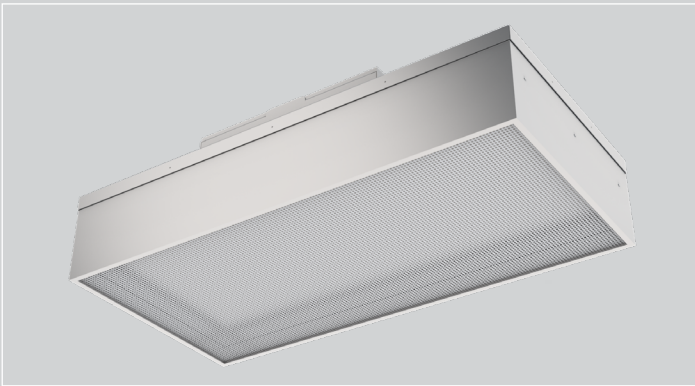


FFDL SERIES

INSTALLATION, OPERATION
& MAINTENANCE MANUAL



FAN FILTER UNIT
FFDL / FFDLRA

FFDL



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IMPORTANT INFORMATION

To ensure ordering of the proper replacement parts or complete FFDL Series unit, record the information from the serial number label, located adjacent to the electrical box, in the fields below for easy future reference. If you cannot locate the Sales Order Number, please contact TITUS for this information.

 Redefine your comfort zone.™		FFDL Series	
Fan Filter Unit AC: 120v 60 Hz 1.80 amps		N	Order Number CO-XXXXXXX
Covered by one or more of the following patents: nos. 4,560,395, & 5,470,363			Serial Number 150412345-BA-AS1CH
Titus 1-800-884-0002 www.titus.com		 LISTED 2F82 AIR FILTER E152685	Unit Part Number 11250-001
SUITABLE FOR COMMERCIAL OR INDUSTRIAL USE ONLY			Date MM/DD/YYYY
 150412345-BA-AS1CH		LABEL PN 268177-XXX	



SERIAL NO. LABEL

Company Purchased From _____

TITUS Job Number _____

Order Number _____

Serial Number _____

Unit Part Number _____

Date _____

Airflows per Certification _____

CONTACT INFORMATION

605 Shiloh Rd
Plano TX 75074
ofc: 972.212.4800
fax: 972.212.4884

CRITICAL OPERATION CONDITIONS OF THE FFDL SERIES

1. Touching the HEPA filter will damage it and will void the filter warranty. The screen is only to protect against an accidental 'touch' of the filter. Never place a hand or tool on the filter. Never lie filter face flat down on a surface; always have filter on its side to protect from damage.
2. Prior to powering the unit, verify the voltage on the label and that the unit has been wired to the correct voltage. The serial number label on the top of the FFDL Series unit has the required voltage, as shown on [page 3](#).

WARNING

TO REDUCE THE RISK OF FIRE, ELECTRICAL SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING

- A. Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
- B. When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.
- C. If this unit is to be installed over an area using liquid, such as water or chemical cleaning solutions, it must be marked as appropriate for the application.
- D. Use this unit only in the manner intended by the manufacturer. If you have any questions, contact the manufacturer.
- E. Before servicing or cleaning the unit, switch power off at unit service panel and lock service panel to prevent power from being switched on accidentally.
- F. NOTE – The FFDL Series has not been investigated for use in fire resistance rated construction.
- G. To fulfill our obligations towards Article 33, in accordance to European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list: Cadmium/ 1,3,5-triglycidyl-s-triazinetriene

PART NUMBERS COVERED BY THIS MANUAL

FFDL Filter	P/N
2 x 4 120V HEPA	11250-001
2 x 4 220V HEPA	11250-002
2 x 4 277V HEPA	11250-003
2 x 4 120V ULPA	11250-004
2 x 4 240V ULPA	11250-005
2 x 4 277V ULPA	11250-006

2 x 3.5 120V HEPA	11251-001
2 x 3.5 220V HEPA	11251-002
2 x 3.5 277V HEPA	11251-003
2 x 3.5 120V ULPA	11251-004
2 x 3.5 240V ULPA	11251-005
2 x 3.5 277V ULPA	11251-006

2 x 3 120V HEPA	11252-001
2 x 3 220V HEPA	11252-002
2 x 3 277V HEPA	11252-003
2 x 3 120V ULPA	11252-004
2 x 3 240V ULPA	11252-005
2 x 3 277V ULPA	11252-006

PART NUMBERS COVERED BY THIS MANUAL

FFDL Filter	P/N
2 x 2 120V HEPA	11253-001
2 x 2 220V HEPA	11253-002
2 x 2 277V HEPA	11253-003
2 x 2 120V ULPA	11253-004
2 x 2 240V ULPA	11253-005
2 x 2 277V ULPA	11253-006

FFDLRA Filter	P/N
2 x 4 120V HEPA	11254-001
2 x 4 220V HEPA	11254-002
2 x 4 277V HEPA	11254-003
2 x 4 120V ULPA	11254-004
2 x 4 240V ULPA	11254-005
2 x 4 277V ULPA	11254-006

2 x 3.5 120V HEPA	11255-001
2 x 3.5 220V HEPA	11255-002
2 x 3.5 277V HEPA	11255-003
2 x 3.5 120V ULPA	11255-004
2 x 3.5 240V ULPA	11255-005
2 x 3.5 277V ULPA	11255-006

2 x 3 120V HEPA	11256-001
2 x 3 220V HEPA	11256-002
2 x 3 277V HEPA	11256-003
2 x 3 120V ULPA	11256-004
2 x 3 240V ULPA	11256-005
2 x 3 277V ULPA	11256-006

2 x 2 120V HEPA	11257-001
2 x 2 220V HEPA	11257-002
2 x 2 277V HEPA	11257-003
2 x 2 120V ULPA	11257-004
2 x 2 240V ULPA	11257-005
2 x 2 277V ULPA	11257-006

Note: A "Z" in the part number indicates that the unit is special. This may indicate a size change from FFDL or a special filter. Please contact the factory for part numbers if this is the situation.

