TERRA UNIVERSAL.COM
Critical Environment Solutions

Installation and Operating Guide *Document No. 1788-27*

Smart Pass-Through Chambers

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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.

1.0 Description

The installation and operating instructions in this manual apply to both the standard Smart Pass-Through and the BioSafe+ Smart Pass-Through, which features a non-outgassing, potted polyurethane door seal. The standard model uses an "e"-shaped, heat-formed gasket to seal the doors.

The Smart Pass-Through series includes an electronic interlock which allows only one open door at a time, thus minimizing the amount of "dirty" air that can enter the cleanroom. This interlock system is operated by an integral Smart Controller, which features indicator lights and alarm bells as standard equipment. The Smart controller can also be equipped with any number of Smart Pass-through™ accessory modules, expanding its capabilities to include UV sterilization, air showers, load presence sensors, data-logging, and a host of high-tech security features.

CAUTION

The operator should always verify the opposite door is fully shut prior to opening a door. Do not yank, shake, or apply excessive force to the doors. Attempting to force open a door while the interlock is engaged may result in damage to the unit.

Smart Door Interlock™

Terra Universal's Smart Pass-Through™ chambers are equipped with electronic interlocks to prevent the opening of both doors simultaneously. When one door is open, the other will remain locked until both doors have been closed.

This cross-contamination protection is accomplished using an internal Smart Pass-through Controller built into the body of the pass-through chamber. The unit arrives from the factory pre-programmed to control the door interlock system, alarm bells, and any Smart Pass-through™ accessories specified in the order.

Figure 1: *Smart Pass-Through with slide-up door*

LED Status Indicator Lights

The interlock system also features LED indicator lights to show the status of the electronic interlock. When an indicator light turns red, the opposite door of the pass-through has been opened and the interlock has been engaged. When the indicator light is green, the pass-through can be opened.

In addition to the red indicator light, the glowing TUI logo will flash when the electronic door interlock has been engaged.

The location of these lights will vary depending on the final design of the Smart Pass-through and any specified options.

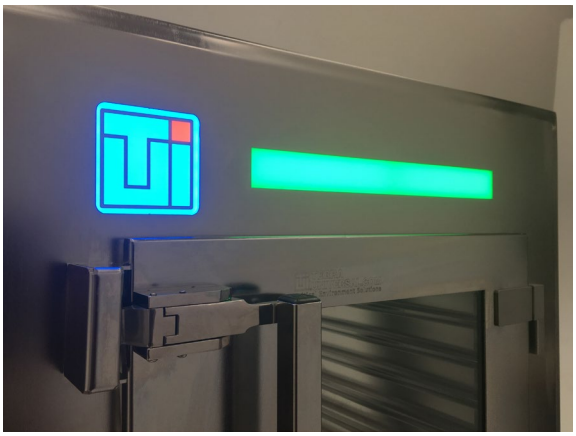


Figure 2: *TUI logo and green LED Indicator Light*

Alarm Bells

The Smart Pass-Through chamber includes two wireless alarm bells that notify operators when one of the pass-through doors has been opened and the interlock has engaged, locking the door on the opposite side. The main purpose of the alarm bells is to alert personnel if the pass-through door on the opposite side has been opened and the interlock is engaged. This is particularly useful if the pass-through does not include windows.

Figure 3: *Smart Alarm Bells*

Each alarm bell is synchronized with one of the doors on the pass-through. Once the Smart Pass-Through has been installed and connected to a power supply, each bell should be tested to determine the corresponding door.

If the alarm bells have not been labeled, use the following procedure to determine alarm bell placement:

1. Starting on the “clean” side of the pass-through (the side that is flush with the wall), plug one of the alarm bells into a standard 120V outlet.
2. Open the “clean” side pass-through door. If the bell begins chiming, move the alarm bell to the “dirty” side of the pass-through.
3. If nothing happens, unplug that alarm bell and plug in the other one. Open the “clean” side door again and verify that the alarm bell activates. Move the alarm bell that activates to the “dirty” side.
4. Make sure that when one side of the pass-through is opened, the alarm bell activates on the opposite side of the pass-through.

