a “SILENCE ALARM” button to quiet the audio alarm. When first powered up, the PCB will light both red and green LED indicators and sound the alarm to indicate it is working. After 5 seconds, the air monitor will indicate either good or bad airflow based on what the connected airflow switch detects. For low airflow, the unit will wait for 10 seconds of bad indications before it sounds both the audio alarm and the red “alert” LED indicator. If the “SILENCE ALARM” button is pressed, the audio alarm will be silenced, but the red “alert” LED will remain on. The alarm is silenced indefinitely unless an airflow change is detected. If safe airflow is later detected for 10 seconds, the green “safe” LED will be lit and the “alert” (red) LED will be shut off. At any time the airflow is safe/good, one can press the SILENCE ALARM test button and the audio alarm and the red LED will turn on as long as this button is held down. The circuit board has also a two-pin connector for use as an external output with isolated relay contacts that close when the red/alert LED is lit (low airflow). These relay contacts are not affected by the “SILENCE ALARM” button.

The circuit board is mounted behind the front panel using standoffs and an appropriate label is used to highlight the “SILENCE ALARM” button with clear areas for the red and green LED’s. No holes to allow sound to be broadcast louder are necessary.

The circuit board can be prepared as a factory special with an additional connector for the following external inputs, and having the following possible functions:

- External Alarm allows an external signal to sound the alarm, such as a sash open switch, or a “fail” signal from the building airflow system.
- Alarm Disable allows an external signal to prevent a “low” airflow alarm from occurring.

Contact Labconco for ordering information on this special circuit board.

Calibration

1. Ensure the flow switch and alarm circuit board are installed and operational.
2. Allow the enclosure to operate for at least two minutes.
3. If factory installed, the monitor will alarm at 60 ± 10 fpm with the inflow velocity set at 90 ± 10 fpm.
4. To change the factory setting, set the inflow velocity required by your Safety Officer to the desired alarm condition using the speed control adjustment procedure outlined in Chapter 6.

5. Once the alarm condition is set, use a small screwdriver to turn the adjustment screw on the airflow switch counterclockwise (facing the screw) until the “low” airflow red LED lights and the audible flow alarm sounds.
6. Adjust the inflow velocity to the nominal operating point required by your Safety Officer.
7. Over time the ULPA filter will load and eventually slow the inflow velocity. Once the alarm condition is met, simply increase the speed control outlined in Chapter 6 or replace the ULPA filter if the speed control is maximized.
8. The table below lists typical alarm conditions based on normal operating conditions. Typical alarm conditions are set at face velocities of 10 to 30 feet per minute below the normal operating conditions due to supply air and exhaust air fluctuations, as well as room air cross drafts. Consult your Safety Officer for proper operating speeds.

Enclosure Operating In-Flow Speed	Alarm Condition Set Point Speed
100 ± 10 fpm	70-90 fpm
90 ± 10 fpm	60-80 fpm
80 ± 10 fpm	50-70 fpm
70 ± 10 fpm	50-60 fpm
60 ± 10 fpm	50 fpm

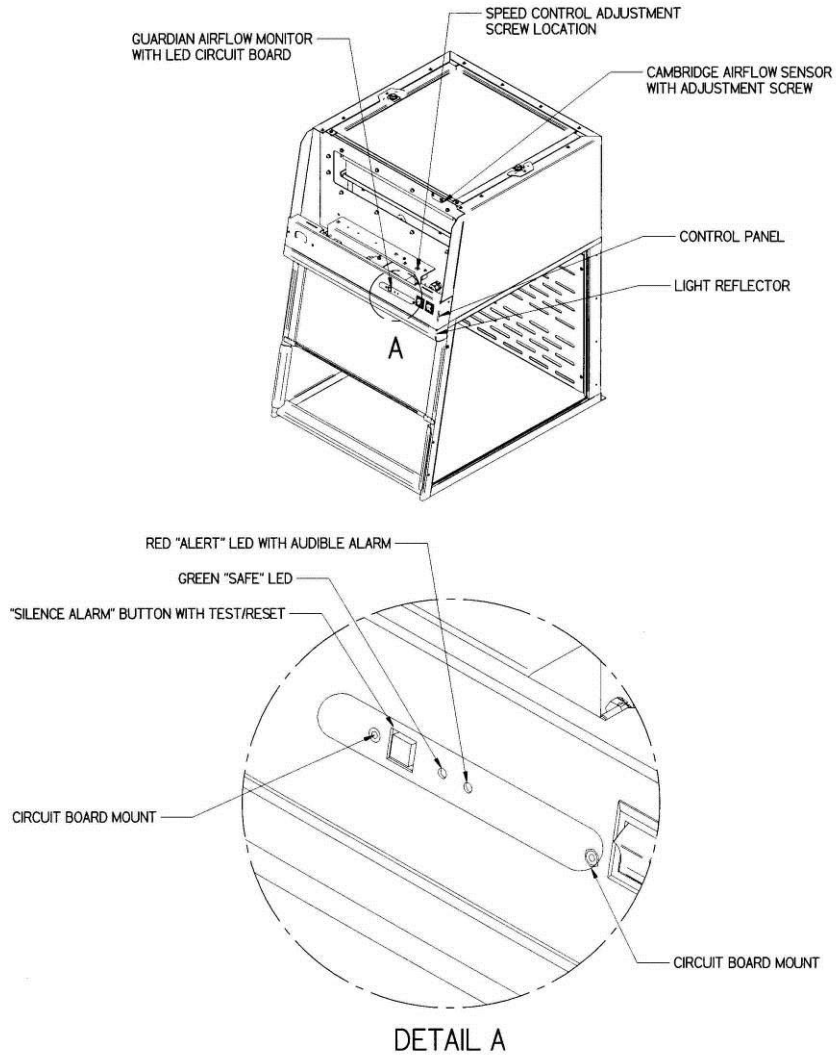


Figure 6-2
Guardian Airflow Monitor (LED) with Airflow Switch

Guardian Digital 1000 Airflow Monitor

Option

Refer to Figure 6-3 for operation and calibration. Refer to the separate Labconco 1000 Alarm Manual for detailed information.

Operation

The Guardian Digital Airflow Monitor consists of the airflow sensor, the Alarm Unit, and the 15 VDC power supply. For 115V operation the alarm unit is powered by plugging the power supply into the factory-prepared digital airflow monitor socket. For 230V operation, the Alarm Unit is powered by plugging the power supply into a building outlet. The alarm has “Enter,” “+,” and “-” buttons to program the monitor. There is also a green LED “SAFE,” yellow LED “CAUTION,” and red LED “LOW” with audible alarm for airflow conditions. The audible alarm can be permanently muted if desired. The Guardian Digital 1000 Airflow Monitor displays a face velocity value, provides an RS232 communications port to a PC or building computer system, can be configured for external input connections such as night setback or external alarm and provides up to three output relays that can be configured. For complete detailed information, please refer to the separate Labconco 1000 Alarm User’s Manual provided with the enclosure.

Digital 1000 Calibration

The filtered enclosure comes factory calibrated with the monitor alarm at 60 ± 10 fpm with the inflow velocity set at 90 ± 10 fpm.

Programming the Guardian 1000 Digital Alarm

Set the desired face velocity of the enclosure with the sash in the down position using an average face velocity of readings from a thermal anemometer.

- a. 2 ft enclosure – 2 readings
- b. 3 ft enclosure – 3 readings
- c. 4 ft enclosure – 4 readings

Configure Alarm

To successfully calibrate the airflow monitor, it will be necessary to change the face velocity by adjusting the airflow exhaust volume. The exhaust volume can be adjusted using the speed control located behind the front panel on the XPert Nano Enclosure. For XPert Nano Enclosures that are ducted to a roof blower, the exhaust volume is adjusted through a damper in the building exhaust system.

The following inflow face velocity speeds are recommended to successfully calibrate. To begin, determine what the low airflow, low warning airflow, normal airflow, and high airflow shall be.

Low Air Alarm Set Point (user defined)	Enclosure Operating Inflow Speed	Low Calibration Set Point (user defined)	High Calibration Set Point (user defined)
40 – 50 fpm	60 fpm	40 – 60 fpm	100 – 120 fpm
60 – 70 fpm	80 fpm	50 – 90 fpm	100 – 150 fpm
80 - 90 fpm	100 fpm	50 – 110 fpm	100 – 170 fpm

NOTE: ENTER button stores information
+/- Buttons allow for scrolling.