INSTALLATION

Note: The FFDL Series Fan Filter Unit is completely assembled at the factory with the exception of the optional 1/4" (0.64 cm)-20 eyebolts that are used when hanging the unit from an engineered support system and with installation of the HEPA/ ULPA filters. (Eyebolts are not included and need to be ordered separately, p/n 222449-001.)

Step 1: Carefully remove the unit from the shipping carton and inspect for any damage that may have occurred during transportation. (See Figure 1.)

Note: When ordering FFDLRA units, the HEPA filters may be shipped separately to be installed into units after the fan box has been installed.

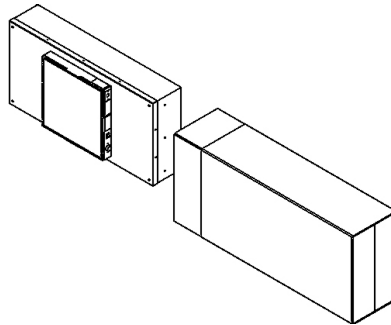


FIGURE 1 : UNBOXING

Step 2. Wipe down plastic bag and move unit into cleanroom. (Double bagging is available upon request.)

Step 3. If using rigidly supported grid (usually 2" (50 mm) or wider), raise unit through ceiling and lower onto the gasketed grid. If using a flexible grid (typically supported with wires), the unit must be secured to an engineered support system with eyebolts, s-hooks, and chain. Screw the four eyebolts into the nutserts on the lid assembly before lifting into an overhead position. (See Figure 2.)

Note: Confirm fan dimensions to match T-grid dimensions. Special size units are available to fit specific cleanroom grid systems.

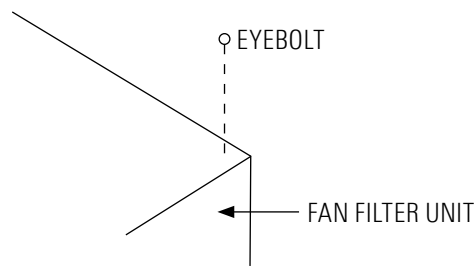


FIGURE 2 : HANGER SUPPORTS

Step 3.1. If using a support grid, continue...

Step 4. Raise the unit and secure it into place using the chosen support system method suspended from a structural support bracing.

Step 5. Have an electrician wire the unit to the appropriate voltage, according to the wiring diagram (page 15), and all national and local electrical codes. If optional power cord was purchased, plug unit into a grounded receptacle. The optional power cord is not acceptable for plenum installations.

Step 6. Turn on the power using the rocker switch (ON/OFF) located on the electrical box. For FFDLRA units, let the unit run for a few hours to purge off particulate (if filters are shipped loose) that may be adhered to the inside of the unit before installing the filters. Do not run fan at full speed, as this may cause overload condition.

Note: Your fan filter controls may have been shipped separately.

UNIT CONTROL BOX

ON/OFF Switch - Speed/Airflow Adjustment

FFDL Series units are equipped with a two-position rocker switch (ON/OFF) and Solid State Speed Control (SSSC), which are located on the front side of the electrical box. (See Figure 3.)

Recommended fan speed during initial start-up and operation is at a low speed. As airflow eventually decreases due to filter loading, fan speed may be increased by moving the SSSC first to a medium speed and eventually to a high speed. Periodic airflow readings (per IEST specifications) should be conducted to determine the filter condition and appropriate fan setting.

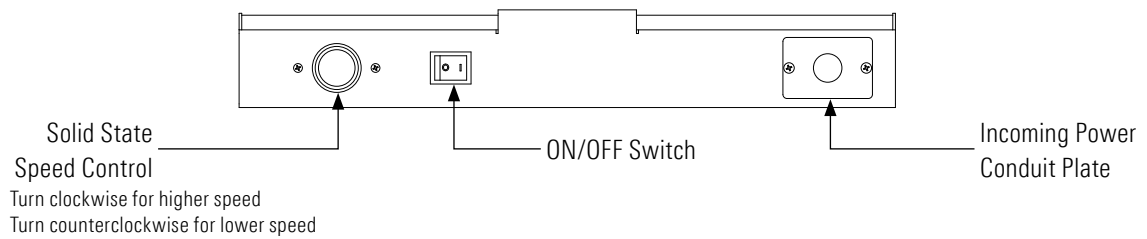


FIGURE 3: SPEED/AIRFLOW ADJUSTMENT

CLEANING THE FFDL SERIES PREFILTER (STANDARD FOAM)



Disconnect the unit from the electrical power source before attempting any service.

Tools Required: None.

Note: To keep the filter in top operating condition, washing the foam prefilter (if installed) is recommended every three to six months.

Step 1. To gain access to the prefilter, remove the ceiling panel next to the unit, if applicable.

Step 2. Switch the ON/OFF switch to the OFF position.

Step 3. Remove the prefilter from the snap-in frame. (See Figure 4, below.)

Step 4. Clean the prefilter by hand washing in water with a mild detergent or by using a vacuum cleaner. Allow prefilter to dry completely before replacing.

Step 5. Complete by reversing the above steps.