Following set up, the appropriate alarm bell will emit a single chime and the red LED indicator light will blink whenever the door is opened on the opposite side of the pass-through. When both doors are closed, the indicator light will stop blinking.

NOTE

If one of the doors is left ajar for an extended period of time, both alarm bells will ring continuously until the door is shut.

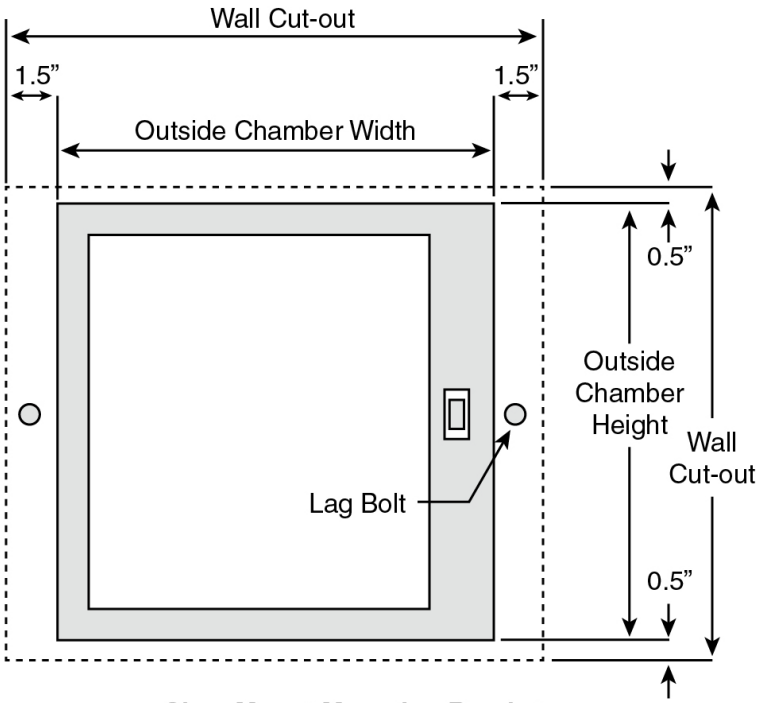
2.0 Installation

2.1 Wall Cut-Out

1. The CleanMount® System (featured on select pass-throughs) utilizes a clamping mechanism to allow the pass-through to be installed without any fasteners piercing the wall surface. This design enables quick installation with minimal impact on any high-grade finished surfaces, and a significant reduction in debris and airborne particulates. When making the wall cut-out for this type of pass-through, installers now have the option of finishing and sealing the cut-out with a cleanroom-grade surface. That way, if the pass-through must be removed at a later date, the CleanMount® System will disassemble quickly and cleanly while the cleanroom can remain in operation.

2. Make a wall cut-out of the size specified in the table below.

Mounting Bracket Style	Wall Cut-Out Dimensions
CleanMount®	Add 3” to the width and 1” to the height of the outside of the chamber



CleanMount Mounting Bracket
Back View

3. Add framing to the inside of the wall cut-out using a rigid support material, such as wood or metal.

4. Finish the wall cut-out with an appropriate substrate and finishing material. As a general rule, the wall cut-out should have the same grade of finishing as the wall it is installed in (e.g. cleanroom-grade materials).