1. Push the ENTER button on the face of the alarm until the Set up Menu is displayed.
2. Scroll to SET UP and hit ENTER.
3. The PASSWORD MENU displays (The Password is 0000). Press the ENTER button repeatedly until the CAL CONFIG MENU is displayed.
4. In the CAL CONFIG MENU set for the following:

CALIBRATION CONFIG MENU	SETTINGS
DISPLAY UNITS	FPM
LOW AIR ALARM	SEE CHART ABOVE – LOW AIR ALARM
LOW AIR CUTOFF	OFF
LOW AIR CUTOFF	SEE CHART ABOVE – LOW AIR ALARM
WARNING AIR ALARM	SEE CHART ABOVE – LOW CALIBRATION SET POINT (Set 3-5 FPM above low air alarm)
WARNING AIR RESET	3 FPM
HIGH AIR ALARM	OFF
HIGH AIR ALARM	OFF
LOWER AIR SAMPLE FLUCTUATIONS	3%
HIGHER AIR SAMPLE FLUCTUATIONS	3%
LOWER/HIGHER AIR SAMPLE DIFFERENCE	10 FPM
WARN TO ALARM AIR TIME	10 SECONDS
ALARM TO WARN AIR TIME	3 SECONDS
SHOW AIR FLOW	ON
SHOW TIME LINE OFF = DISPLAYS BAR GRAPH	OFF
AUDIBLE ALARM	ENABLED
SENSOR DIFFERENCE	2%

5. To complete the CAL CONFIG, be sure to enter “DONE”. You are returned to the Main Menu.

Calibrate Alarm

1. Scroll to set up and hit ENTER, then CALIBRATE and hit ENTER.
2. The PASSWORD MENU displays (The Password is 0000). Press the ENTER button repeatedly until the next menu is displayed.
3. Adjust the speed of the fan until the low airflow velocity is reached. Use your thermal anemometer readings to determine the low air velocity.
4. Enter the value of your low airflow velocity using your +/- scroll keys. Be sure the front panel is installed. Step out of the way, wait approximately 30 seconds for air currents to settle and hit ENTER. The airflow alarm will sample the airflow.
5. Adjust the speed of the fan until the high airflow velocity is reached using the readings from the thermal anemometer. Then re-install the front panel, if so equipped.
6. Enter the value of your high airflow velocities. Be sure the front panel is installed. Step out of the way, wait approximately 30 seconds for air currents to settle and hit ENTER. The airflow alarm will sample the airflow.
7. The set up menu is displayed. Select DONE and hit ENTER.
8. The main menu will be displayed. Select RUN and hit ENTER.

You have successfully configured and calibrated your Guardian 1000 Digital Airflow Monitor.

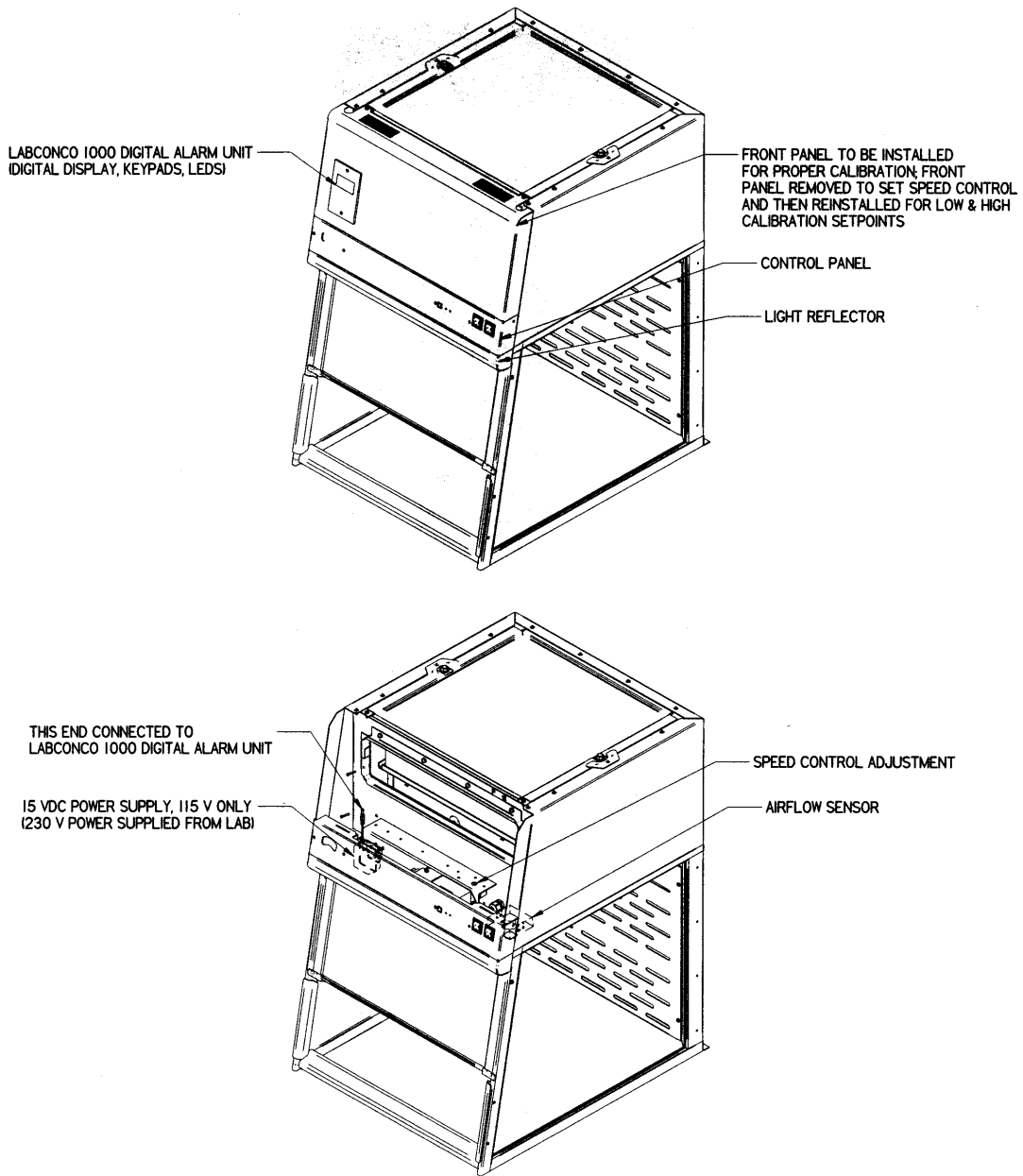


Figure 6-3
Guardian Digital 1000 Airflow Monitor

Initial Certification

The filtered enclosure has been certified at the factory for an inflow velocity of 90 ± 10 fpm along with the Filter Leak Test. The filtered enclosure should be certified for the proper inflow velocity required by your Safety Officer. It is also a conservative recommendation to perform the Filter Leak Test again should there be any damage caused during transport.

Re-Certification

Under normal operating conditions, the enclosure should be recertified at least annually if serviced. The certifier should perform the following tests.

- Inflow Velocity Test
- ULPA Filter Leak Test

In addition, the following tests should also be performed at the user's discretion:

- Measure of Line Voltage and Current
- Smoke Test to determine proper airflow patterns
- Lighting Intensity Test (when appropriate)
- Noise Level Test (when appropriate)
- Vibration Test (when appropriate)

Fluorescent Light Replacement

1. Disconnect the power.
2. Locate the small light reflector located under the control panel shown in Figure 6-2 and Figure 6-3.
3. Remove the light reflector support by removing two Phillips screws on the bottom of the light reflector.
4. Rotate and remove the old fluorescent lamp.
5. Reinstall the new fluorescent lamp and light reflector in reverse order.
6. Power the unit up and try the new fluorescent lamp.



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

LED Light Replacement

1. Follow instructions for fluorescent lights above, but replace with direct replacement LED T8 bulbs. Only LED sizes available are for 3', 4', and 5' enclosure widths. See Appendix A for ordering replacements.

Motorized Impeller Replacement

The motorized impeller must be replaced as a complete unit. When the motorized impeller is replaced, the capacitor may also be replaced. See Appendix A for Replacement Parts Diagram. See Figure 6-5 for an isometric view of the motorized impeller plenum assembly. The ULPA filter rests on top of the motorized impeller assembly.



Do NOT contact blower wheel while still in motion.

NE PAS être en contact avec la roué du ventilateur tant qu'il est en marche.

1. Wear appropriate personal protective equipment to decontaminate the filtered enclosure and then unplug from the electrical outlet.
2. Remove filter per the ULPA filter removal procedure outlined in this chapter.
3. Consult the wiring diagram in Appendix C of the manual and disconnect all the wires of the motorized impeller. Be sure to connect wires on the new motor in the same way the old motor was wired. If contaminated with chemicals, neutralize the old motor by submersion in an appropriate solvent. Bag and dispose of the old motor responsibly.
4. Remove four screws in the motor bracket that hold motor bracket to the supports with the vibration isolation mounts. Remove the motor and bracket.



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

5. Replace the capacitor with a new one of equal voltage and capacity.
6. Reassemble the new motorized impeller by reversing the assembly steps.

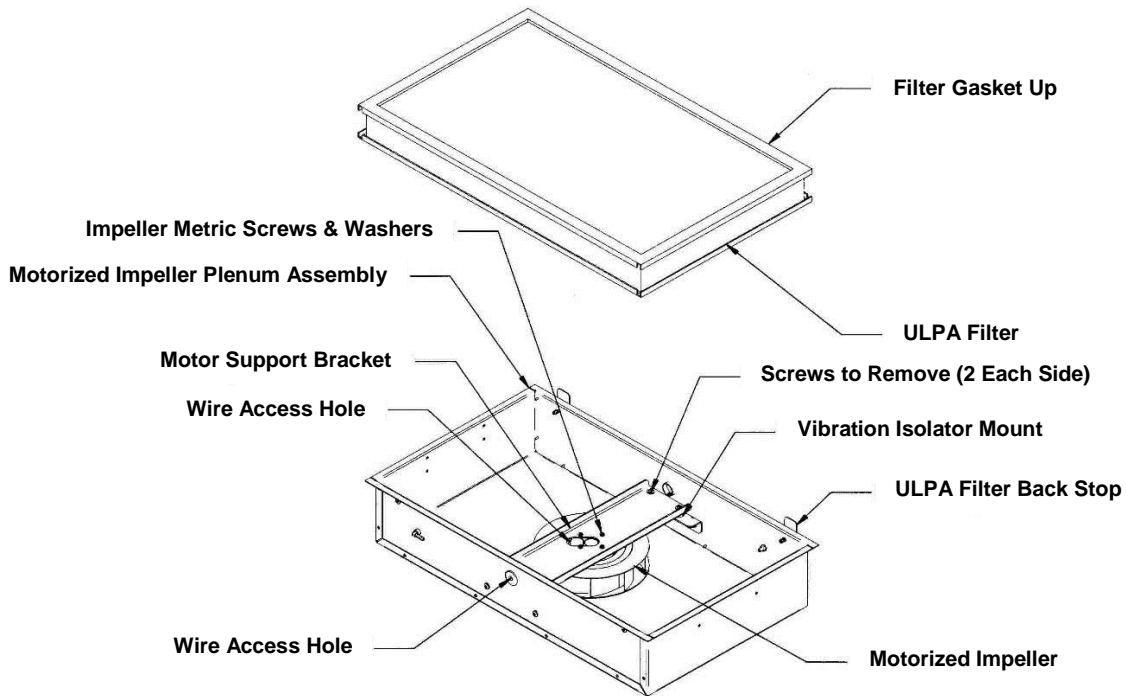


Figure 6-4
Motorized Impeller Replacement

Speed Control Replacement



Do NOT contact blower wheel while still in motion.