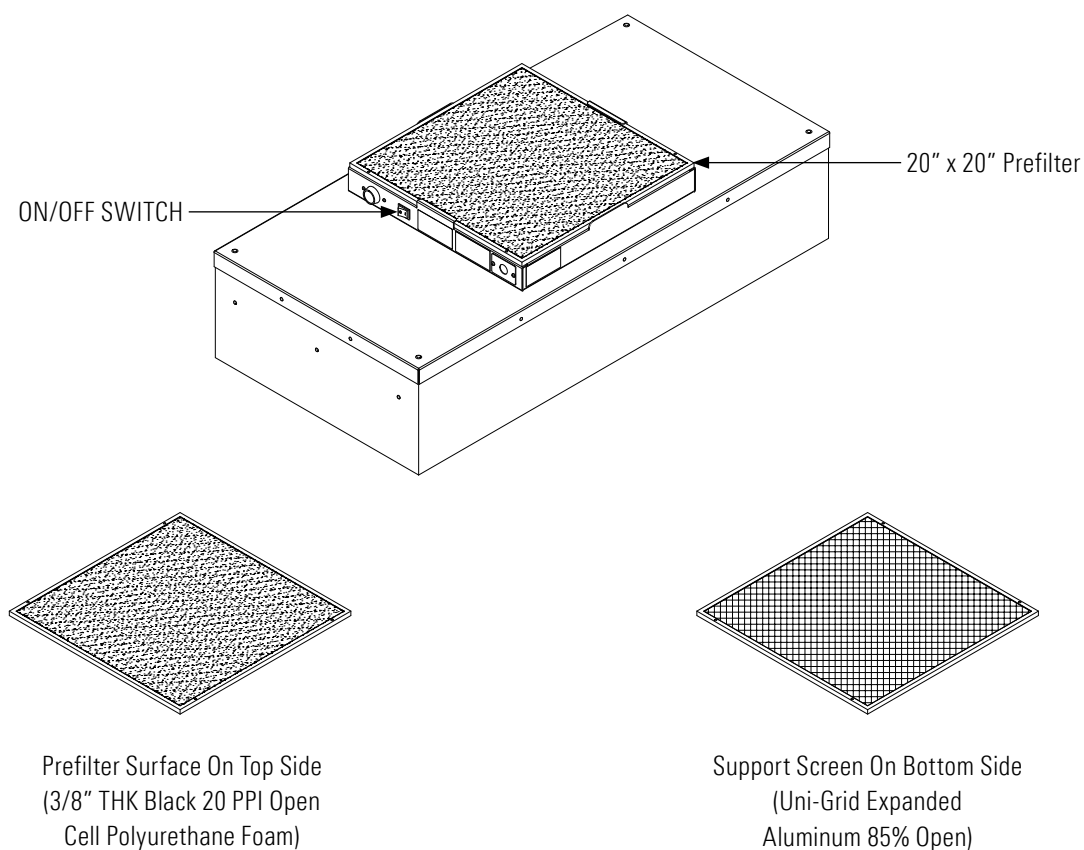


FIGURE 4: FOAM CLEANING PREFILTER

CHANGING THE FFDL SERIES PREFILTER (G4 PLEATED)



Disconnect the unit from the electrical power source before attempting any service.

Tools Required: None.

Note: To keep the filter in top operating condition, replacing the pleated prefilter is recommended every twelve months or sooner.

Step 1. To gain access to the prefilter, remove the ceiling panel next to the unit, if applicable.

Step 2. Switch the ON/OFF switch to the OFF position.

Step 3. Remove the prefilter from the snap-in frame. The beverage board frame has slots that have to be depressed to release the filter from the prefilter housing (See Figure 5, below.)

Step 4. After removing the new G4 pleated prefilter from the box, remove the die cut slots from the beverage board frame and install on prefilter bracket.

Step 5. Complete by reversing the above steps.

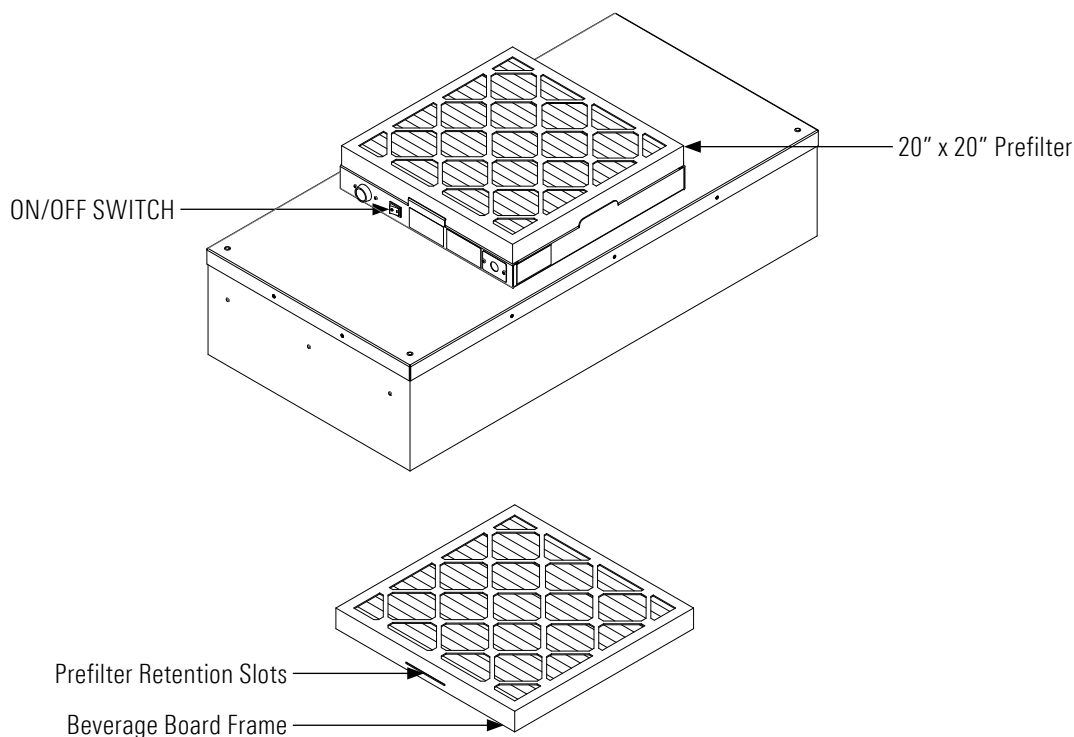


FIGURE 5: G4 PREFILTER PLACEMENT

SERVICE: REMOVAL AND REPLACEMENT OF FFDL HEPA/ULPA FILTERS



Disconnect the unit from the electrical power source before attempting any service.



The FFDL 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. Only handle the filter by the frame.

Note: All filters should be visually inspected for freight damage before installation. It is necessary to use two workers when removing the filter and for installation to avoid twisting or separation of the media seals. Handle the filter only by the frame and never place anything on the upstream filter side of the filter. Additionally, it is important to keep the filter level to prevent any shearing force on the media itself.