CleanMount® Mounting Bracket Style

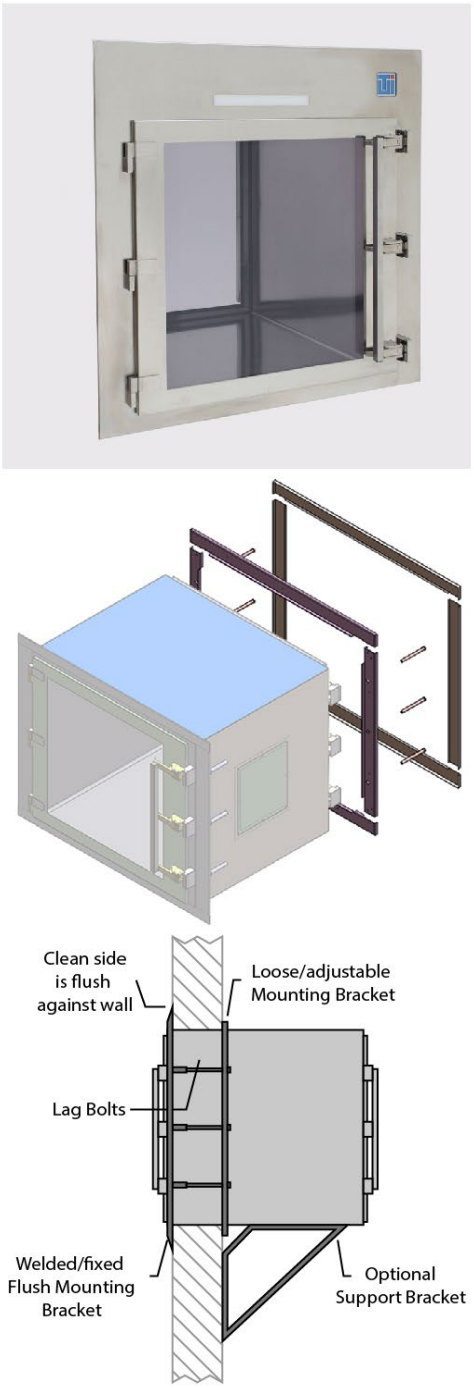


Figure 4 *Pass-through with CleanMount® Mounting Bracket*

5. To allow the pass-through to be removed for maintenance without requiring shut down of the cleanroom environment, be sure to finish the surfaces of the wall cutout with an appropriate non-shedding material, taking care not to obstruct the power supply connection.

   Installation Video: To view a video demonstrating a similar installation, please visit the following link: https://youtu.be/1tnedlfBi9w

6. Standing on the "clean" side of the wall, slide the pass-through completely into the wall until the welded mounting bracket is flush with the "clean"-side wall surface. The "clean"-side mounting bracket should fit tightly against the wall without the need for fasteners.

7. Install any support brackets and check the alignment of the pass-through chamber by following the procedures outlined in **Section 2.2 Door Alignment**.

8. The "dirty"-side mounting bracket is shipped preassembled. Pop off the bracket covers and slide the bracket onto the body of the pass-through (See **Figure 4**). If necessary, detach one section of the mounting bracket by removing the two screws at each corner, creating a "C" shape. Slide the "C"-shaped bracket onto the chamber and then reattach the missing section, tightening all corner screws once the bracket is in place.

9. Confirm chamber positioning with a level, and insert the provided lag bolts into the pre-drilled holes in the mounting bracket. Thread the lag bolt into the guide that extends from the "clean"-side mounting bracket (See **Figure 7**). The size of the pass-through will determine the number of bolts required. Use a socket wrench to tighten the lag bolts into the pre-welded nuts until the mounting bracket is flush against the wall.

CAUTION

Be careful not to over-tighten the "dirty"-side mounting bracket lag bolts. The bracket should be secured against the wall but should not bend inward (forming gaps).

Figure 5: *Push the Smart Pass-through into the cut-out from the "clean"-side until it is flush with the wall*

Figure 6: *Slide the "dirty"-side mounting bracket onto the body of the Smart Pass-through*

Figure 7: *Thread the lag bolt into the guide attached to the "clean"-side bracket, sandwiching the wall between the brackets*

Figure 8: *Snap the bracket covers back into place to hide the lag bolts and other hardware*

10. Install the bracket covers by snapping each of them into the bracket clips (See **Figure 7 & 8**).

> NOTE
> **Terra Universal provides lag bolts that accommodate wall thicknesses between 4" and 6". Longer lag-bolts are required for thicker walls (not provided by Terra).**

> NOTE
> **Although the mounting brackets are designed to provide a sufficient seal against the wall surface, caulking may be used to fill any seams or gaps after the installation is complete.**

2.2 Electrical

> WARNING
> **Electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction. When cutting or drilling holes for electrical, take caution not to damage electrical wiring or other hidden utilities.**

1. Once the pass through is correctly positioned into the wall, open the access panel on the side of the pass-through by removing the small screws that hold the panel in place.