NE PAS être en contact avec la roué du ventilateur tant qu'il est en marche.

1. Remove the bracket that the speed control is attached to. See Figures 6-1, 6-2 and 6-3.
2. Remove the two screws holding the speed control using a Phillips screwdriver. Refer to Appendix A for Replacement Parts Diagram.
3. Disconnect all wires leading to the speed control. 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 screws that were removed earlier.

Maintenance on the Optional Ionizer

Occasional cleaning of the ionizer's emitter points is the only routine maintenance required. Regularly scheduled cleaning extends the life of the unit and sustains the delivery of ionized air. Clean the emitter points every 60 to 90 days (based on 8-hr daily operation).

Emitter Point Cleaning



NOTE: Disconnect power to the XPert Nano Enclosure at least one minute before performing cleaning or replacement of the Ionizer Emitter Points. The ionizer has a high voltage power supply that must discharge over that one minute time period.

Emitter points are better cleaned without removal. Use a clean room compatible (non-shedding) swab moistened with the following solution to gently wipe the points.

Cleaning solution of 50% IPA (laboratory or electronic grade isopropyl alcohol and 50% de-ionized water).

Emitter Point Replacement

If the ionizer fails to neutralize charges in the airstream, the only portions of the ionizer that can be serviced are the emitter points. Do not attempt to disassemble the ionizer bar located under the work surface. A surface static charge meter is required to test the ionizer's effectiveness. Apply a static charge to a piece of plastic with a synthetic fabric and measure the voltage at the surface before and after placing it in the airstream with the ionizer ON.

Ionizer Emitter Points Part Number 3884300

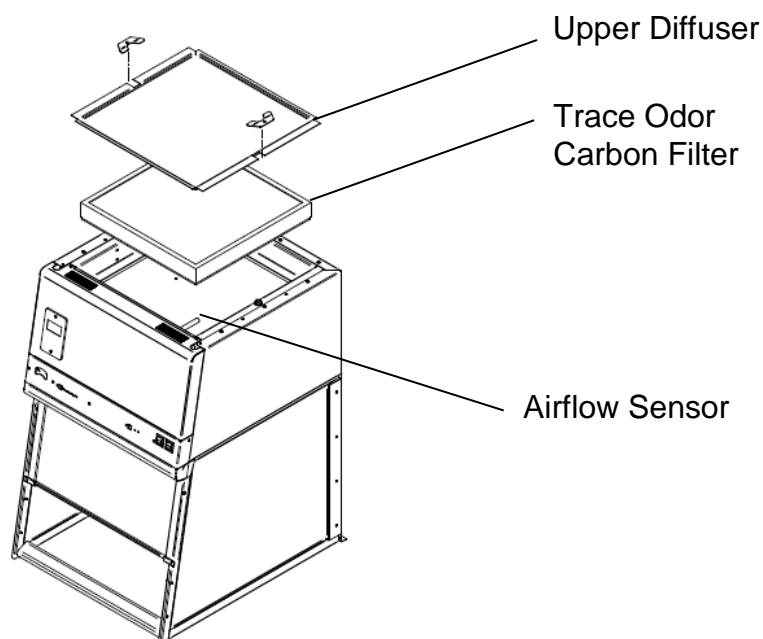
Emitter points may require replacement in two to three years or when erosion or damage is evident. To replace the points:

1. Remove power to the unit for at least one minute
2. Grasp each emitter point with a small needle nose pliers and pull them out of their socket
3. Install the replacement point with care. Using the needle nose pliers and gripping the emitter away from the sharp point.
4. Follow the Emitter Point Cleaning instructions above before use.

Trace Odor Carbon Filter Installation

In the event that low volumes of solvents are required, a Trace Odor Carbon Filter can be installed.

1. Remove the screws (2) located on each side of the upper diffuser.
2. Lift and remove the upper diffuser.
3. Place the Trace Odor Carbon Filter on top of the HEPA filter with the gasket-side DOWN. Use care when maneuvering past the airflow sensor. Be careful not to harm the HEPA filter media that is exposed.
4. Replace the upper diffuser.
5. Replace all screws.



Chapter 7:

Accessorizing the Nano Enclosure

There are several ways to accessorize and modify the filtered enclosure for your individual requirements. These include the addition of airflow monitors; exhaust transition kits, remote blowers, exhaust dampers, filters, storage cabinets and utility shelf kit.

1. Guardian™ 1000 Digital Airflow Monitor or Guardian™ LED Airflow Monitor

The Guardian Digital 1000 Airflow Monitor or Guardian LED Airflow Monitor allows you to continuously monitor airflow through the enclosure. Either monitor is usually provided with the XPert enclosures.

Description	Order Part #'s	Individual Parts Required
Guardian Airflow Monitor 115V or 230V		
1 ea.	3811500	Airflow Monitor Printed Circuit Board
1 ea.	3910700	Airflow Sensor w/ Connector
2 ea.	1885405	#6-32 x .31" Phillips machine screw to mount Airflow Monitor Circuit Board
2 ea.	1891808	#6-32 x .50" Phillips thread cutting screw to mount Airflow Sensor
Guardian Digital 1000 Airflow Monitor		
115V 1 ea.	3908500	115V Guardian Digital Monitor, Airflow Sensor, Sensor Cable, and 15 VDC power supply
230V 1 ea.	3908501	230V Guardian Digital Monitor, Airflow Sensor, Sensor Cable, and 15 VDC power supply

Add appropriate Front Panel with cutout to mount Digital 1000 Airflow Monitor

1 ea.	3904803	2' Front Panel w/ cutout
or		
1 ea.	3904804	3' Front Panel w/ cutout
or		
1 ea.	3904805	4' Front Panel w/ cutout

NOTE: The cutout can also be made with a reciprocating saw and a 1/8" diameter bit. The centerline of the cutout is located 3.3" from the left side and 4.2" from the bottom. The 1/8" mounting holes are spaced 4.38" apart top to bottom and centered over the cutout. The cutout dimensions are 2.43" wide by 4.13" tall.

2. Canopy Exhaust Connection for Ducting to Outside

Canopy Exhaust connects to the filtered enclosure with integral motorized impellers from the top so the duct can be routed up and outside the building. The Canopy Exhaust is available for 6" nominal duct on 2', 3' and 4' sizes and 10" nominal duct on 5' and 6' sizes. The Canopy Exhaust Connection should be sealed to the top of the enclosure with silicone sealant to prevent leaks. See Figure 3-3 and Figure B-3.

Order the following:

Part	Description
3924400	2' Canopy Exhaust Connection (6")
3924401	3' Canopy Exhaust Connection (6")
3924402	4' Canopy Exhaust Connection (6")
3924403	5' Canopy Exhaust Connection (10")
3924404	6' Canopy Exhaust Connection (10")
3924410	2' Canopy Exhaust Connection Double HEPA (6")
3924411	3' Canopy Exhaust Connection Double HEPA (6")
3924412	4' Canopy Exhaust Connection Double HEPA (6")
3924413	5' Canopy Exhaust Connection Double HEPA (10")
3924414	6' Canopy Exhaust Connection Double HEPA (10")

3. 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

Catalog #	Description	Shipping Wt. (lbs/kg)
4863500	Remote Blower, 115 V, 60 Hz. 4.4 amps	35/16
4863501	Remote Blower, 115/230 V, 50 Hz, 5.6/2.8 amps	35/16
7053501	Explosion-Proof Remote Blower, 115 V, 60 Hz, 4.4 amps	40/18

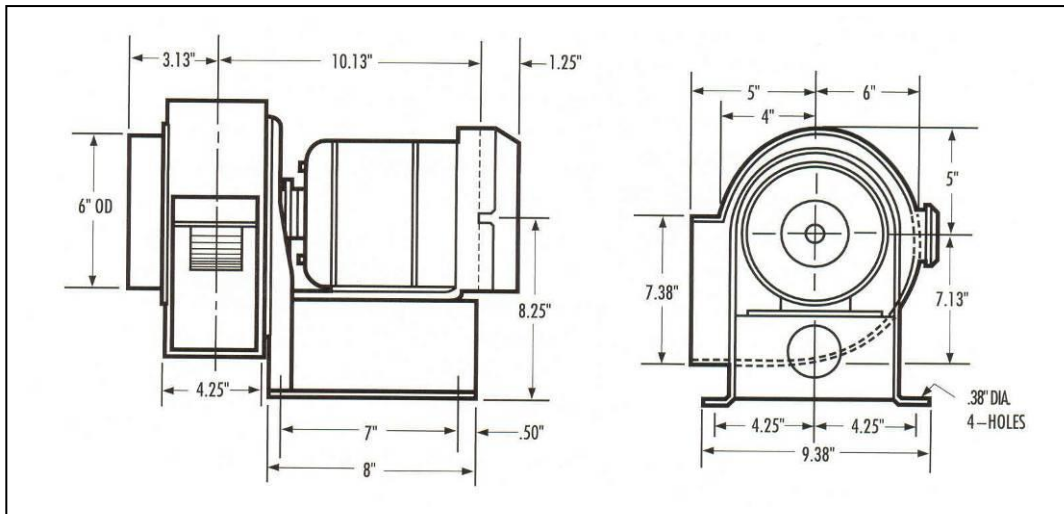
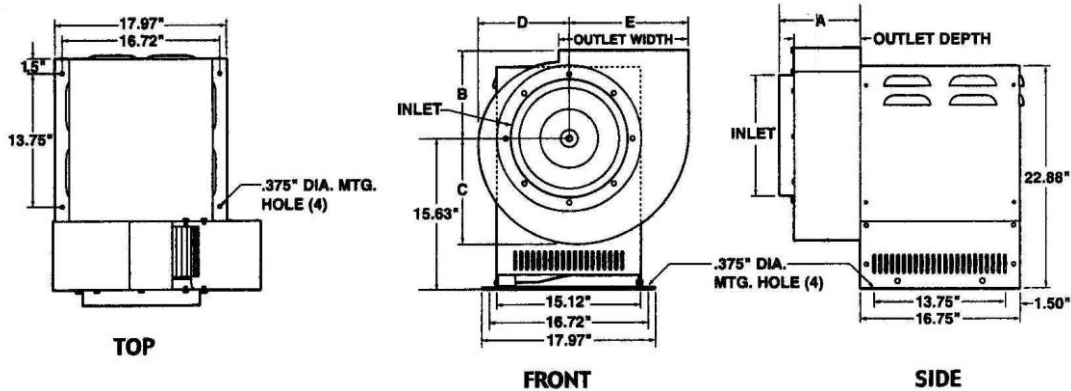


Figure 7-1

Has a 1/4 hp or 1/3 hp adjustable belt drive motor and corrosion resistant epoxy coated steel housing and wheel with blower inlet of 10" ID. Outlet dimensions are 5.5" x 10" OD.

Catalog #		HP	Description	CFM@RPM Ranges at Static Pressure (inches of H ₂ O)						
Std.	EP			.25"	.38"	.50"	.62"	.75"	.88"	1.00"
7068200		1/4	Remote Blower, 115V, 60 Hz, 4.4 A	540@800	410@800	350@870	390@970			
	7068300	1/4	Explosion Proof Blower 115V, 60 Hz, 4.5 A	720@950	760@1050	710@1060	620@1060			
7068400		1/3	Remote Blower, 115V, 60 Hz, 6.1 A		760@1050	710@1060	620@1060	430@1060	460@1150	500@1220
	7068500	1/3	Explosion Proof Blower, 115V, 60 Hz, 6.4 A		850@1130	825@1160	790@1190	770@1220	740@1260	640@1260



4. Exhaust Dampers

Exhaust dampers allow adjustments required to maintain proper airflow for roof-mounted blowers or house exhaust systems. The 2', 3', and 4' stations use 6" diameter and the 5' and 6' stations use 10" diameter.

Catalog #	Description
3924000	6" Epoxy Coated Steel In-Line adjustable damper
4724200	6" PVC In-line adjustable damper
5983400	10" PVC In-line adjustable
3776800	10" Airtight Damper (10" tall)

5. Accessory Filters and Secondary Filters/Filter Kits

ULPA Filter

ULPA Filter is 99.999% efficient on particles 0.3 micron and 5' and 6' have two each.

Width	Catalog #	Size
2'	3885700	18" x 18" x 3.31"
3' or 6'	3885701	30" x 18" x 3.31"
4'	3885702	42" x 18" x 3.31"
5'	3885703	24" x 18" x 3.31"

Bag Kit, ULPA Filter Bag-In/Bag-Out

The bag helps contain hazardous particulate matter during filter changing operations. The 5' and 6' have two each.

Width	Catalog #	Size
2'	3776023	48" Circum. x 54" lg.
3' or 6'	3776024	73" Circum. x 96" lg.
4'	3776025	96" Circum. x 96" lg.
5'	3776026	60" Circum. x 72" lg.

Odor Control Carbon Filter

Provides granular activated carbon or impregnated carbon used for Odor Control applications on integral motorized impeller models exhausted back into the room. The 5' and 6' have two each.

Filter Classification and Size	Catalog #	X Pounds
2' Organic 18 x 18 x 1	3937200	5.5 lbs. activated
3' or 6' Organic 30 x 18 x 1	3937300	9.2 lbs. Activated, 2 required on 6'
4' Organic 42 x 18 x 1	3937400	12.9 lbs. activated
5' Organic 24 x 18 x 1	3981400	7.3 lbs. activated each, 2 required
2' Formaldehyde 18 x 18 x 1	3937201	7.0 lbs impregnated
3' or 6' Formaldehyde 30 x 18 x 1	3937301	12.0 lbs. impregnated, 2 required on 6'
4' Formaldehyde 42 x 18 x 1	3937401	16.8 lbs. impregnated
5' Formaldehyde 24 x 18 x 1	3981401	9.5 lbs. impregnated, 2 required
2' Ammonia & Amines 18 x 18 x 1	3937202	8.0 lbs. impregnated
3' or 6' Ammonia & Amines 30 x 18 x 1	3937302	13.5 lbs. impregnated, 2 required on 6'
4' Ammonia & Amines 42 x 18 x 1	3937402	18.9 lbs. impregnated
5' Ammonia & Amines 24 x 18 x 1	3981402	10.7 lbs. impregnated, 2 required
Acid Sulfur 2'	3937203	7.0 lbs. impregnated
Acid Sulfur 3' or 6'	3937303	12.0 lbs. impregnated, 2 required on 6'
Acid Sulfur 4'	3937403	16.8 lbs. impregnated
Acid Sulfur 5'	3981403	7.3 lbs. impregnated, 2 required

Double Filtration Kit

For field installation atop XPert Nano Enclosures. Provides a second level of filtration with a redundant filter in series. Contact Labconco as kit include entire support system and bag-in/bag-out system. Order ULPA filter separate.

Catalog #	For use with:	Shipping Wt. lbs./kg
3966102	2' XPert Nano	6/3
3966103	3' XPert Nano	10/5
3966104	4' XPert Nano	13/6
3966105	5' XPert Nano	8/4
3966106	6' XPert Nano	7.5/3

Chapter 8: Troubleshooting

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

PROBLEM	CAUSE	CORRECTIVE ACTION
Contaminants outside of enclosure.	Improper user techniques for the enclosure.	See “Certifying the Enclosure” Chapter 3 and “Safety Precautions” Chapter 4 sections in the manual. (Ref. Appendix D).
	Restriction of the baffle air slots or blockage of the exhaust outlet.	Remove obstruction to ensure that all air slots and the exhaust outlet are unobstructed.
	External factors are disrupting the enclosure airflow patterns or acting as a source of contamination.	See “Location Requirements” Chapter 2, “Certifying the Enclosure” Chapter 3, and “Safety Precautions” Chapter 4 sections of this manual. (Ref. Appendix D).
	Enclosure has improper face velocity.	Have enclosure certified and check exhaust system. Check filters for loading. Adjust enclosure speed control. Enclosure should have an average face velocity of 60-100 fpm for weighing procedures and 75-105 fpm for biohazardous procedures.
Blower won’t operate.	Unit not plugged into outlet.	Plug the enclosure into appropriate electrical service.
	Circuit breaker(s) or Ground Fault Interrupter.	Reset circuit breaker.
	Blower wiring is disconnected.	Inspect blower wiring.
	Blower switch is defective.	Replace switch.
	Motorized impeller or blower is defective.	Replace motorized impeller or blower. See Chapter 6.
Low face velocity or poor containment of contaminants.	Enclosure sash not closed.	Close sash to the lowest position.
	ULPA filter clogged.	Replace ULPA filter or increase speed.
	Carbon filter loaded with chemicals.	Replace carbon filter.
Blower and lights won’t operate.	Unit not plugged into outlet.	Plug enclosure into appropriate electrical service.
	Circuit breaker(s) tripped.	Reset or replace circuit breaker.

PROBLEM	CAUSE	CORRECTIVE ACTION
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.
Airflow monitor malfunction.	No power. No lights. No display.	Power cable to circuit board is disconnected and needs to be connected. Sensor cable needs to be connected. Power supply is not plugged into proper voltage; plug in power supply. Verify that all airflow monitor interface cables are connected. Check fuses on enclosure.
	No audible alarm.	Alarm has been temporarily silenced using “SILENCE ALARM” or “enter” buttons.
	Wrong alarm set point.	Airflow monitor was not properly adjusted. Repeat calibration steps outlined in this manual in Chapter 6 or in the supplied Digital 1000 Monitor Manual.
	Constant audible alarm.	Check airflow and calibration of airflow monitor. See Chapter 6.
	Continuous alarm.	Check the face velocity of the enclosure as the airflow of the system may have changed. If incorrect, adjust the speed control to increase face velocity. The ULPA filter may have become loaded. If face velocity is correct, calibrate the airflow monitor outlined in this manual in Chapter 6.
	Monitor alarms; air way to airflow monitor sensor is blocked by insects, dust or debris.	Lightly clean the airway with clean air. Be careful not to touch sensitive electrical components.
	Audible disable will not stay operational.	An alarm condition must be continuously present before the audible alarm can be silenced. If flow conditions fluctuate near the alarm set point, the airflow monitor will automatically reset it. Action should be taken to bring the enclosure airflow into proper operating parameters or adjust the alarm set point lower.