For FFDL Filters:

Tools Required: Phillips head screwdriver, rivet hand tool, Ø5/32 aluminum rivet grip range .126-.187

Step 1. Remove unit from ceiling.

Step 2. Remove the eight screws holding the HEPA/ULPA filter to the lid assembly.

Step 3. Lift the lid assembly off the HEPA/ULPA filter. (See Figure 6.) Discard the used filter as per requirements of the applicable regulations.

Note: Before replacing with a new HEPA/ULPA filter, carefully inspect the new filter for any visual damage. Also, inspect the gasket in the "tee" bar to ensure a tight seal. Replace as necessary.

Step 4. Install rivets in ends to plug unused holes.

Step 5. Replace with the new HEPA/ULPA filter and complete by reversing the above steps.

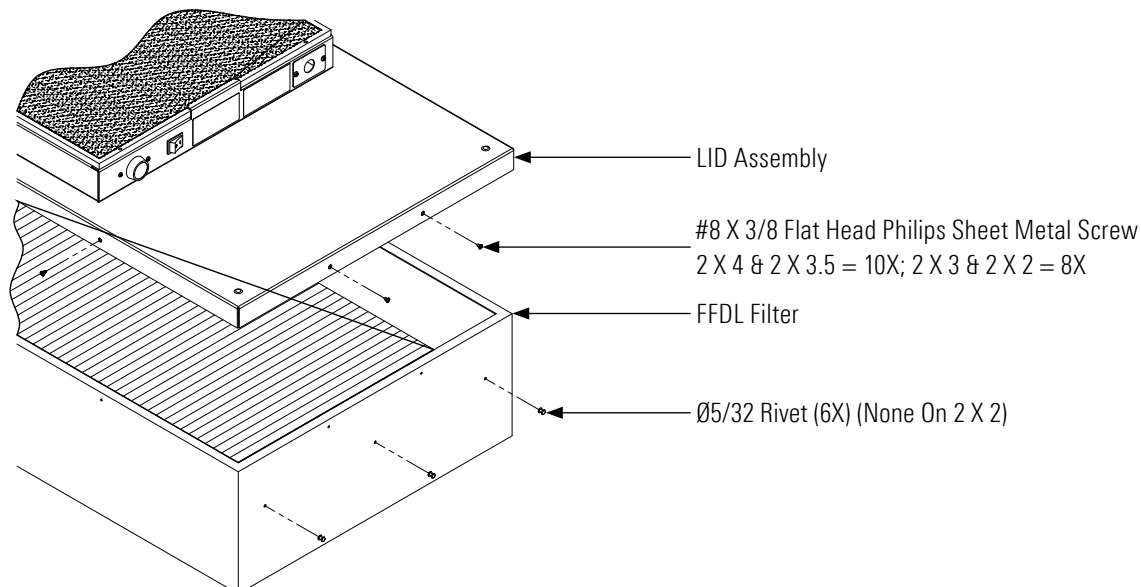


FIGURE 6: FFDL FILTER REPLACEMENT

SERVICE: REMOVAL AND REPLACEMENT OF FFDLRA GEL SEAL FILTERS



Disconnect the unit from the electrical power source before attempting any service.



The FFDLRA 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. Only handle the filter by the frame.

Note: All filters should be visually inspected for freight damage before installation. It is necessary to use two workers when removing the filter and for installation to avoid twisting or separation of the media seals. Handle the filter only by the frame and never place anything on the upstream filter side of the filter. Additionally, it is important to keep the filter level to prevent any shearing force on the media itself.

For FFDLRA Filters:

Tools Required: Phillips head screwdriver, 3/16" ball driver hex head wrench

Step 1. Remove the diffuser screen by removing the six 10-32x1/2 screws.

Step 2. Loosen the six 1/4x20 socket cap head screws far enough to rotate the filter clip 90°. The filter will not drop during this operation. Slowly pull the filter away from the knife-edge seal, taking care not to touch the filter face during this operation. It is important to pull the filter slowly and evenly away from the seal so that the gel remains in the filter track.

Step 3. Inspect filter for visual damage. If damaged, set aside for replacement or repair.

Step 4. Inspect the gel seal if reinstalling the removed filter. Determine if the gel has lost its ability to seal. If so, have a certified professional replace the missing, dried out, and/or severely damaged gel.

Step 5. Place the filter evenly against the filter plenum housing of the FFDLRA unit. Install filter clips and screws. The clips can be rotated and angled into place. Using the clips as a lever, the filter can be seated. It is recommended to work either clockwise or counter-clockwise around the filter and raise the filter into the gel.

Step 6. Reinstall screen. Reinstall and hand-tighten diffuser screen screws. Avoid overtightening the screen hardware.