2. Pull the power cord through into the access panel area. A predrilled hole is available if the power line will be hidden inside of the wall. Alternatively, a second hole can be drilled in a more suitable location on the bottom of the pass-through, if needed. Guide the power cord through the exit hole.

3. Using the appropriate couplings, hardwire the power source based on your system's requirements. Reference the electrical wiring diagram for your unit for additional information.

2.3 Door Alignment

Pass-through chambers being installed in a cleanroom wall must be properly aligned to ensure proper operation of the interlock mechanism.

1. In a properly aligned pass-through chamber, the self-closing fire-rated door shuts and latches completely without assistance and the LiftLatch is centered in the corresponding catch (See **Figure 9**). To align the chamber, one corner may need to be shimmed before tightening the mounting brackets to the wall.

2. Large chambers may include support legs with leveling feet. The feet adjacent to the cleanroom wall should be adjusted to support the chamber once the "clean" side door has been properly aligned.

3. Repeat this procedure for the opposite (i.e., "dirty") door. Raise or lower the chamber corners until the door latch engages the center of the catch. Then adjust the support frame leveling feet to retain this alignment.

Figure 9: *Properly aligned LiftLatch*

4. Pass-through chambers deeper than 24" require support brackets. If your installation includes support brackets, fasten these to the wall underneath the chamber to achieve correct door alignment. The pass-through chamber should rest on top of the support bracket without the need for additional fasteners (See **Figure 1:** *bottom*).

NOTE **Pass-through doors can be removed for sterilization by lifting upwards at the hinges.**

2.4 Floor Mounted Pass-throughs

CAUTION

The floor underneath and surrounding the pass-through must be flat and level within a tolerance of 1/16" for every 36".
An uneven floor surface may cause gaps to appear between the pass-through components and the floor.

1. Prepare the wall cut-out outlined in **Section 2.1**

2. Align the floor ramps with the bottom of the pass-through so that the two notches on the rear of the ramp hook onto the studs below the pass-through doors. Push the ramp in until it is flush with the surface of the pass-through and then set it down. The pass-through door may need to be opened to ensure the ramp is fitted properly. No fasteners are required.

NOTE

Although the pass-through is designed to operate under positive pressure and assumes some leakage, silicone caulking may be used to fill any seams or gaps after the installation is complete.

Figure 10: *Hook the ramps on the studs at the bottom of the pass-through*

2.5 Protruding Exhaust Flange or Filter Housing

If the pass-through arrived with either an exhaust flange or an ULPA filter housing preinstalled, these features will need to be detached from the pass-through prior to installation to allow the pass-through to fit through the wall cut-out.

Figure 11: *Exhaust Flange*

Figure 12: *ULPA Filter Housing*

1. To remove the exhaust flange, unscrew the 8 domed cap nuts around the base of the flange and remove the flange (See **Figure 11**).

2. To remove the ULPA filter housing, unscrew the 4 domed cap nuts on either side of the housing and remove both the ULPA filter and the housing (See **Figure 12**).

3. Reinstall these features once the pass-through installation has been completed. Installation is the reverse of disassembly.

3.0 Smart Pass-through Accessory Modules

NOTE **Refer to the original order form for details and specifications relating to your Smart Pass-through.**

The following section provides information relating to each of the available accessory modules. Each module must be specified at the time of order and typically cannot be retrofitted or field-installed. Smart Pass-throughs can be equipped with any number of accessory modules, resulting in many different possible combinations. Because of the customized nature of the Smart Pass-through, some details may differ from your particular configuration. Contact Terra Universal with any questions not answered by the information presented below.

