TERRA UNIVERSAL.COM
Critical Environment Solutions

Installation and Operating Guide   *Document No.1788-34*

EZ-UP Internal Frame Cleanroom

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Your Comprehensive Equipment Source

Particle Filtration

Laminar Flow Control

Ultra-Clean Materials

Vibration Isolation

Ergonomics

Process Gas Generation

Temperature Control

Biohazard Containment

Sterilization

Static Control

Chemical Vapor Removal

Anti-Microbial Treatments

Humidification/ Dehumidification

Vacuum Control

Exhaust Fume Ventilation

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Proprietary Notice

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Safety Notice

A thorough familiarity with all operating guidelines is essential to safe operation of the product. Failure to observe safety precautions could result in poor performance, damage to the system or other property, or serious bodily injury or death.

The following symbols are intended to call your attention to two levels of hazard involved in operation:

CAUTION — **Cautions are used when failure to observe instructions could result in significant damage to equipment.**

WARNING — **Warnings are used when failure to observe instructions or precautions could result in injury or death.**

The information presented here is subject to change without notice.

WARNING

IMPORTANT SAFETY NOTICE:

Terra Universal cleanrooms are not designed to support more weight than the original equipment included with the order. Ceiling beams are not load-bearing and will not support personnel or other additional loads. Placing added weight on any frame member may result in serious damage to the cleanroom and its occupants.

1.0 Description

Terra Universal's EZ-UP Internal Frame Cleanrooms provide low-cost contamination control, creating an ISO 7 – ISO 8 environment nearly anywhere you need clean areas. They create the ideal environment for material testing, processing and packaging, as well as enclosing particle-sensitive equipment. An all-steel support frame creates a rigid, free-standing support structure, and prefabricated components allow for easy installation. Each design is preconfigured to meet a specific cleanliness requirement.

Positive Pressure Cleanrooms vs. Containment Rooms

A positive-pressure cleanroom is designed to keep airborne contaminants from entering the cleanroom by pressurizing the enclosed space. The Fan/Filter Unit pulls air from the outside environment through a HEPA filter and forcefully blows the micro-filtered air into the cleanroom environment. The overpressure created by the FFU causes air to constantly flow outward from any gaps in the walls, preventing any unfiltered air from entering the cleanroom. These types of cleanrooms will often have a 4"- 6" gap around the entire base of the cleanroom to allow uniform air release.

A containment (negative-pressure) room is designed to keep contaminants from escaping into the environment outside of the enclosure. In this scenario, the direction of the FFU is reversed so that it blows HEPA-filtered air out into the surrounding environment. In contrast to the positive-pressure cleanroom, a negative-pressure cleanroom should be relatively airtight to maintain containment and prevent excessive influx of outside air. These types of rooms are particularly useful for enclosing dust-producing processes or ongoing renovations in order to protect sensitive operations nearby.

NOTE — **A containment (negative pressure) room does not meet ISO cleanroom specifications. These rooms are designed to enclose particle-producing operations in order to protect the rest of the facility.**

Fan/Filter Units (FFUs)

Each FFU includes a 700 CFM impeller blower (average flow at 100 FPM with filter load) mounted in a powder-coated steel housing with a plenum design that optimizes uniform air velocity across the entire face of the filter. A HEPA (high efficiency particulate air) filter installed inside the housing is rated 99.99% efficient at 0.3um particles. The filtration medium consists of micro porous polyurethane mini pleats held in place by strong, rigid plastic separators that keep the medium from nesting. This design channels airflow with optimal efficiency to reduce resistance. The filter is sealed into the sturdy aluminum frame with a fire-retardant, non-outgassing adhesive. On an optional basis, an ULPA (ultra-low penetration air) filter, rated 99.9995% efficient at 0.12um particles, may be substituted for the HEPA filter. The Fan/Filter Units are controlled via a speed switch on the pre-filter housing and will begin operating immediately upon connection to power.

Vinyl Wall Panels

The 40 mil vinyl walls are transparent, flame-resistant, and anti-static. Long spans are fused together via RF-welding, while the end panels are attached using industrial-grade zippers to complete the enclosure. After the vinyl has been installed, the frame expands to stretch the vinyl taut, eliminating any excess slack in the ceiling or walls.

Zippered Entry Option

The end panels can be fabricated with an 8'-high zipper flap for access into the cleanroom. This is the ideal entry option for both positive- and negative-pressure cleanrooms where strict contamination control is required.

Strip Shield Entry Option

Strip shields, made of 60-mil anti-static vinyl, come standard in 8" (203 mm) widths, with 2" (51 mm) overlap, for easy entrance or exiting. Strip shields attach to the support frame by means of a unique non-contaminating Grip Track mounting system.

Positive pressure cleanrooms require some sort of passageway to allow air to escape. If the gaps along the floor of the cleanroom are too small to exhaust the air generated by the fan/filter units, then the strips will billow outward. In this case, the strips can be cut shorter to allow additional venting above the floor.