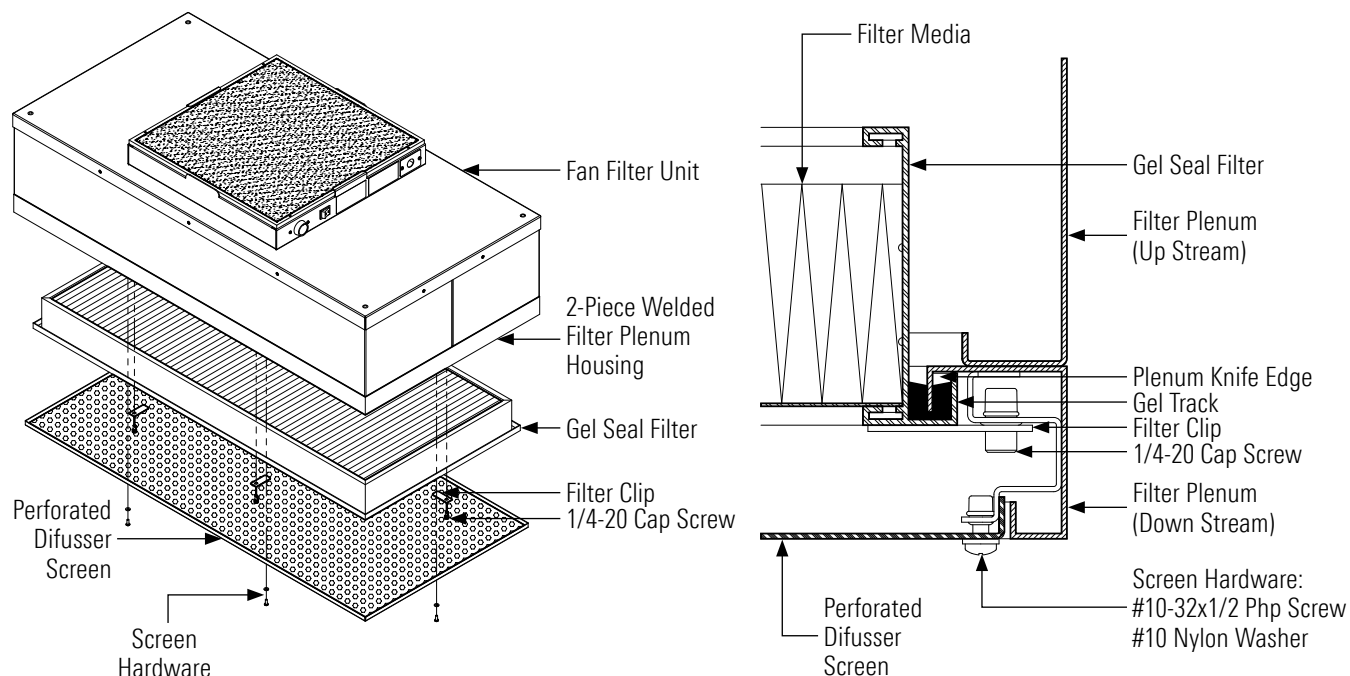


FIGURE 7: FFDLRA FILTER REPLACEMENT

SERVICE: FFDL MOTOR REMOVAL AND INSTALLATION FROM ABOVE CEILING



Disconnect the unit from the electrical power source before attempting any service.



Electrical service should only be performed by licensed electricians or authorized TITUS service technicians.

Tools Required: Phillips head screwdriver, wire cutters to remove tie-down and install replacement tie-downs

- Step 1.** To gain access to the motor, remove the ceiling panel next to the unit, if applicable.
- Step 2.** Switch the ON/OFF switch to the OFF position.
- Step 3.** Remove the prefilter off the prefilter frame.
- Step 4.** Loosen the electrical cover screws (two), and slide/lift off cover. (See Figure 9.1.)
- Step 5.** Disconnect incoming power connections.
- Step 6.** Using a low torque setting, remove challenge port tubing, if applicable. (See Figure 8.)
- Step 7.** Remove the eight screws to free the motor/blower assembly from the lid assembly. If using power drivers, set the unit to a low torque setting to avoid stripping the sheet metal screws (See Figure 9.1.)
- Step 8.** Lift motor/blower assembly lid and turn upside down.
- Step 9.** Disconnect motor wire harness connector from prefilter bracket.
- Step 10.** Remove the four screws mounting the blower bracket to the blower assembly plate, and cut cable tie securing blower cable to blower bracket. Remove motor mount assembly from plate.
- Step 11.** Remove the four screws mounting the blower to the blower bracket. (Note orientation of blower cable to bracket.)
- Step 12.** Install new motor/blower and components previously removed in reverse order to complete work. Don't forget to reinstall challenge port tubing, if applicable.

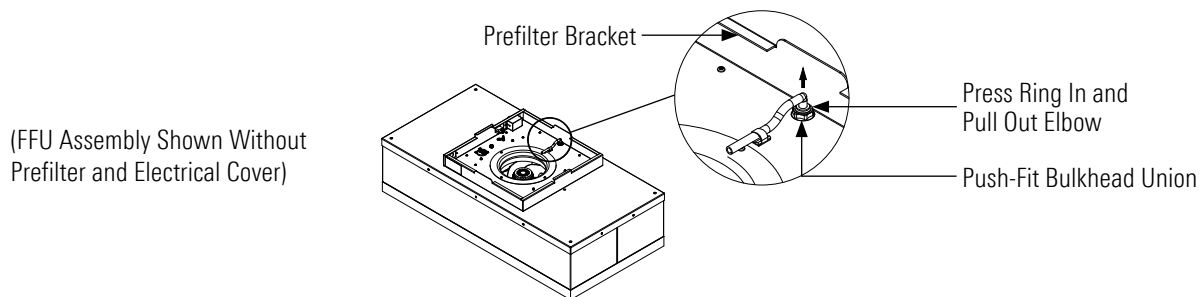


FIGURE 8: CHALLENGE PORT DETAIL

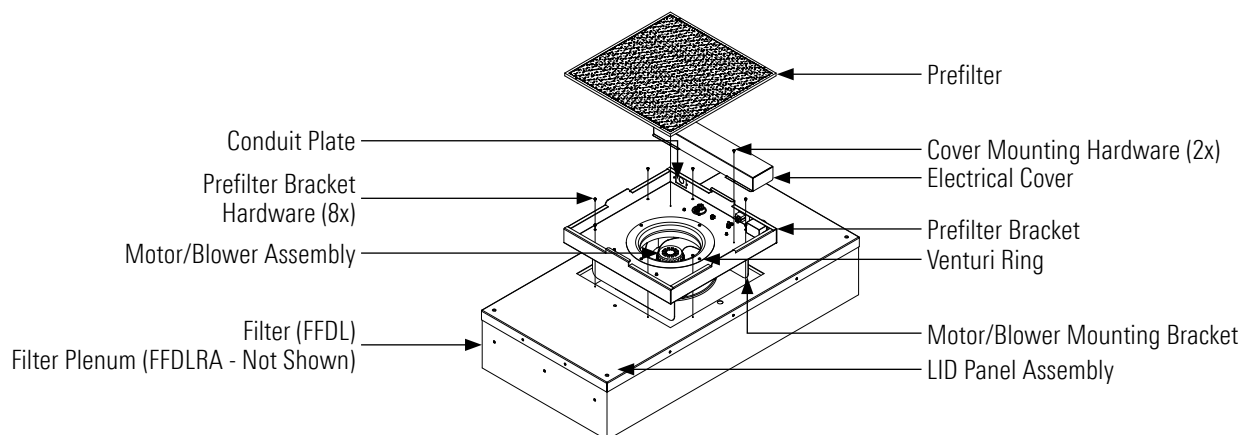


FIGURE 9.1: FFDL MOTOR REPLACEMENT

SERVICE: FFDLRA MOTOR REMOVAL AND INSTALLATION



Disconnect the unit from the electrical power source before attempting any service.