3.1 UV-C Disinfection

WARNING **Avoid direct exposure to UV-C light. Never attempt to open the pass-through doors when the UV disinfection cycle is in progress.**

The UV-C Sanitizing Module performs an exposure cycle that neutralizes bacteria, viruses and mold spores within the pass-through chamber. The recessed UV-C light fixture is located in the ceiling of the chamber behind a quartz glass window that allows for complete transmission of UV-C wavelengths. The glass windows of the pass-through doors block UV-C light during the exposure cycle.

The light is activated when the pass-through door closes. Once the cycle begins, the interlock activates and the pass-through cannot be opened until a preset period of time has passed.

Figure 13: *Recessed UV-C light*

Figure 14: *Cycle time can be adjusted via the timer on the "dirty"-side of the pass-through*

Manual Cleaning and Sterilization

Use a clean, non-shedding cloth (polyester wipes are recommended) and wipe surfaces in a slow, unidirectional motions, folding the soiled surface of the cloth portion to trap contaminants after each pass. Avoid circular motions when cleaning. If cleaning with isopropyl alcohol or a similar agent, perform a full wipe-down of the sanitized area with deionized water.

Cavicide, Caviwipes and similar products contain ethylene glycol and benzethonium chloride, which are caustic chemicals that corrode stainless steel if not rinsed with water. After disinfecting with ethylene glycol or benzethonium chloride products, the affected area must be fully wiped down with deionized water and dried.

3.2 Recirculating Air Showers

The Recirculating Air Shower configuration equips the Smart Pass-through with one of Terra's fan/filter units. HEPA-filtered air flows down from the ceiling of the chamber and exits through vents at the bottom of the chamber before circulating back up through the walls of the pass-through. This recirculating air flow prevents particles from settling and accumulating within the pass-through chamber, while making the interior air progressively cleaner with each pass over the HEPA filter.

Figure 15: *A stainless steel screen hides the HEPA filter*

Figure 16: *Air escapes through the exhaust vents along the bottom of the chamber*

The FFU is controlled using a separate power switch and fan speed dial located on the "dirty" side of the pass-through. When switched on, the blower can take up to 30 seconds to ramp up to the indicated speed. Increasing the speed of the blower will increase the number of air exchanges per hour and increase the pressure within the chamber. However, increasing the speed too much can cause turbulence within the chamber and generate excessive heat from the motor.

A Minihelic gauge displays the pressure differential between the chamber and the external environment in inches of water column. A typical pressure differential will read as a fraction of an inch of water column (e.g. 0.5" WC), depending on the speed setting and the remaining life of the HEPA filter.

Figure 17: *Exposed filter after removing protective screen*

WARNING **Turn off both power switches prior to servicing the pass-through. If the unit is equipped with a key-switch, insert the key and turn it to BYPASS mode to disable the Smart Interlock.**

HEPA Filter Replacement

The HEPA filter should be replaced if there is a noticeable reduction in air flow or if a leak is present. Airflow should be measured with an air speed monitor and FFUs should be tested periodically to detect these changes.

1. Remove the metal screen on the ceiling of the chamber to expose the HEPA filter (See **Figure 17**).
2. Rotate the clips that hold the filter in place and allow the HEPA filter to drop out of the housing.