LED Strip Lighting (Optional)

The optional LED light strips provide energy-efficient and space-efficient lighting that installs quickly to the underside of the ceiling frame members. The aluminum housing features a polycarbonate lens for enhanced chemical resistance and easier cleaning. Bulbs are CE/ROHS-certified and rated for up to 50,000 hours of constant use.

Power Requirements: 110/220VAC, 50/60Hz, 15A

2.0 Installation

> **NOTE**
> **All frame and ceiling members are labeled according to the drawings attached to this manual.**

Site Preparation

Sweep and vacuum the area thoroughly. You may wish to paint the floor with a good quality epoxy paint to reduce floor dust.

Required Installation Equipment

- Electric Screwdriver
- Rubber Mallet
- Scissors
- Measuring Tape
- 6' Ladder/Step Stools
- 6' Folding Tables (2-3 recommended)
- Extension Cords

Unpacking and Component Inspection

A. Roll the crate close to the assembly area.

B. Use an electric screwdriver to remove crate screws and remove the top.

C. Remove the screws on the crate side walls to remove the 2'x4' supports.

D. Unpack all system components and check for damaged or missing parts (refer to the sales order to determine correct quantity of parts). Any damage should be reported to the shipping company immediately. Contact Terra Universal if any parts are missing.

E. Place the box containing the FFU on a table. Slit open one end and slide out the inner brown box. Open the box and slide the FFU onto the table.

Preparing the Fan Filter Units (FFUs)

> ⚠️ **CAUTION**
>
> **Do not puncture or bend the filter grid on the bottom of the FFU. Do not place the FFU on tools or other objects. Lift the FFU mainly from the corners and sides, not on the grid.**

A. Install the 9-pin Power Cable Adapter.

B. Test to confirm that the FFU runs properly by plugging it into a working wall outlet.

C. Set the FFU power switch to "Medium." The "Medium" speed generally provides sufficient airflow and later allows increasing the speed setting to "High" when particulates that are trapped in the filter reduce air flow.

D. Coil the cables on top of the FFU. (If desired, lightly tape the cables to the FFUs to prevent damage during installation.)

E. Set FFU aside for later installation.

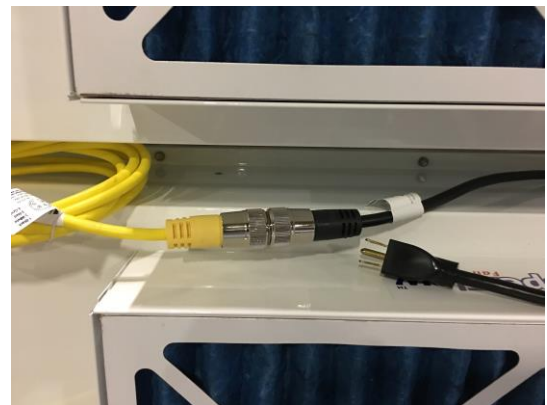F. Repeat Steps A through E for any remaining FFUs.

Figure 1: *Power cord adapter connection*

EZ-UP Internal Frame Cleanroom

Frame Members– Layout

A. Remove all frame members from the crate.

B. Referring to the drawings attached at the end of this manual, lay out the frame members on the floor by matching the labels to their respective locations on the drawing. The labels follow a sequence to make this step easier.

C. If your room has telescoping legs that are not already installed, insert the foot sections into each of the corner and center posts. Slide the legs down to their shortest setting and use the supplied pins to secure the leg assemblies.

D. If your room has casters that are not already installed, remove the casters from the Accessories box and install them using the included nuts.

Frame Members – Assembly

A. Start with Frame Member 1 and begin assembling the frame components in the sequence shown on the attached drawings.

B. Use the provided set screws to secure each connector as the frame is assembled.

*Figure 2:* Telescoping leg with adjustment pin inserted

Figure 3: Use the Allen-head set screws to hold the frame members together

C. After the frame is fully assembled, square the room: Use a tape measure to measure from corner to corner (be sure to measure both ways). The two measurements should be very close to the same length. To make adjustments, gently slide the posts around on the floor until the room is square to about 1% (less than 1" difference between the two diagonal measurements).

Figure 4: Fully assembled frame
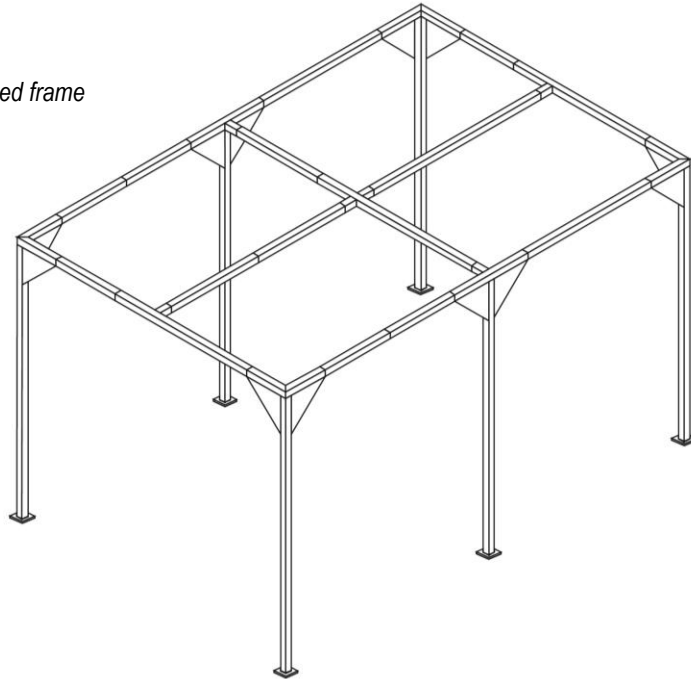
D. Use a level to confirm that the posts are vertical (perpendicular to the floor). For minor adjustments, gently tap the bases into position.

E. If the cleanroom design includes a strip shield entryway, hook the Grip Track mounting bracket onto the frame in the desired location. Do not fasten the bracket to the frame yet.

F. If the cleanroom is equipped with telescoping legs, after the frame is fully assembled, adjust the height of the frame before installing the vinyl wall panels (which will add a significant amount of weight, making later height adjustments more challenging). Remove the adjustment pins at the bottom of each leg and set the height according to the table below:

Figure 5: Grip Track bracket hooked onto the frame (view from inside the cleanroom)

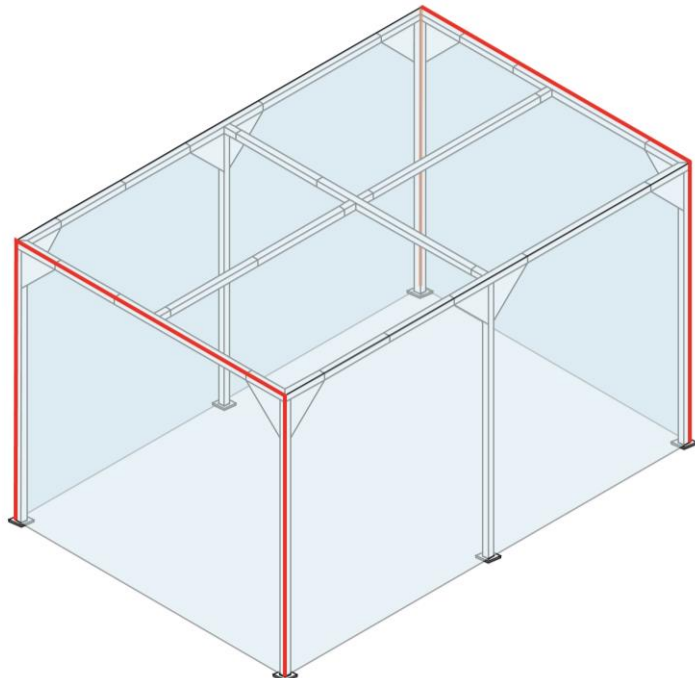| Configuration	Height Extension
Sealed, No Casters (3" floor overlap)	7.5"
Sealed, Casters (3" floor overlap)	0"
Positive Pressure, No Casters (4" gap at the bottom)	10.5"
Positive Pressure, Casters (4" gap at the bottom)	16.5"

Installing the Vinyl Walls

The vinyl wall panels are typically divided into large sections that will be zipped together in their final positions. The vinyl panels are designed to hug the frame tightly once fully zipped.

Required Tools: Rubber mallets or heavy-duty spreaders (such as a ratcheting cargo load bar)

Step 1: Start by taking the large vinyl center panel and stretching it over the top of the cleanroom as shown.
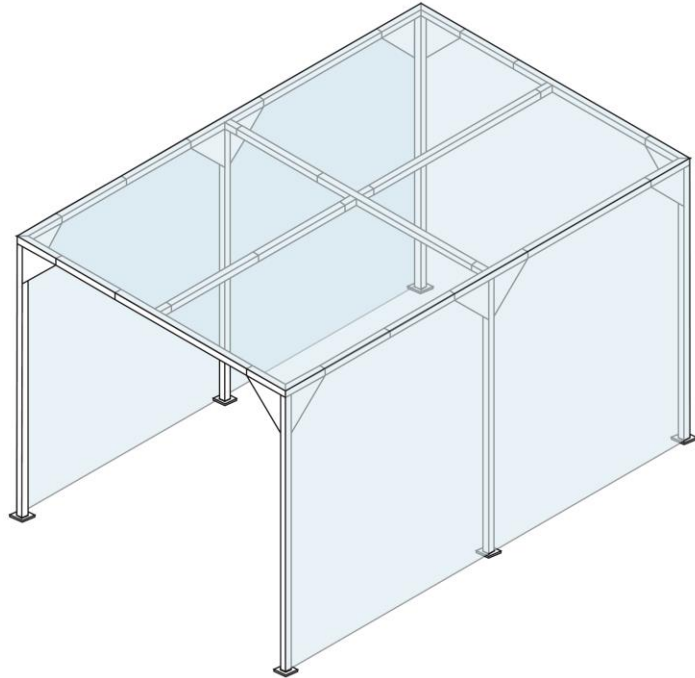
Step 2: Attach the two end panels by zipping together the adjoining panel edges (shown in red in the diagram).

If there is still too much slack in the panels, the vinyl will have to be stretched by adjusting the frame. Each cleanroom frame is adjustable in both directions (width and length).

NOTE | **Optimally, the entire side of the frame should be adjusted at once to stretch the vinyl evenly. However, depending on the availability of additional helpers, the frame may need to be gradually adjusted one section at a time.**

Refer to the attached drawings for the adjustment points on your cleanroom. During frame assembly, you may have recognized that the adjustment points utilized connectors with additional length hidden inside the frame.

Step 3: From inside the cleanroom, begin by loosening the set screw at all necessary adjustment points.

Step 4: With the vinyl panels fully zipped, slowly apply force to the opposing frame members to extend the frame at the adjustment point.

Force should be applied at the top of the posts and close to the nearest welded joint.

A ratcheting spreader (such as a cargo load bar) is the most effective and efficient tool for this process. If one is not available, rubber mallets may be used on the frame to extend the frame in increments.

Step 5: As soon as the vinyl tightens and the slack disappears, tighten the set screws to lock in the frame adjustment.

Step 6: After all adjustments are complete, fasten the Grip Track bracket that secures the strip shields (if equipped) to the frame using self-tapping sheet metal screws.
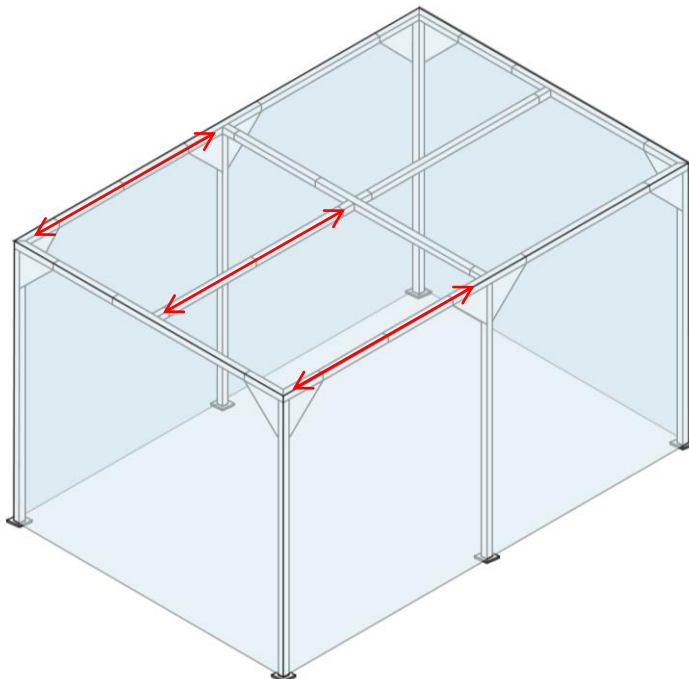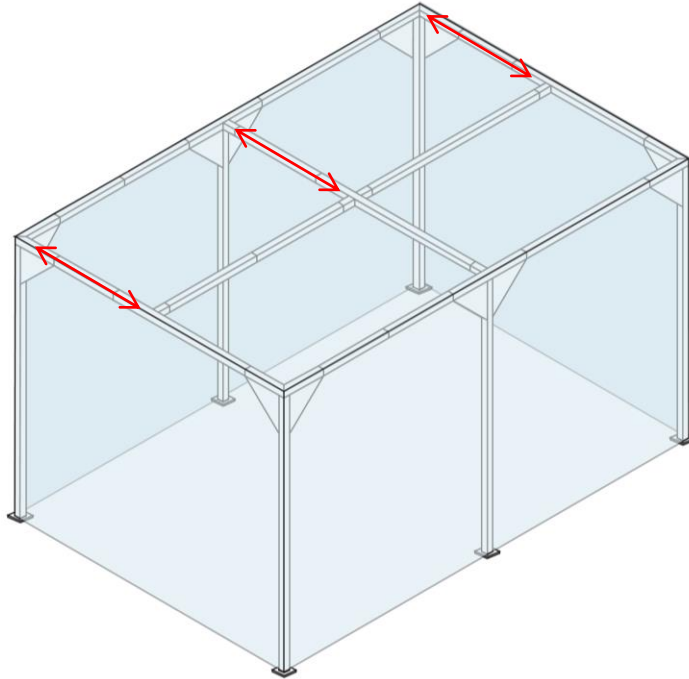
Installing Fan/Filter Units (FFUs)

Fan/filter units are typically shipped fully assembled on their stand (in a horizontal configuration). The horizontal FFU stand is designed to accommodate a maximum of two FFUs.

If they are crated separately:

A.   Position the FFU stand in the desired location, just outside of the assembled cleanroom.

B.   Temporarily secure the stand in place to prevent tipping during FFU installation. This can be achieved by placing weights on the feet of the stand.

C.   Have two (2) other people lift the FFU. Turn the FFU on its side and align the four mounting holes (one at each corner) with the predrilled holes on the stand.

D.   Have another person fasten the FFU to the stand using the provided bolts and washers. Fully tighten all bolts before letting go of the FFU.

E.   Repeat Steps C and D for any remaining FFU(s).

Preparing the Vinyl Wall for FFU Porting

With the FFU stand assembled and in position, the FFUs must now be ported into the cleanroom through the vinyl wall panel.

Figure 6: FFU stand fully assembled

A.   Orient the FFU stand according to the type of cleanroom:

For **positive pressure cleanrooms**, the blue pre-filter will be outside of the cleanroom (facing away), and the large HEPA filter screen will aim into the cleanroom.

For **containment (negative pressure) rooms**, the blue pre-filter will be exposed to the inside of the enclosure, with the HEPA filter screen facing outward into the surrounding environment.

B.   Move the FFU stand so that the face of the appropriate filter is pressed against the vinyl wall.

C.   Mark the cut-out by tracing along the edge of each filter face. The cut-out only needs to be large enough to expose the entire filter face (for unrestricted airflow). Be careful not to make the cut-out too big. Do NOT make one large cut-out to accommodate both filters.

D.   Carefully cut out FFU ports according to your markings.

Installing the Polypropylene Frame Kit

The FFU stand assembly includes a polypropylene frame kit that will connect the FFUs to the cut-outs in the vinyl wall, eliminating any gaps or potential leaks around the ports. After assembly, the polypropylene frame will clamp the vinyl wall around the face of the exposed filter.

If the FFU stand was shipped fully assembled, the polypropylene frame is likely already installed. If not, follow the instructions below to prepare the FFUs:

A.   After the FFUs have been mounted on their stand, gather the white polypropylene frame components:

A **positive pressure cleanroom** will include 4 polypropylene mounting bracket components and 1 polypropylene frame.
A **containment (negative pressure) cleanroom** will include 1 polypropylene bracket and 1 polypropylene frame.

B.   Begin by attaching the mounting pieces to the FFUs. The mounting components will have an L-shape and will be installed around the edge of the filter face. The proper placement for each piece can be determined by their dimensions, as they will only fit one way. Pilot holes are predrilled in each piece to show where to fasten. Use ½" self-tapping sheet metal screws for fastening.
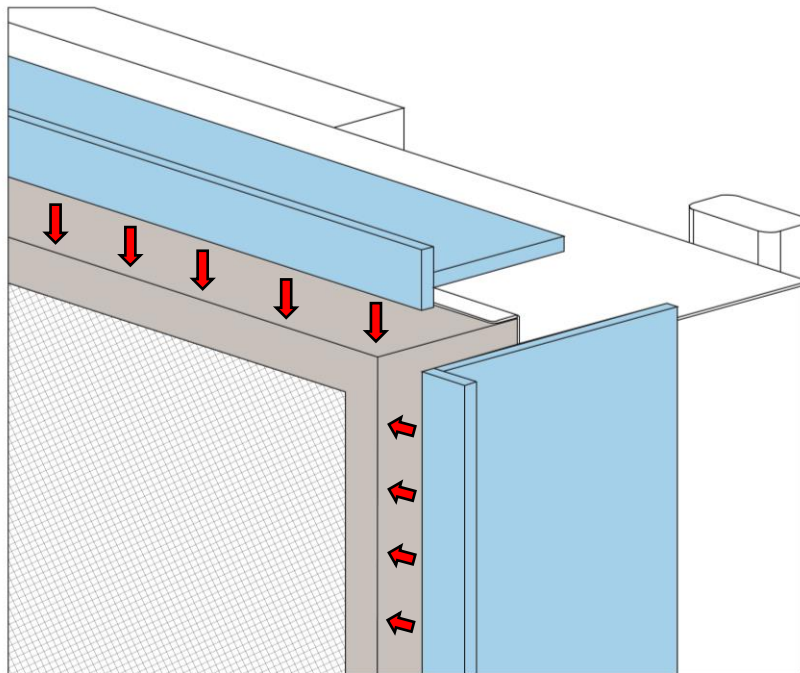

Figure 7: *The polypropylene mounting components (shown in blue) are attached along the outside edge of the filter, flush with the filter face. Whenever possible, fasteners should grab the steel housing of the FFU, not the gray aluminum frame of the HEPA filter. The above diagram shows two pieces of a positive pressure frame kit coming together at the corner of the FFU. For a negative pressure room, the mounting component would instead be one solid piece attached in the same way.*

Figure 8 (right): *A positive pressure polypropylene mounting kit shown in the correct orientation prior to fastening. The screen covering the face of the HEPA filter can be seen at the top of the photo. The mounting bracket is made up of four separate pieces that must be held flush with this screen while fastening.*

Figure 9 (below): *A negative pressure (containment) polypropylene mounting bracket shown in the correct orientation on the pre-filter side of a single FFU. The mounting bracket simply slides onto the pre-filter housings of both FFUs so that it is flush with the face of the pre-filter. Use the same ½" self-tapping sheet metal screws to fasten the polypropylene to the housing according to the predrilled pilot holes. Do NOT use fasteners near the power cord and power switches.*

C.   After the mounting components have been attached, position the FFU stand against the outside of the vinyl wall panel again, with each filter face aligned with its respective cut-out. Have one person hold the stand in this position until Step D is complete.

D.   From inside the cleanroom, align the flat polypropylene frame with the exposed filters so that the frame will clamp the vinyl wall to the polypropylene mounting bracket on the FFUs. Have another person fasten the polypropylene components together using the pilot holes as a guide. Once fastened, the vinyl wall panel should be sandwiched tightly up against the FFU. Repeat this process for all remaining FFUs.

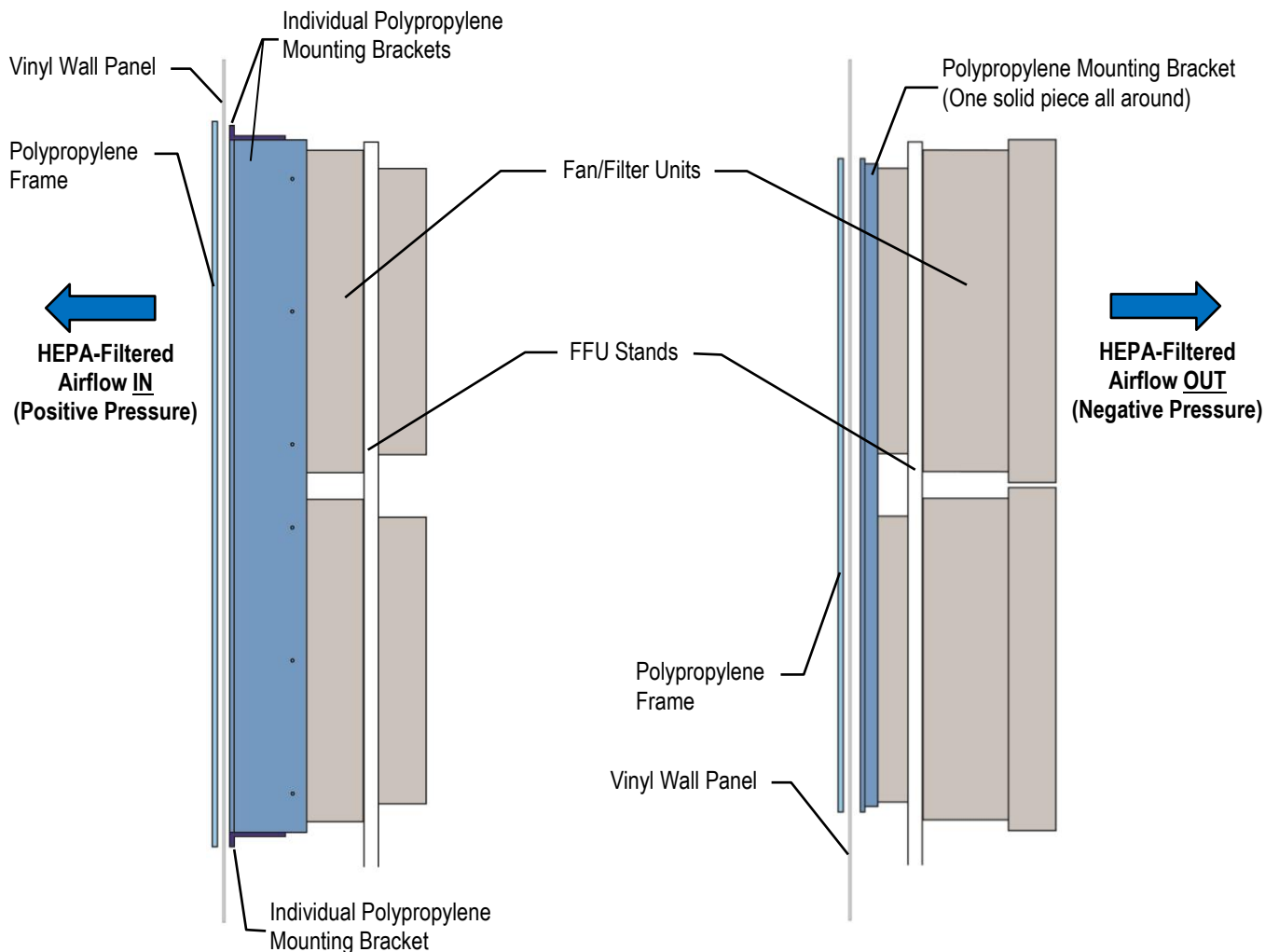**Side View of the FFU Attachment to the Vinyl Wall Cut-Out**

Figure 10: Positive Pressure Cleanroom Configuration   *Figure 11: Negative Pressure Cleanroom Configuration*

Installing Strips for the Entryway (If Equipped)

A. Below the installed Grip Track bracket, mark the desired entryway on the vinyl panel.

   If possible, it is recommended that the width of the cut-out be 6"- 8" narrower than the width of the Grip Track to allow the strips to overlap the edges of the wall panel. We also recommend that the top of the cut-out ends at least 12" away from the Grip Track to provide stability for the strips.

B. Cut the vinyl to create the opening for the entryway.

C. Take the 8"-wide door strips out of the box.

D. Open the Grip Track by pulling the front cover outward.

E. Locate the gray hanger at the top of each strip and hook it onto the grip track as shown in the diagram.

F. Slide the strips along the Grip Track to adjust the overlap.

G. After installing all of the strips, snap the Grip Track closed.
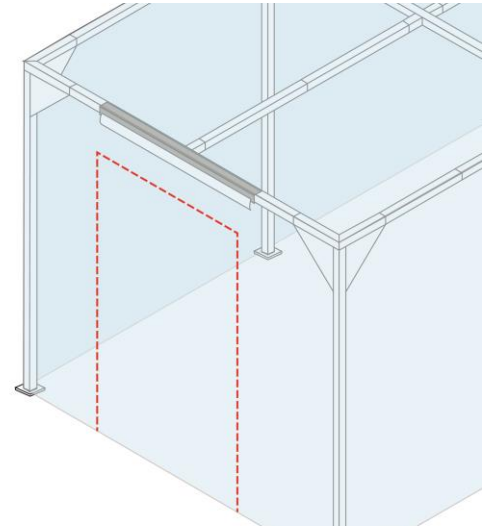

Figure 12: The cut-out shown above is about 6" narrower than the Grip Track bracket and the top of the cut-out stops approximately 12" away from the opening of the Grip Track.

Installing LED Strip Lights

A. Place the boxes containing the lights on the table.

B. Remove the lights, taking care not to damage the plastic lenses.

C. Test the lights before installation by connecting them to a working wall outlet.

D. Use the provided VHB adhesive tape to attach the lights to the desired ceiling frame members. Be sure to thoroughly clean both surfaces before applying the tape to the light strip. After removing the tape backing, press the light strip against the frame surface (the tape should experience 15 psi for proper adhesion).

E. Run the power cables to your power source and secure the wiring along the frame as necessary.

Completing Installation

Connect all power cables to the appropriate power source.

Prepare the cleanroom for use by turning on the FFUs and performing a thorough cleaning to remove adhered particles from all interior surfaces.

It is advisable to anchor the feet of both the cleanroom and the FFU stand after installation is complete.
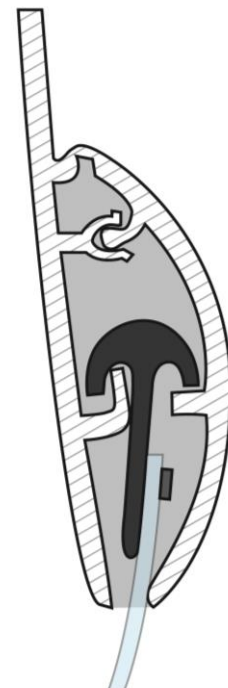

Figure 13: Cross-section showing the vinyl strip hooked onto the Grip Track

3.0 Operation and Maintenance

Operation of the EZ-UP Internal Frame Cleanroom is controlled by speed switches on the FFUs and typically requires minimal maintenance. The filters provide effective operation for years under typical operating conditions. In fact, filter efficiency increases as the filter captures more and more particles. The filter does not require replacement until the back pressure that it generates increases to the point that the system can no longer provide an adequate air flow velocity to maintain required particle counts. To monitor this condition, periodic testing with a particle counter is recommended.

Filter Replacement

> ⚠️ **CAUTION**
>
> **Never attempt to service or replace the filter/blower without first disconnecting system power. The filter is protected with an expanded metal face screen. This is never to be used to handle the filter. It is only for protection against an accidental touch of the filter. Handle filter only by the frame.**

Tools Required: Phillips Head Driver

Step 1: Disconnect the power cable and disassemble the polypropylene frame/bracket assembly.

Step 2: Remove the FFUs from the stand.

Step 3: Remove the ten (10) screws holding the HEPA/ULPA filter to the lid assembly.

Step 4: Lift the lid assembly off the HEPA/ULPA filter (See Figure 3). Discard the used filter as per applicable regulations.

Step 5: Prior to replacing with a new HEPA/ULPA filter, carefully inspect the new filter for any visible damage.

Step 6: Install the new filter by reversing the removal steps.

Step 7: Refer to the instructions in Section 2 for reassembly and reinstallation of the FFU stand and polypropylene frame.
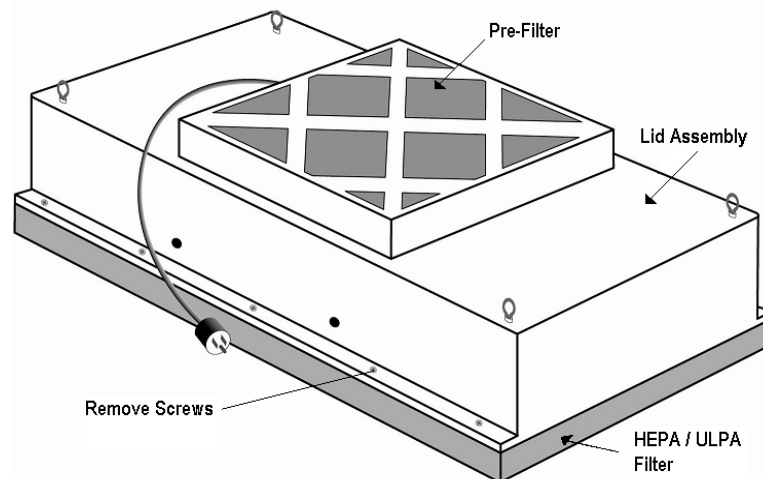
<u>**Cleaning**</u>

The powder-coated steel frame of the cleanroom can be cleaned with Isopropyl Alcohol (IPA). The vinyl wall panels and polypropylene components will stand up to most cleaning agents and sterilizers. However, we recommend checking chemical compatibility and testing the agent on a small area before commencing routine cleaning.

Wipes

Wipes are used more frequently than any other cleaning product or tool. Selection of wipes should be based on intended usage. When selecting wipes you should consider things such as particle-shedding properties, chemical residue of the wiper content, static properties, absorbency, and size. When using wipes, wipe in only one direction –either from top-to-bottom or left-to-right. Use only slight overlapping strokes. Remove surface spots with a commercial cleaner and woven polyester wipes.

Vacuums

There are a variety of different vacuums available for your cleanroom. Selection of a vacuum will depend heavily on the application and the type of cleanroom you have. With all different types of sizes and filtration systems, select the one that you feel will best suit the cleaning needs of your room.

4.0 Warranty

Products Manufactured by Terra: Terra Universal, Inc., warrants products that it manufactures to be free from defects for a period of 12 months for parts and 90 days for labor, commencing from the date of shipment. Terra's sole responsibility is to repair or replace, at its option, any part of the product that proves defective or malfunctioning during this time limit. In some cases, components incorporated in Terra Universal products are covered by additional warranties from component manufacturers; obtain specific information from Terra sales representatives. This warranty is void if the equipment is abused or modified by the customer, is operated outside Terra's operating instructions or specifications, or is used in any application other than that for which it is specified. This warranty does not include routine maintenance or service procedures, breakage of quartz baths after 60 days, shipping damage, nor damage from misuse, intentional or unintentional abuse, neglect, natural disasters, or acts of God.

Products Manufactured by Others: Terra Universal, Inc., warrants that, to the best of its ability, Terra's representations of products that are manufactured by others reflect the manufacturer's representations, subject to change without notice. Sole warranty for these products is the original manufacturer's warranty that is passed forward to the purchaser and constitutes the customer's sole remedy for these products. Detailed warranties for distributed products are available through Terra sales representatives.

Freight Shortage or Damage: Upon receipt of any equipment from Terra Universal, Inc., customer shall immediately unpack and inspect for damage or shortage. The customer shall not accept a damaged package or a short shipment until the carrier makes a "damage or shortage" notation on both the carrier's and customer's copy of the freight bill or delivery receipt. Service title passes when the shipment is loaded, so customer is responsible for filing and collecting a freight claim. Any replacement products must be ordered and paid for separately. For Terra's "Policy and Procedures for Returning Goods," see Terra's Internet site: www.TerraUniversal.com.

Generally, customers can improve the chance of collecting on a freight claim by following these procedures: 1) formally requesting that the carrier inspect the shipment immediately upon suspecting damage or shortage to verify condition; 2) notifying the carrier upon discovery of concealed damage and requesting an inspection within 15 days of receipt, both in person or phone and following up via mail; 3) keeping the shipment as intact as possible, including retaining original packaging materials and keeping the product as close to the original receiving location as possible; 4) holding salvage for disposition by the carrier.

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Warranty Returns: All warranty returns must be authorized in advance by Terra Universal and approved under an RMA. Unless approved in advance for good reason, all returns must be in original condition, including all manuals, and must be packaged in original packaging materials. All returned goods are to be shipped to Terra Universal, freight prepaid at customer's expense. See Terra's "Policy and Procedure for Returned Goods."