Electrical service should only be performed by licensed electricians or authorized TITUS service technicians.

Tools Required: 3/16 hex head wrench, Phillips head screwdriver.

Note: It is highly recommended to also change the motor capacitor when changing the motor.

Step 1. To gain access to the motor, remove the gel seal HEPA/ULPA filter.

Step 2. Switch the ON/OFF power switch on top of the unit to the OFF position, or, if easier, OFF at the breaker panel.

Step 3. Disconnect motor wire harness connector from top panel, per filter removal instructions on page 10.

Step 4. Remove the four screws mounting the blower bracket to the upper plate, and cut cable tie securing blower cable to blower bracket. Remove motor mount assembly from plate.

Step 5. Place motor mount assembly on workstation. Remove the four screws mounting the motor to the blower bracket. (Note orientation of blower cable to bracket.)

Step 6. Install new motor/blower and components previously removed in reverse order to complete work. Carefully tighten motor mount bracket screws. Don't forget to reinstall challenge port tubing.

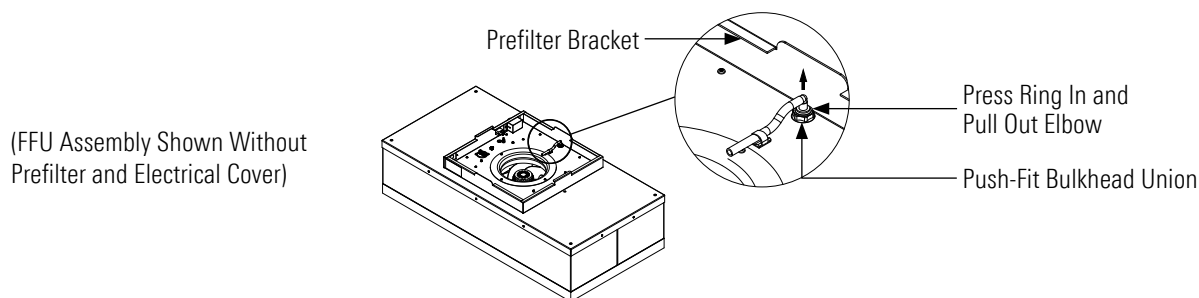


FIGURE 8: CHALLENGE PORT DETAIL

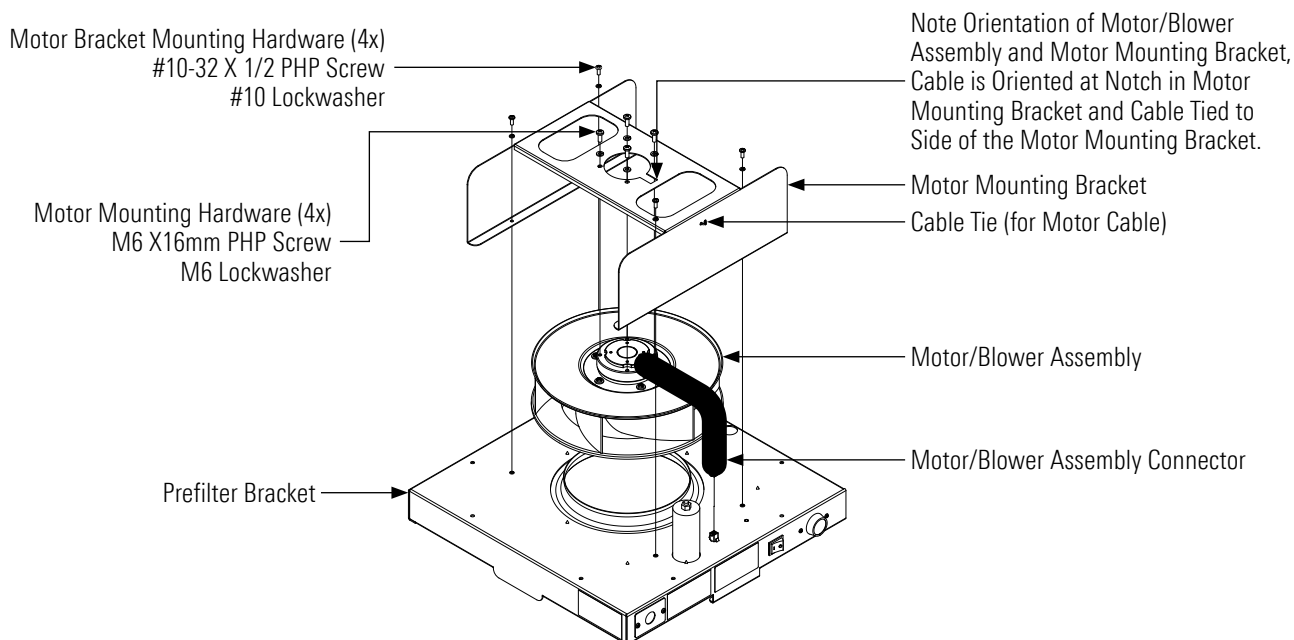


FIGURE 9.2: FFDLRA MOTOR REPLACEMENT

TROUBLESHOOTING

IF LOW AIR VELOCITY

- Step 1.** Check prefilter media; replace or clean as necessary.
- Step 2.** Adjust SSSC clockwise for higher blower output.
- Step 3.** Check power supply for proper voltage, amperage, and distribution frequency.
- Step 4.** Replace HEPA filter if the air velocity remains low.