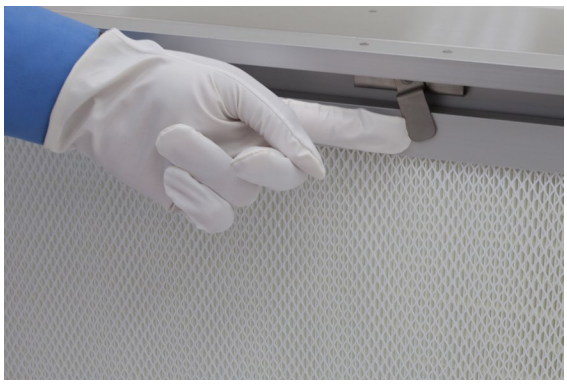


Figure 18: *Rotate the retaining clips to release the filter*

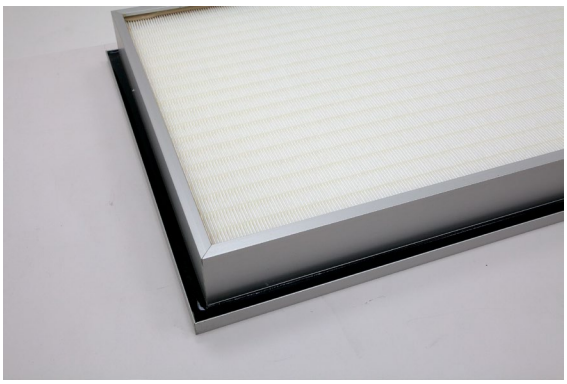


Figure 19: *Black gel-filled channel forms a seal when installed*

3. The HEPA filter assembly is surrounded by a gel-filled channel. Touching only the aluminum frame, lift the new HEPA filter up into the housing, pressing the knife-edges into the gel. Rotate the clips to secure it in the proper position.
4. Snap the protective metal screen back into the ceiling.

Replacement HEPA Filters	
Filter Size	**Cat. #**
2’ x 2’	6601-27-R
2’ x 3’	6601-26-R
2’ x 4’	6601-25-R

3.3 Load Presence Sensors

The optional Load Presence Sensors can detect objects placed within the pass-through using a pair of infrared beams. Whenever interference is detected between the IR transmitter and receivers, the Smart Pass-through Controller sends a signal to the “Load Presence” indicator lights on both sides of the pass-through, alerting personnel of materials ready for transfer. The indicator lights will blink until the object causing the interference has been removed.

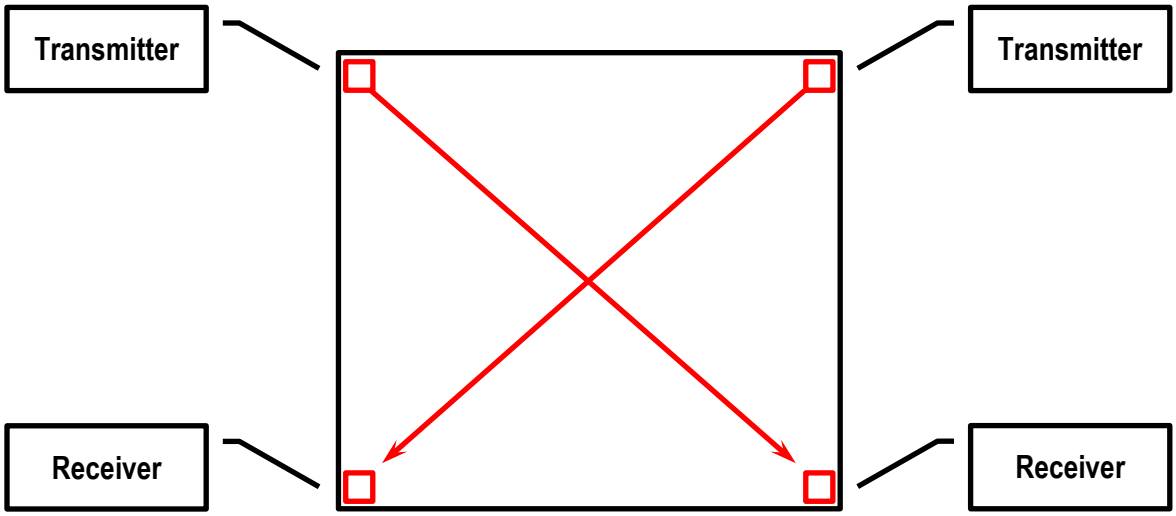


Figure 20: *View from above of the IR beam pattern*

NOTE **Be sure to always place materials near the center of the pass-through to avoid potential blind spots.**

3.4 Refrigeration Module

The optional Refrigeration Module quickly and quietly cools the internal chamber to the user's specifications. The module is mounted on top of the "dirty" side of the pass-through and requires that a support frame be installed below the pass-through (see **Figure 4**).