Service Operating Record Log

Customer Name _____ Model Number _____

Date Installed _____ Serial Number _____

Unit Location _____

Date	Comments

Appendix A:

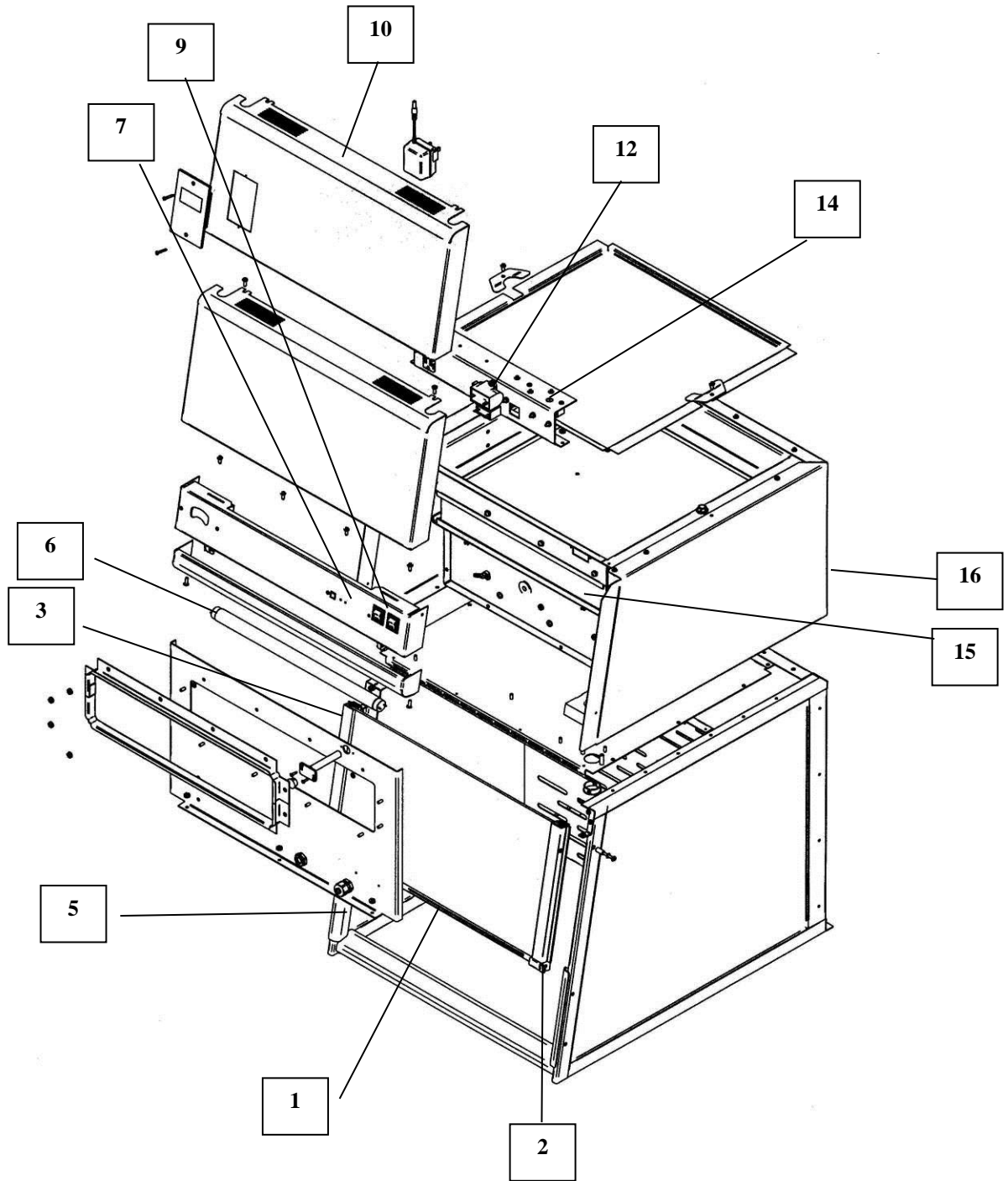
Replacement Parts

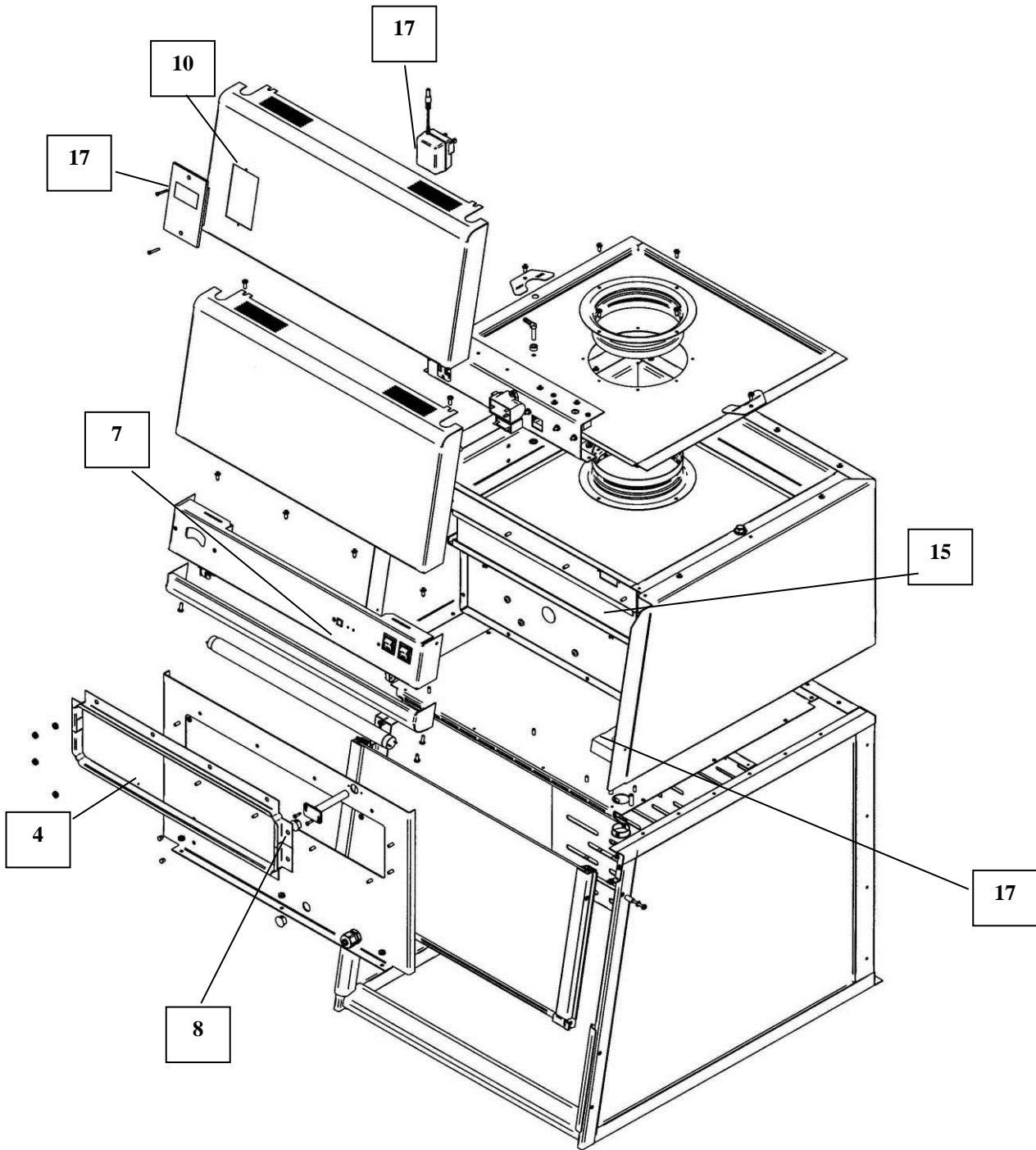
The components that are available for your filtered enclosure are listed. The parts shown are the most commonly requested. If other parts are required, please contact Product Service.

Item	Qty.	Part Number	Description
1A	1	3911800	Sash Assembly, 2'
1B	1	3911801	Sash Assembly, 3'
1C	1	3911802	Sash Assembly, 4'
1D	1	3966900	Sash Assembly, 5'
1E	1	3966901	Sash Assembly, 6'
2A	1	3907500	Stop, Sash R.H.
2B	1	3907501	Stop, Sash L.H.
3A	1	6916500	Latch, Sash
3B	1	3906700	Bracket, Latch
3C	1	1927403	Spring, Compression Latch
3D	1	3973201	Gas Spring Assembly 40 Lb., 5' or 6'
4A	1	3776023	Bag Kit, 2' – for Bag-In/Bag-Out on XPert
4B	1 or 2	3776024	Bag Kit, 3' or 6' – for Bag-In/Bag-Out on XPert
4C	1	3776025	Bag Kit, 4' – for Bag-In/Bag-Out on XPert
4D	2	3776026	Bag Kit, 5' for Bag-In/Bag-Out or XPert
5	1	3915401	Side Air Foil
6A	1	3708300	Lamp, Fluorescent 2' Enclosure (F15T8-SP35)
6B	1	9721902	Lamp, Fluorescent 3' Enclosure (F17T8)
6C	1	9721901	Lamp, Fluorescent 4' Enclosure (F25T8)
6D	1	9721900	Lamp, Fluorescent 5' (F32T8)
6E	1	9721903	Lamp, Fluorescent 6' (F40T8)
6F	1	9721910	LED, 5' Enclosure 48" nominal width LED
6G	1	9721911	LED, 4' Enclosure 36" nominal width LED
6H	1	9721912	LED, 3' Enclosure 24" nominal width LED
7	1	3811500	Guardian Airflow Monitor Printed Circuit Board
8	1	3910700	Airflow Switch
9A	2	1307000	Switch, Rocker (2 position)
9B	1	1306300	Switch, Rocker (3 position)
10A	1 or 2	3904800	Front Panel, 2'
10B	1	3904801	Front Panel, 3'
10C	1	3904802	Front Panel, 4'
10D	1	3904803	Front Panel 2' with Digital Monitor Cutout
10E	1	3904804	Front Panel, 3' with Digital Monitor Cutout
10F	1	3904805	Front Panel, 4' with Digital Monitor Cutout
10G	1	3904806	Front Panel, 5'
10H	1	3904807	Front Panel, 6'
10I	1	3904808	Front Panel, 5' with Digital Monitor Cutout
10J	1	3904809	Front Panel, 6' with Digital Monitor Cutout
11A	1	3916500	Impeller, Motorized 2' or 3' Enclosure, 115V
11B	1	3916501	Impeller, Motorized 2' or 3' Enclosure, 230V
11C	1 or 2	3903300	Impeller, Motorized 4', 5' and 6' 115V
11D	1 or 2	3903301	Impeller, Motorized 4', 5' and 6' 230V

Appendix A: Replacement Parts

Item	Qty.	Part Number	Description
12A	1	1306900	Capacitor, 115V 10 MFD
12B	1 or 2	1306600	Capacitor, 4', 5' and 6' 115V 15 MFD
12C	1 or 2	1306800	Capacitor, 2', 3', 4', 5' and 6' 230V 4 MFD (All Sizes)
13A	1	1295510	Ballast, Fluorescent 2', 115V/230V
13B	1	1294000	Ballast, Fluorescent 3', 4', 5' and 6', 115V or 230V
14A	1	1325500	Speed Control, 115V
14B	1	3885302	Circuit Board – 100V (Ionizers)
14C	1	3885300	Circuit Board – 115V/230V (Ionizers)
14D	1	1325501	Speed Control, 230V
15A	1	3885700	ULPA Filter (2') 18 x 18 x 3.32 w/ Gasket
15B	1 or 2	3885701	ULPA Filter (3' or 6') 30 x 18 x 3.32 w/ Gasket
15C	1	3885702	ULPA Filter (4') 42 x 18 x 3.32 w/ Gasket
15D	2	3885703	ULPA Filter (5') 24 x 18 x 3.32 w/ Gasket
16A	1	1305800	Power Cord, 115V, Right Angle
16B	1	1334200	Power Cord, 230V, Right Angle
17A	1 (115V)	3908500	Digital Airflow Monitor, 115V – 15 VDC Adapter, Airflow Sensor
17B	1 (230V)	3908501	Digital Airflow Monitor, 230V – 15 VDC Adapter, Airflow Sensor





Appendix B: Dimensions

See the following dimensions and exhaust options for all the XPert Nano Enclosures.

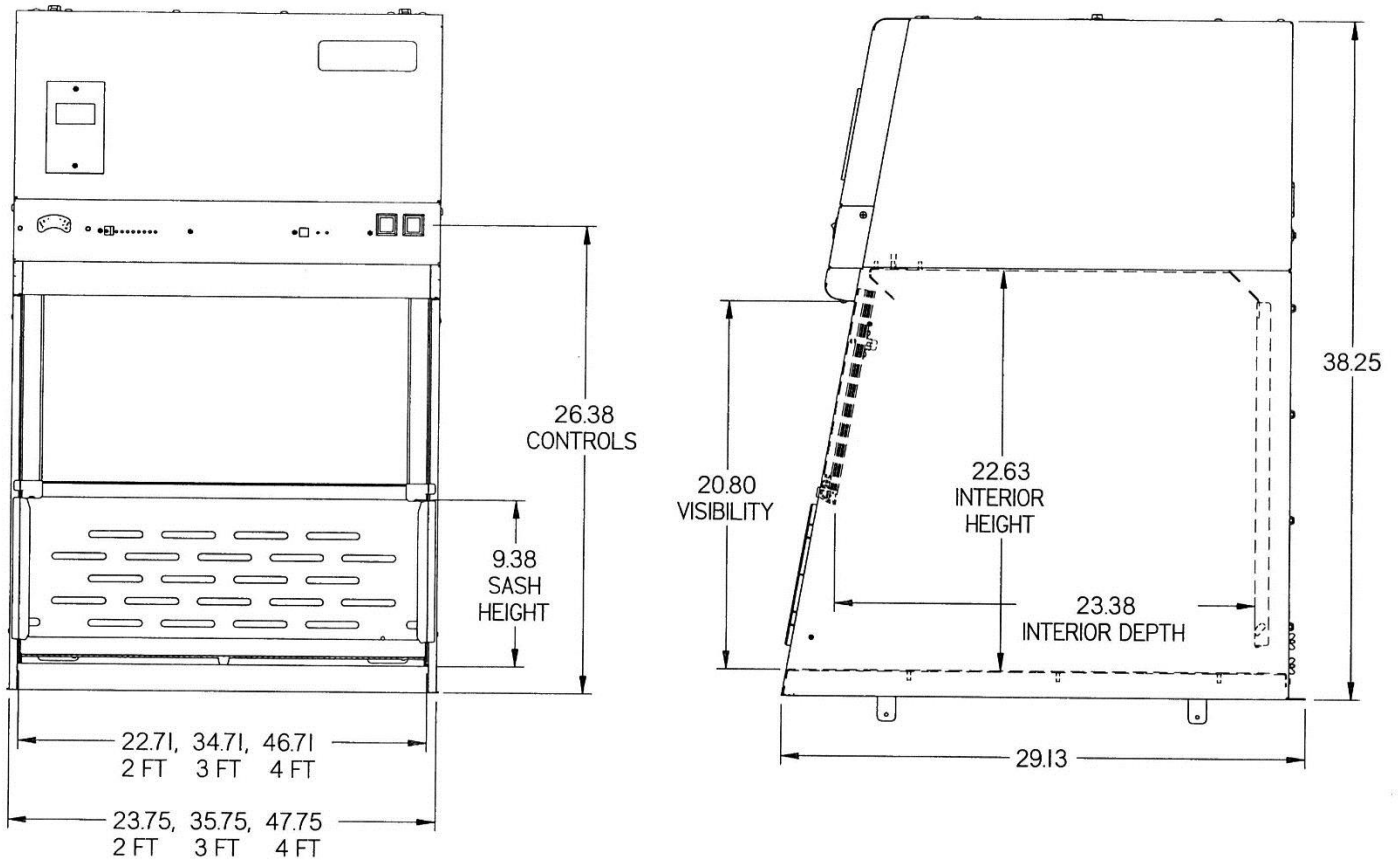


Figure B-1
XPert Nano Enclosure, 2', 3' and 4'

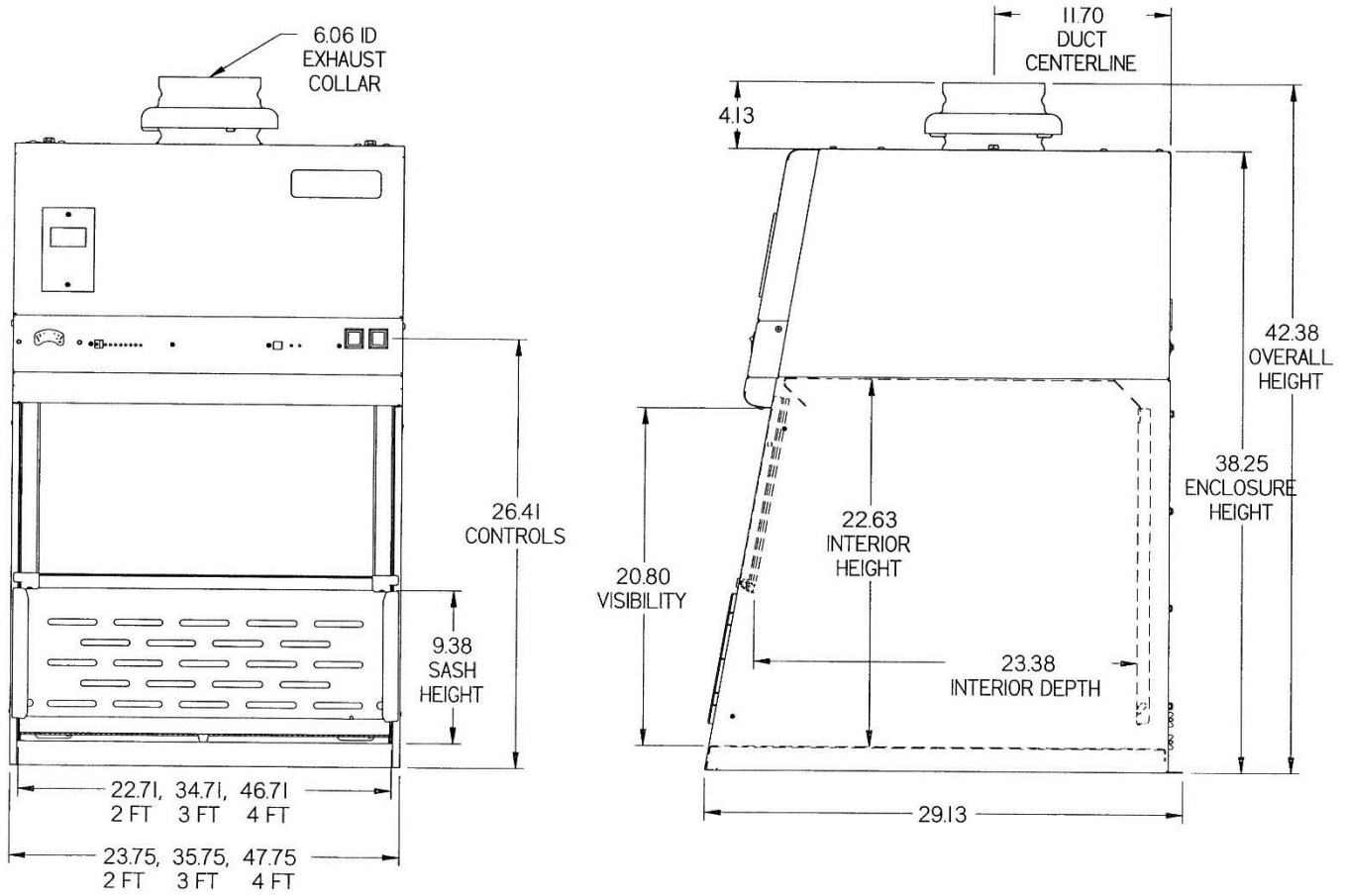


Figure B-2
XPert Nano Enclosure with Duct Connection or
Canopy Connection, 2' 3' and 4'

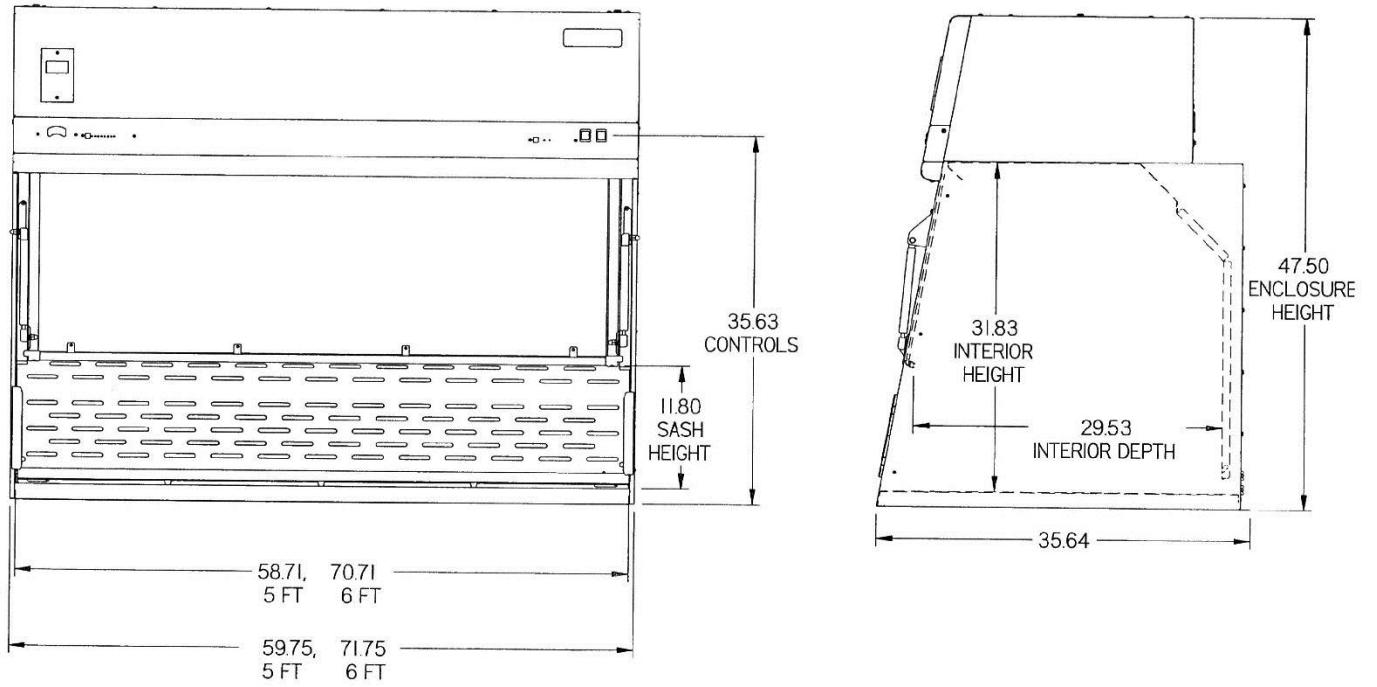


Figure B-3
5' and 6' x 35.64" Deep XPert Nano Enclosure

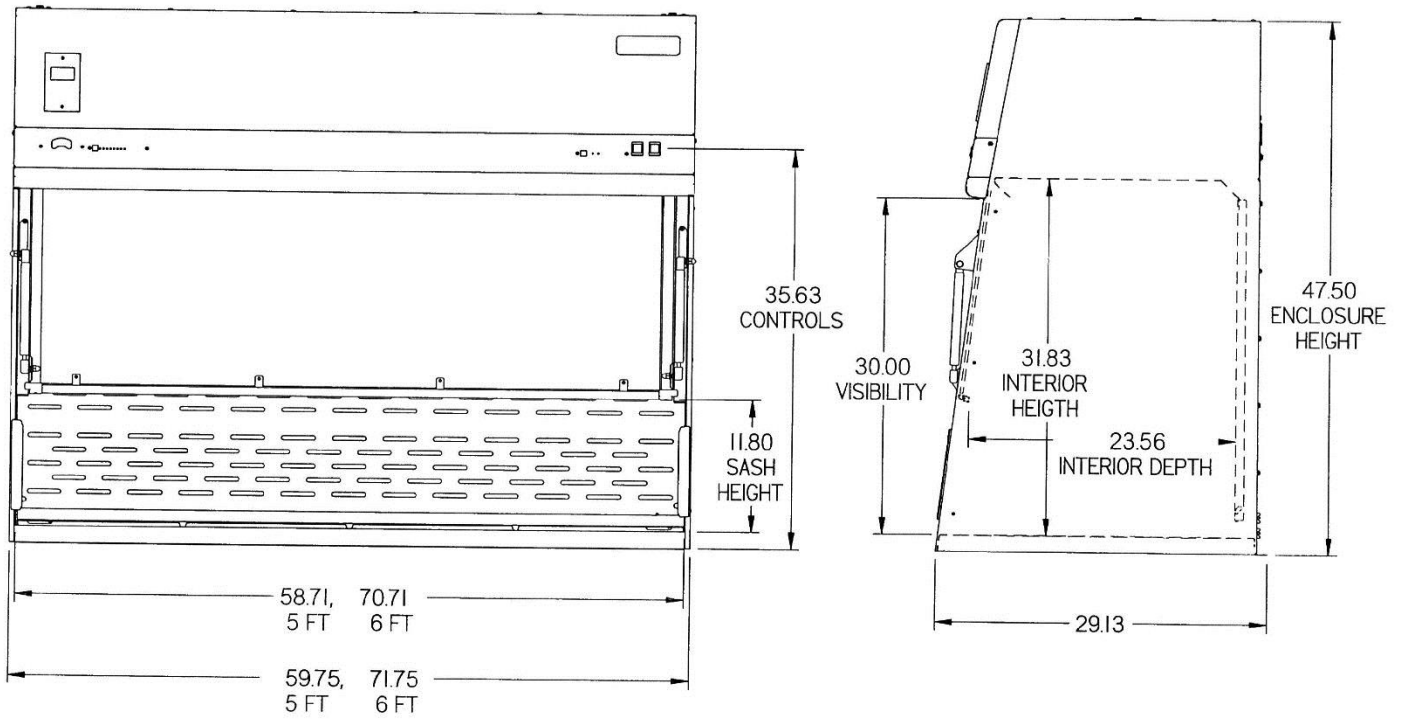


Figure B-4
5' and 6' x 29.13" Deep XPert Nano Enclosure

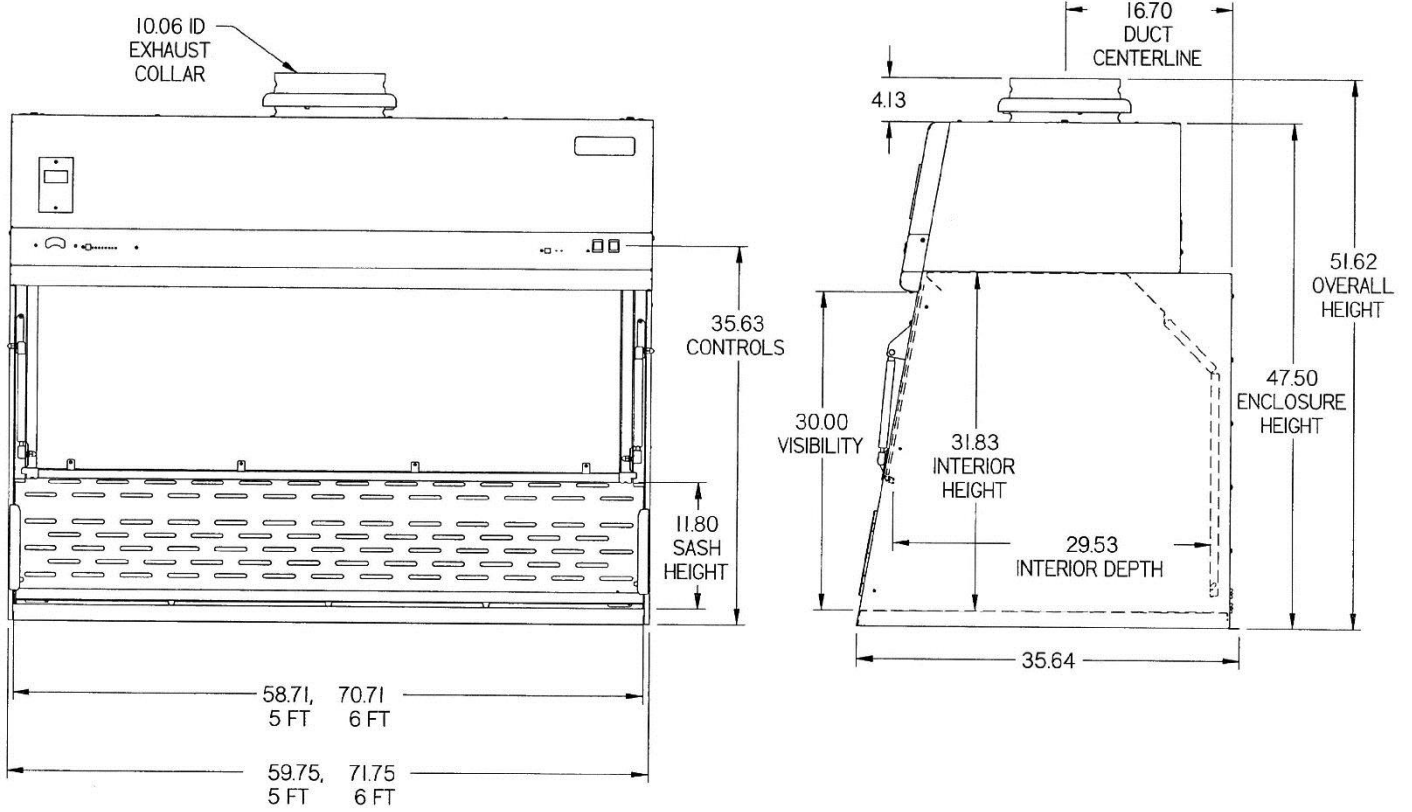


Figure B-5
5' and 6' x 35.64" Deep XPert Nano Enclosure

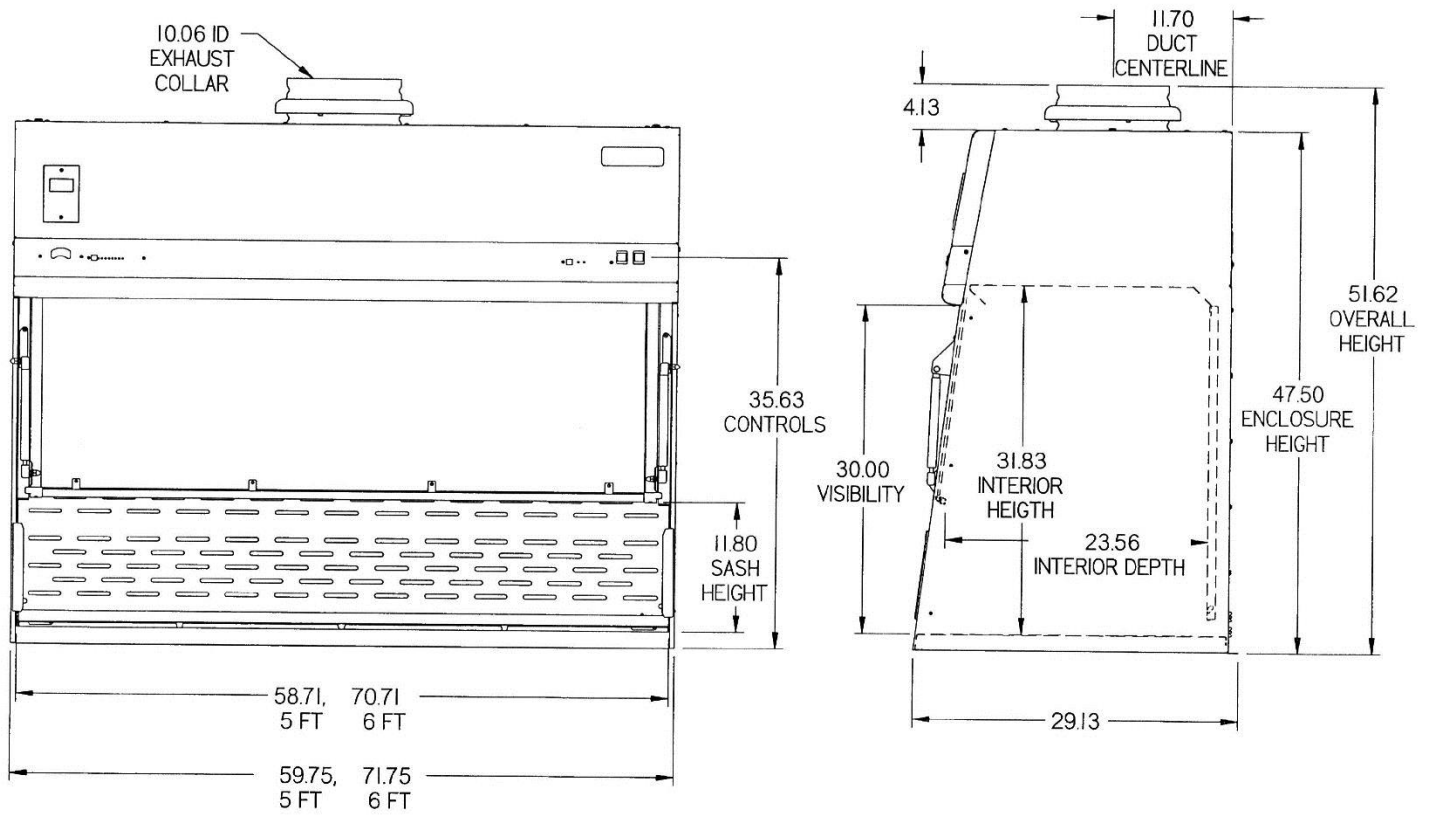


Figure B-6
5' and 6' x 29.13" Deep XPert Nano Enclosure

Appendix C:

Specifications

This Appendix contains technical information about all the XPert Nano Enclosures including electrical specifications and environmental operating conditions.

Electrical Specifications

- 3 Amps, 100V/115V, 50/60 Hz
- 2 Amps, 230V, 50/60 Hz

Environmental Conditions

- Indoor use only.
- Maximum altitude: 6562 feet (2000 meters).
- Ambient temperature range: 41° to 104°F (5° to 40°C).
- Maximum relative humidity: 80% for temperatures up to 88°F (31°C), decreasing linearly to 50% relative humidity at 104°F (40°C).
- Main supply voltage fluctuations not to exceed $\pm 10\%$ 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: Quick Chart

Model Size	2'	3'	4'	5'	6'
Sash Height from Work Surface (inches)	9.44	9.44	9.44	12.00	12.00
Total Open Area with Bypass (sq. ft.)	1.45	2.20	2.95	4.80	5.80
Exhaust Airflow Volume at 90fpm (CFM)	130	200	265	430	520
Alarm Airflow Volume at 60 fpm (CFM)	85	130	175	290	350
Initial Mag. Gauge Pressure Reading (inches H ₂ O)	0.20 to .045	0.15 to 0.40	0.10 to 0.35	0.10 to 0.50	0.10 to 0.50
Number of Laskin Nozzles needed at 10 psig	1	1	1	1	1
Exhaust ULPA Filter w/ Gasket Dimensions (inches)	18x18x3.31	30x18x3.31	42x18x3.31	(2) 24x18x3.31	(2) 18x30x3.31
*Motor Horsepower (HP)	0.13	0.13	0.30	0.60	0.60
*Capacitor (MFD, Volts)	10MFD, 115V (2) 4MFD, 230V	10MFD, 115V (2) 4MFD, 230V	15MFD, 115V 4MFD, 230V	15MFD, 115V 4MFD, 230V	15MFD, 115V 4MFD, 230V
Fluorescent Lights	F15T8-SP35	F17T8	F25T8	F32T8	F40T8
Power Usage (watts)					
Blower	76	78	124	195	238
Lights	22	24	32	39	53
Total	98	102	156	234	291

To determine the actual face velocity at the sash opening, airflow velocity readings will need to be taken. This should be done across the sash opening of the enclosure. The “average face velocity” is achieved by taking readings in two rows across the enclosure with the readings 6" from the ends and evenly spaced every 12"; the first row is 3" down from the upper sash foil and the second row is 3" up from the work surface.