IF HIGH AIR VELOCITY

Adjust SSSC counterclockwise for lower blower output.

NON-LAMINAR FLOW AND/OR EXCESSIVE CONTAMINATION

- Step 1.** Ensure that no large obstructions are upstream of airflow pattern.
- Step 2.** Determine that no other air-moving devices are operating in or around cleanroom which disrupt room's airflow pattern.
- Step 3.** Check air velocity and, if low, conduct the "Low Air Velocity" procedure outlined above.
- Step 4.** Conduct smoke and photometer test on HEPA filter. Seal or replace HEPA filter as necessary.

Contact Technical Support at:

TITUS

605 Shiloh Rd
Plano TX 75074
ofc: 972.212.4800
fax: 972.212.4884

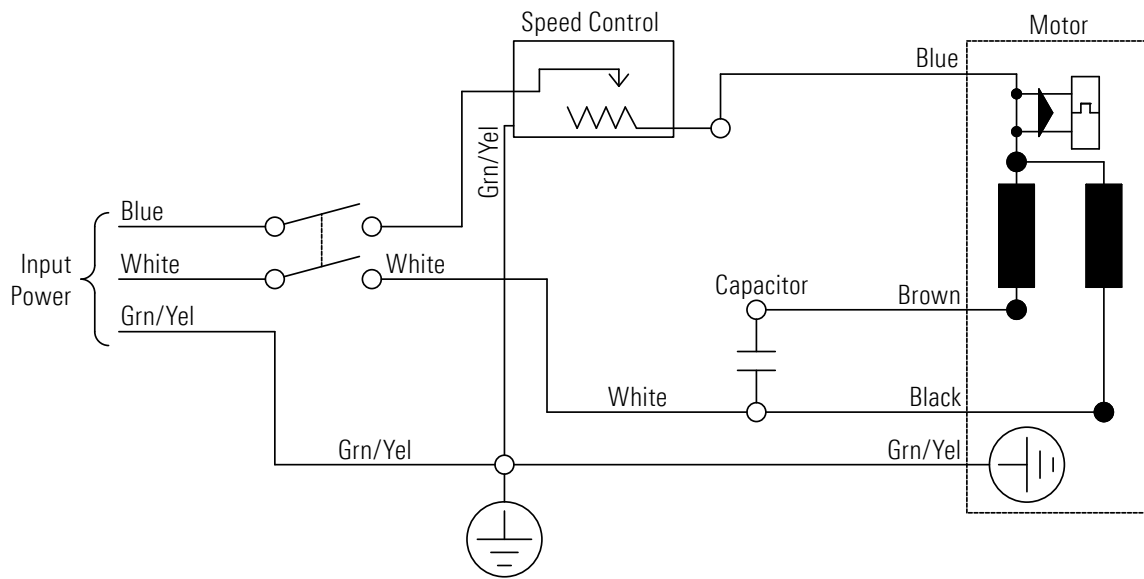
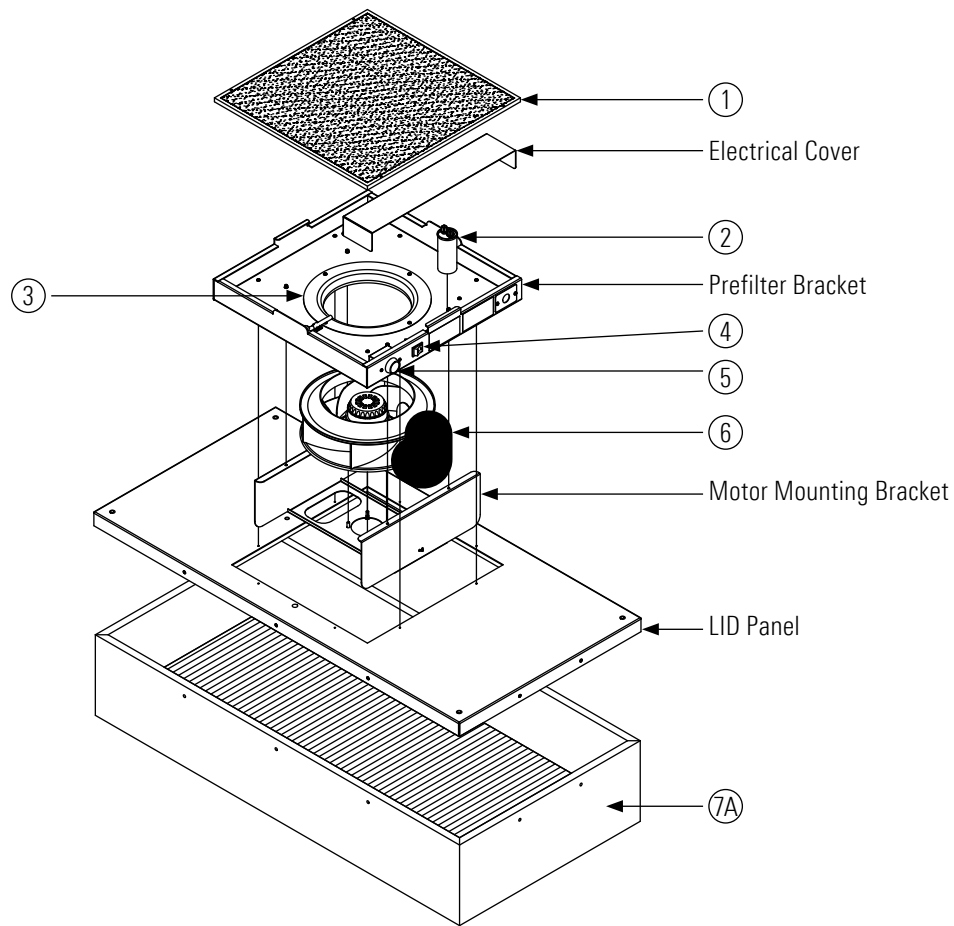