Be sure the evaporator drain tube exits from the bottom of the pass-through (see **Figure 21**). Connect the drain tube to an appropriate drainage device.

Turn on the unit using the green master power switch on the "dirty" side of the pass-through. The temperature controller is preconfigured for basic operation prior to shipment.

Figure 21: *Drain tube exiting the evaporator inside the pass-through*

CAUTION **To prevent overheating of the compressor and evaporator coils, the refrigeration module's air intake and exhaust vents must be clear of obstruction after installation.**

To enter a new set-point:

1. Press MENU once to open Setpoint 1 (Press MENU twice for Setpoint 2)
2. Display flashes the first digit of Setpoint 1
3. Press MAX to set the digit, 0-9
4. Press MIN to activate the next digit (flashing)
5. Repeat steps 3 and 4 until all digits are set
6. Press ENTER to save the new setting and return to Run Mode

For additional instructions on setting alarms or reconfiguring the controller, refer to the manual from the controller manufacturer: https://cdn.novusautomation.com/downloads/manual_n1040_v21x_i_en.pdf

Specifications			
Condenser		**Evaporator**	
Refrigerant	R-404A	**Btu/hr @ 10° TD**	1,200
Horsepower	¼ HP	**Btu/hr @ 12° TD**	1,440
Btu/hr	3,660	**Btu/hr @ 15° TD**	1,800
Power Requirements	115V, 60Hz, 1Ph	**CFM**	210
		Defrost	Electric
		Drain Connection	½" O.D.
		Fan Diameter	5-1/2"
		Number of Fans	2
		Volts	115

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.

All Claims: Terra Universal expressly disclaims all other warranties, expressed or implied or implied by statute, including the warranties of merchantability or fitness for intended use. Terra Universal is not responsible for consequential or incidental damages arising out of the purchase or use of the products supplied by Terra Universal. Terra Universal is not liable for damage to facilities, other equipment, products, property or personnel of others, or of their agents, suppliers, or affiliated parties, which is caused or alleged to have been caused by products supplied by Terra Universal. In any event or series of events, Terra Universal's total liability for any and all damages whatsoever is limited to the lesser of the actual damages or the original invoice cost of the items alleged to have caused the damage. The customer's sole and exclusive remedy for any cause of action whatsoever is repair or replacement of the non-conforming products or refund of the actual purchase price, at the sole option of Terra Universal. All claims must be made in writing within 90 days of the date the product was shipped. Any claims not made within this time limit shall be deemed waived by the customer. Terra Universal is not responsible for any additional costs of repair caused by poor packaging or in-shipment damage during return.

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."

Thank you for ordering from
Terra Universal!

5.0 Appendix: Installation Qualification Checklist

To confirm proper installation, fill out the checklist below for each pass-through installed. Note any suspected damage, deviations from installation procedures, or performance issues in the Comments section. Equipment is found to be acceptable only when all installation criteria have been accepted and the document signed by the relevant parties.

Installation Checklist

Verify the following:	Check if Confirmed and Accepted	Performed by / Date
All mounting brackets are secured tightly against the wall		
Support brackets (if provided) have been installed below the pass-through		
No gaps larger than 1/16" exist between the pass-through and the wall/floor surface		
Pass-through doors open smoothly and close completely, with the latch centered in the corresponding catch		
The seal/gasket on the inside of each door is intact, fully adhered to the door, and seats tightly against the face of the pass-through without visible gaps		
The interlock functions properly, preventing the door from opening when the opposite door is also open		
The interior of the pass-through is clean and clear of any debris from installation		
Floor ramps (if provided) have been positioned at the base of the pass-through		

Performed by: _____ Date: _____

Reviewed by: _____ Date: _____

Comments: