TERRA UNIVERSAL.COM
Critical Environment Solutions

Installation and Operating Guide *Document No. 1800-20*

Vertical Laminar Flow (VLF) Station

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Installation and Operating Guide

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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:

The information presented here is subject to change without notice.

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.**

1.0 Introduction

This manual provides information on installing and operating your Terra Universal Vertical Laminar Flow (VLF) Station.

2.0 Description

Terra Universal's Vertical Laminar Flow Station provides a workspace enclosure that delivers a uniform wash of HEPA-filtered air onto the work surface. The station's design also protects the area beneath the enclosure from in-rushing contaminants from the outside environment. Made of a stainless steel frame (optionally powder-coated) with acrylic side panels (optional Static-Dissipative PVC panels), Terra's durable VLF systems are built to last.

Why laminar flow? What separates Terra's Vertical Laminar Flow Station from simple workshop blowers is the ability to provide an evenly-distributed column of air, with all particles moving in the same direction and speed. This eliminates inconsistent air currents inside the enclosure that would otherwise create turbulence and eddies, allowing particles the potential to contaminate. For those seeking the cleanest-possible work environment, laminar flow is ideal.

The backbone of Terra's VLF system is a fan filter unit (FFU) that incorporates a 3-speed, direct-drive 1/3-horsepower electric motor that forces air through a HEPA filter. In conjunction with the system's pre-filters, the HEPA filter removes 99.99% of all particles 0.3 microns and larger from the air stream. At the default speed, each 2' x 4' FFU provides 750 CFM (cubic feet per minute) of filtered air at 90 FPM (feet per minute), which test results show exceeds ISO 14644-1 for an ISO 5 environment.

VLF Stations feature Room-Side Replaceable (RSR) FFUs, which allow the HEPA filter to be easily replaced without disassembling the blower unit (see **Section 5.2 Filter Replacement**).



Figure 1. *Vertical Laminar Flow Station (stainless steel version) positioned above one of Terra's workbenches*

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Automatic Filter Monitoring System
Terra VLFs incorporate an automatic filter monitoring system, a feature that eliminates the need for frequent, tedious inspection of the HEPA filter to determine operating efficiency. This system includes a digital pressure gauge that monitors the filter backpressure and indicates when to replace the installed HEPA filter.

Touch-Screen Interface
All new standard Terra VLFs incorporate an electronic touch-screen control panel, allowing the user unprecedented ease-of-use in both monitoring system settings and in making changes to them.

Optional: Motorized Sliding Shield
The continuously adjustable Motorized Sliding Shield controls the size of the access opening. A higher sash opening will minimize turbulence around small parts, while a lower sash opening will promote stronger, more laminar airflow.

The transparent, static-dissipative PVC window features a surface resistance value of about 10^7 ohms/square. This characteristic helps reduce the potential for electrostatic discharge that can damage sensitive components and also eliminates surface charges that attract airborne particles, such as powders, causing them to cling to the walls.

Optional: IonBar™
An optional component for Terra's Vertical Laminar Flow Stations, Terra's IonBar™ ionizes air molecules in the air output for enhanced static/particle control. Installed on the underside of the air filters, the IonBar™ sports a teardrop design to minimize disturbance of the laminar flow.

3.0 Installation

3.1 Site Preparation

The Vertical Laminar Flow Station typically ships fully assembled. These standard units can be simply moved into position and connected to power to complete the installation. For custom units that arrive in two separate sections, see Section 3.3 for assembly instructions.

Before uncrating and moving the unit, ensure that entryways have sufficient vertical clearance to accommodate the entire unit. The upper housing should not be disassembled except at the factory.

NOTE

The HEPA filters typically arrive uninstalled to minimize the potential for damage during shipping. See Section 5.2 for instructions on installing the HEPA filters prior to operating the VLF Station.

3.2 Unpacking

Uncrate your Vertical Laminar Flow Station, checking for any visible damage incurred during shipment. If damage is found, immediately contact the freight company to file a claim.

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3.3 Assembly (For Units Shipped Disassembled)

WARNING

Due to the size of these units, one person should not attempt to install the VLF Station on their own. Always have multiple installers at hand to ensure safe maneuvering of the unit.

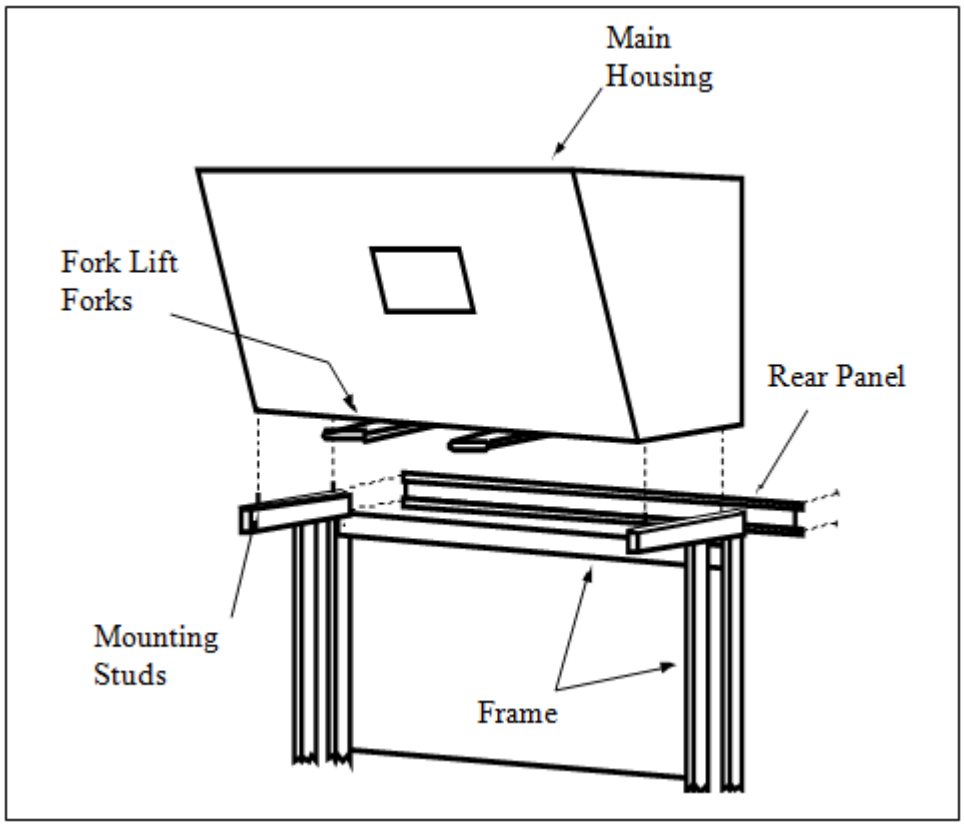


Figure 2. *Diagram showing the general method of assembly for VLF Stations that arrive in separate sections*

A. Remove the rear panel for easier mounting of the main housing

B. Using a forklift or other heavy-lifting device, lift the housing assembly above the frame. Adjust the frame so that it lines up with the main housing's attachment points (screws protruding out from top of frame)

C. Carefully lower the main housing onto the frame, confirming that all attachment points are properly aligned before joining the two parts

D. Maneuver the assembly into its final operational location, ensuring that it is on a flat and level surface. Make sure that the unit is installed within reach of an appropriate power outlet. Once situated in-place, rest the frame upon the ground.

E. Connect the unit to power. The unit will automatically turn on and begin to operate at 100% blower speed (factory default setting).

4.0 Operation

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4.1 Touchscreen Interface Overview

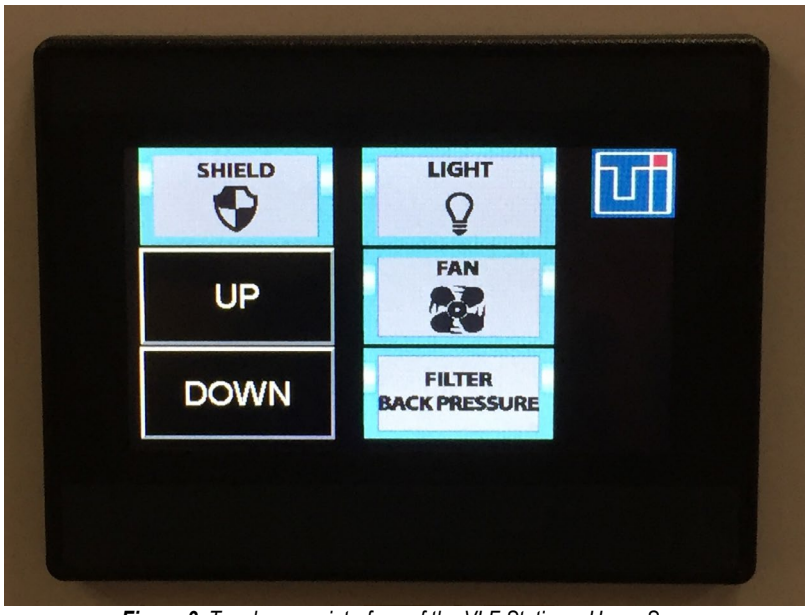


Figure 3. *Touchscreen interface of the VLF Station – Home Screen*

VLF Touch-screen Interface			
Legend	**Function**	**Description**	**Details**
SHIELD	Shield Height Adjustment	Pressing and holding either UP or DOWN will move the shield. Release the button when the desired position is reached.	The Shield icon will turn red when the shield is operating. The shield will hit a stop once it reaches minimum or maximum extension.
LIGHT	Light On/Off	Press the LIGHT icon to toggle the light fixture.	The Light icon will turn red to indicate the light is active.
FAN	Fan Settings	Press the FAN icon to enter the settings menu for the blower motors.	The Fan icon will turn red while the fans are physically operating (RPM is detected).
FILTER BACK-PRESSURE	Filter Replacement Settings	Press the FILTER BACK-PRESSURE icon to enter the settings menu for the filter replacement alert.	The FILTER BACK-PRESSURE icon will turn red when it is time to replace the filter (based on settings)

CAUTION

Do NOT continue to press UP or DOWN after the shield has hit one of the stops. Doing so could cause premature wear to the shield motor.

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4.2 Initial Set-Up

CAUTION

Most VLF stations use two independent blowers to provide sufficient airflow and maximize flexibility. Users must determine the optimal airflow necessary for their application and set appropriate speeds for BOTH fans.

A. When connected to power, the VLF Station interface will display the Home Screen and the blowers will begin operating at 100% speed (factory default).

B. Press the FAN icon to open up the blower settings.

C. Verify the blower speed is at 100%. If the blower is turned off (red box as seen below), press the middle button that says OFF to turn on the blower. Allow 10 seconds for the unit to ramp up. Observe the RPM reading in the lower left corner to confirm that the fan is operating sufficiently (typical reading at 100% is approximately 1100 RPM).

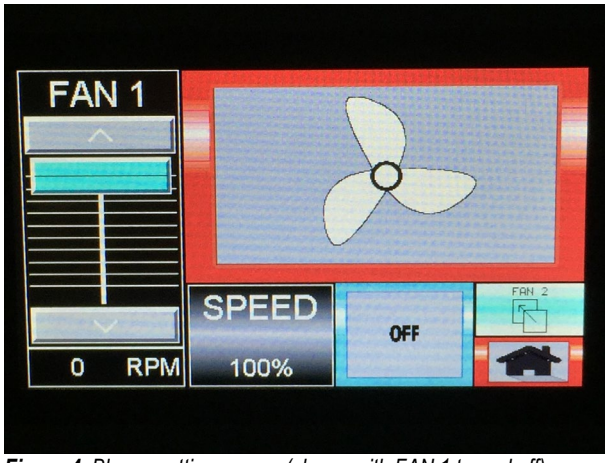


Figure 4. *Blower settings menu (shown with FAN 1 turned off)*

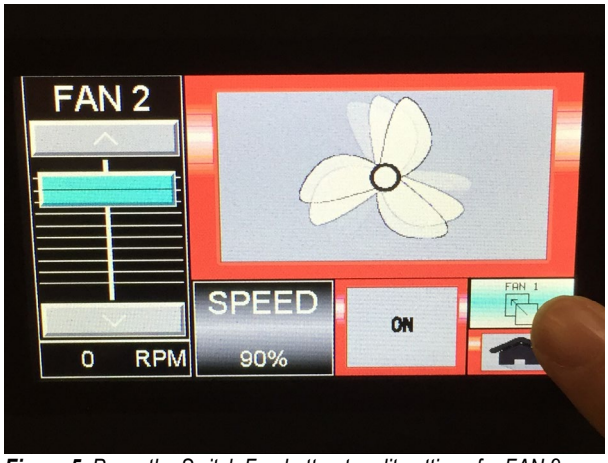


Figure 5. *Press the Switch Fan button to edit settings for FAN 2*

D. Press the Switch Fan button (just above the Home button) to switch to FAN 2. The identifier in the upper left corner should display FAN 2. Repeat the procedure in Step C for FAN 2.

NOTE

The box around the picture of the fan will remain red as long as the RPM reading is zero.

E. Once both blowers are operating at full power, press the Home button to return to the Home Screen.

F. Press the FILTER BACK-PRESSURE to open the next settings menu.

The typical reading falls within the range of 0.6 to 0.8"WC at 1100 RPM (100% power). Note the backpressure reading for your system. As a general rule, the filter replacement alert should be activated when the back-pressure reading has doubled, indicating significant filter load (approximately 1.5"WC). Operators can choose a more appropriate set-point for their application by pressing "Set Point", which opens up the enter-value screen.

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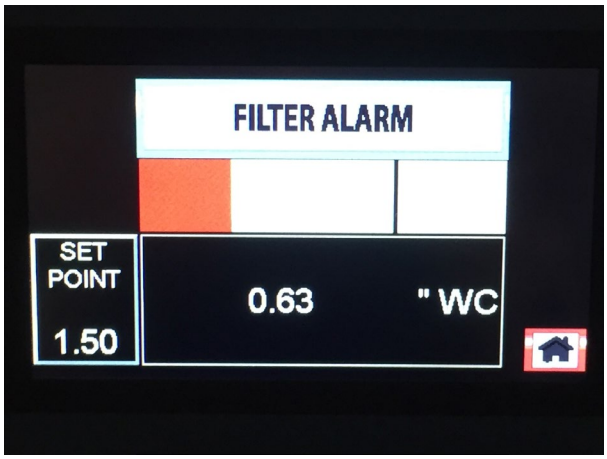


Figure 6. *Filter back-pressure settings menu*

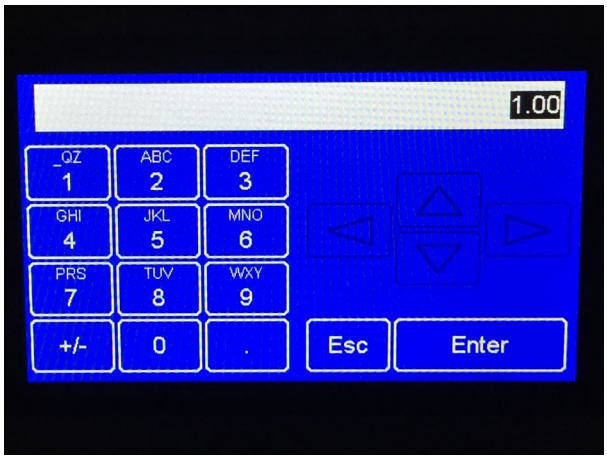


Figure 7. *Enter-value screen*

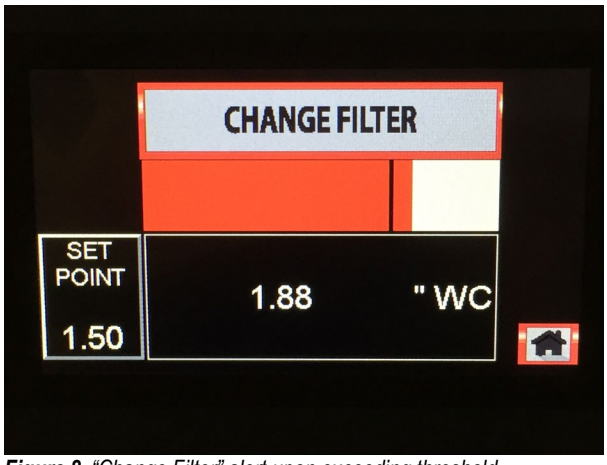


Figure 8. *"Change Filter" alert upon exceeding threshold*

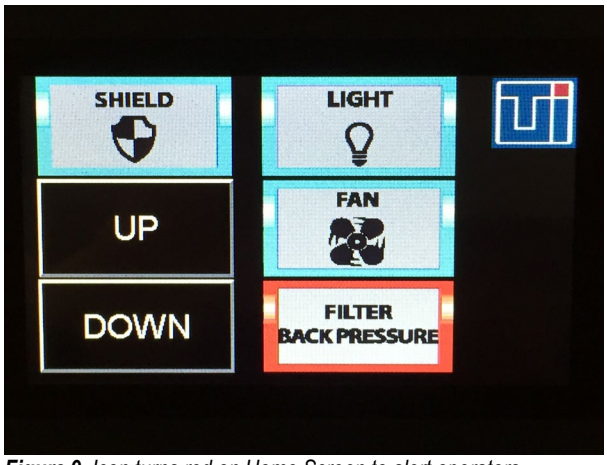


Figure 9. *Icon turns red on Home Screen to alert operators*

NOTE

The VLF Station will automatically initiate an alert to replace the filter at 1.8"WC, regardless of the set-point chosen by the user (indicated by the vertical black line in the Filter Back-Pressure settings menu).

G. Confirm the backpressure falls within the proper range and enter a new set-point if desired.

H. Press the Home button to return to the Home Screen.

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4.3 Operating the VLF Station

Following initial set-up, the VLF Station is ready for operation. Users can turn on the light fixture and operate the shield as needed from the Home Screen.

To adjust the airflow:

A. Press the FAN icon to open the blower settings menu.
B. Blower speed can be adjusted dynamically by sliding the blue bar up and down on the screen. The speed percentage will change to show the new setting, and the RPM reading will begin to change as the fan adjusts to the new setting. The fan animation will also speed up or slow down according to the settings.

   Alternatively, users can press "SPEED" to open the enter-value screen, allowing them to enter an exact speed value in percentage terms.

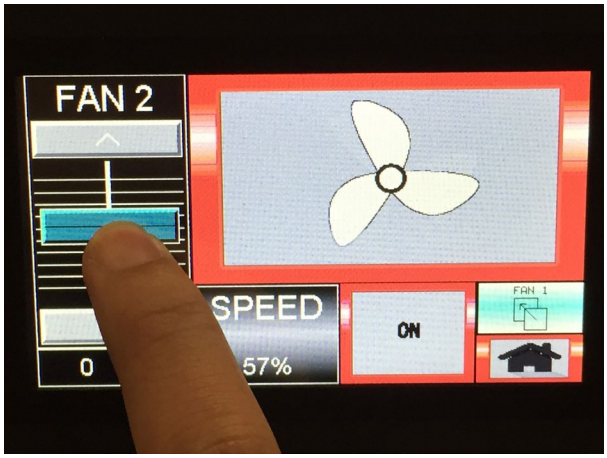


Figure 10. *Slide the blue bar with your finger to adjust*

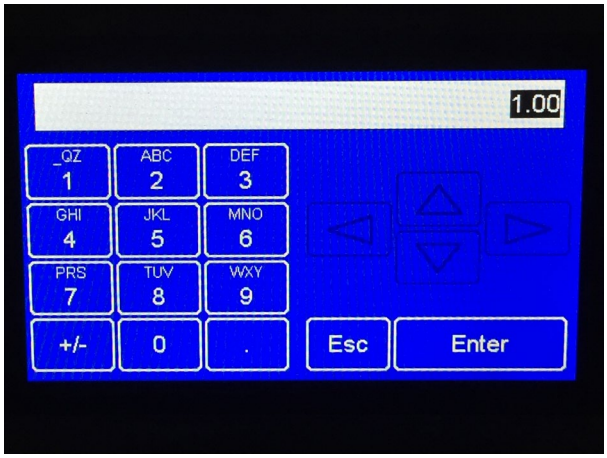


Figure 11. *Enter-value screen (similar to other functions)*

C. Press the Home button to return to the Home Screen.

NOTE

If the blower does not immediately adjust to the new setting, toggle the fans OFF and ON using the middle button (to the right of "SPEED").

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5.0 Troubleshooting

Problem: Pressing "UP" results in the sash going down, or pressing "DOWN" results in the sash attempting to exceed the limit stops on the track.

Possible Solution(s): Use the following procedure to reset the limit switch:

1. Disconnect the power source.
2. Remove the left top cover.
3. Flip the switch in the top left corner from "ON" to the "Reset" position.
4. Reconnect the power source.
5. Press the "Down" button on the touch screen panel.
6. Flip the switch back to "ON."
7. Check the "UP" button if the sash stops before touching the limit switch.

6.0 Maintenance

CAUTION

Disconnect the unit from power before performing any maintenance. When cleaning the unit, take care not to apply too much liquid, which can potentially damage the sensitive electronics housed within.

Operators are responsible for inspecting the general condition of the unit before each use. Any obviously worn or damaged component should be thoroughly examined and a safety evaluation should be performed before placing the unit back into service.

Other than the components involved in filter replacement, the Vertical Laminar Flow Station features no user-serviceable parts and field-repairs should not be attempted. Contact Terra Universal's Customer Service department for more information regarding any operability issues with the unit.

6.1 Cleaning Instructions

	Cleaning Instructions
DO	- Verify chemical compatibility before using any type of cleaning agent - Use water, ordinary soap and/or mild liquid detergent - Rinse the surfaces of your VLF with a cloth dampened with clean water if a cleaning agent is used (DI water may be required) - Use a cloth to apply any cleaning solutions. If a stubborn stain presents itself, a soft-bristled brush may be used with extreme care, with the exception of the electronic touch-screen interface
DO NOT	- Use liquids containing abrasives to clean the surfaces of the VLF - Use wax or other coatings on electrostatic dissipative work surfaces, as they may modify the dissipative properties of the laminate - Use hard brushes or intense scrubbing actions to clean the workstation surface - Use isopropyl alcohol (IPA) or other solvents on touch-screen panel, motorized shield or the side panels - Apply liquid directly to the surface of the blower hood, as errant leakage may short the electronic touchscreen interface. Instead, apply cleaning agent to a cloth before using

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When the VLF is used in a cleanroom environment, Terra recommends use of knitted polyester wipers or spun-lace, non-woven blends of cellulose and polyester manufactured and packaged specifically for cleanroom use. These products are manufactured under tightly controlled conditions that restrict the use of binders or chemical treatments that can outgas, and cleanroom packaging and strict lot control ensure optimal cleanliness.

Less critical environments (ISO 6 – 8 / Class 1000 – 100,000) generally tolerate more absorbent materials made of 100% cotton twill or cellulose.

For thorough, repeatable results, avoid cleaning with a circular motion, which rubs dirt or grit into the surface. Using mild pressure, wipe in one direction, from top to bottom or side to side, in slightly overlapping stokes. Fold the wiper between strokes, and replace with a clean wiper often.

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6.2 Filter Replacement

The top of the unit includes a MERV-7 pre-filter that should be replaced every three months or according to user protocols, depending on the operating environment.

Terra's HEPA filters will continue to provide adequate throughput while operating with 0.0-1.0"WC (water column) of differential pressure, as displayed on the touchscreen interface. Once this pressure reaches approximately 1.5"WC, the blowers will begin to deliver less-than-optimal airflow into the unit, increasing the risk of contamination. The presence of a high differential pressure can also increase the rate of wear to the blower's motors.

To keep your unit operating at its peak efficiency, replace the HEPA filters whenever the differential pressure reaches 1.5"WC. When operated within a cleanroom, filter changes are very infrequent, with filters often lasting for years before reaching this threshold.

See **Section 4.0: Operation** for information on setting up the Filter Backpressure set-point, which will alert users to when the filter needs to be replaced.

Replacement Filters
The necessary replacement filters vary depending on the size of the VLF Station. Please contact Terra Customer Service with your Order Reference Number or the Part Number for your specific VLF to order the correct replacement filters.

A) First, you must remove the stainless steel screen covering the filter that is held in place with friction catches. This screen protects the filter from damage and enhances airflow uniformity.



Figure 12. *Double-roller catches hold the screen to the housing*

B) Next, rotate the metal tabs that help hold the HEPA filter in place.

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Figure 13. *The rotary latches grip the edges of the HEPA filter*

C) Gently let the used filter drop down, and set aside. The filter assembly is surrounded by a channel containing gel seal. Wipe any residual gel from the knife-edge of the fan module still in the ceiling to prepare for the replacement filter. Position your new filter carefully before pushing into place; the knife-edge of the fan module should be centered in the channel (equal amounts of gel on both sides).

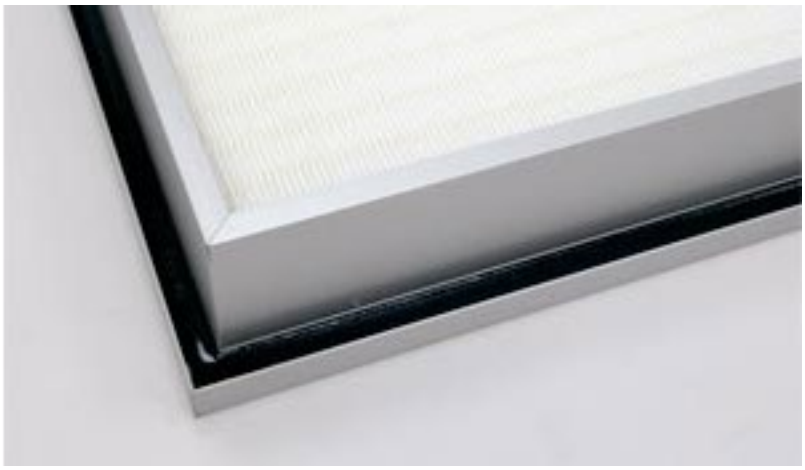


Figure 14. *Gel-filled channel of the HEPA filter*

D) Rotate the metal tabs so that they lock in the new HEPA filter.

E) Reinstall the stainless steel screen by pushing up on the friction catches until the screen clicks into place. If the catches are difficult to engage, line up the rollers with the stud and give the screen a sharp tap. Do this for each catch, one by one, until the screen is held firmly in place.

F) To replace the pre-filter located at the top of the fan module, slide the old filter out of the two tracks holding it in place on top of the FFU and then slide in the new pre-filter.

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7.0 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.

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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."

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