FIGURE 10: WIRING DIAGRAM (SSSC)

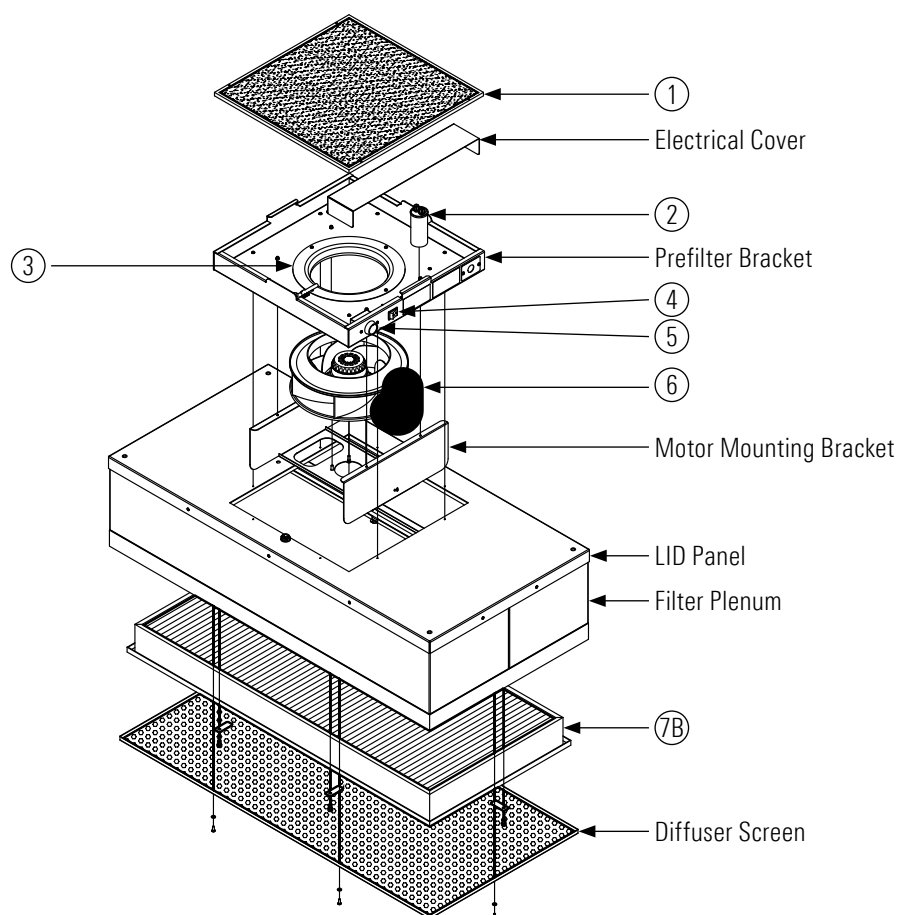
FFDL SERIES REPLACEMENT PARTS DIAGRAMS



FFDL STYLE

Item	Description	Part Number
1	Pre-Filter, 20 x 20, Foam (FFDL)	62981-038
1	Pre-Filter, 20 x 20, 2" Pleated (Optional)	64125-001
2	Capacitor, 440VAC, 3μF (230V)	268110-001
2	Capacitor, 440VAC, 4μF (277V)	268110-002
2	Capacitor, 440VAC, 16μF (115V)	268110-003
3	Venturi Ring	268109-001
4	Rocker Switch, DPST (ON/OFF)	63739-002
5	Speed Control (115V)	268716-115
5	Speed Control (230V)	268716-230
5	Speed Control (277V)	268716-277
6	Motor/Blower Assembly (115V)	268171-115
6	Motor/Blower Assembly (230V)	268171-230
6	Motor/Blower Assembly (277V)	268171-277

FFDL SERIES REPLACEMENT PARTS DIAGRAMS



FFDLRA STYLE

Item	Filter Replacement, FFU Size (Actual Filter Size)	Part Number HEPA (99.99%)	Part Number ULPA (99.9995%)
7A	FFDL Filter, 2 x 4 (23.63 X 47.63)	69600S-001HAPXX	69600S-001UAPXX
7A	FFDL Filter, 2 x 3.5 (23.63 X 41.63)	69600S-002HAPXX	69600S-002UAPXX
7A	FFDL Filter, 2 X 3 (23.63 x 35.63)	69600S-003HAPXX	69600S-003UAPXX
7A	FFDL Filter, 2 X 2 (23.63 x 23.63)	69600S-004HAPXX	69600S-004UAPXX
7B	FFDLRA Filter, 2 X 4 (21.00 x 45.00)	69601-001H	69601-001U
7B	FFDLRA Filter, 2 X 3.5 (21.00 x 39.00)	69601-002H	69601-002U
7B	FFDLRA Filter, 2 X 3 (21.00 x 33.00)	69601-003H	69601-003U
7B	FFDLRA Filter, 2 X 2 (21.00 x 21.00)	69601-004H	69601-004U

LIMITED WARRANTY

LIMITED WARRANTY:

Unless otherwise expressly stated in TITUS's published specifications for the Goods, TITUS warrants that Goods are free from defects in material and workmanship, except for services which are warranted to be performed in a competent and diligent manner in accordance with any mutually agreed specifications. The foregoing warranty shall apply for eighteen (18) months from the date of shipment from TITUS's facility, except for services for which the warranty shall apply for ninety (90) days from the date of performance (the "Warranty Period"). Provided Buyer informs TITUS in writing of any breach of warranty prior to the expiration of the applicable Warranty Period, TITUS shall, as its sole obligation and Buyer's sole and exclusive remedy for any breach of this warranty, repair or replace/re-perform the Goods which gave rise to the breach or, at TITUS' option, refund the amounts paid by Buyer for the Goods which gave rise to the breach. Any repair, replacement or re-performance by TITUS hereunder shall not extend the applicable Warranty Period. The parties shall mutually agree on the specifications of any test to determine the presence of a defect. Unless otherwise agreed upon by TITUS in writing, Buyer shall bear the costs of access, de-installation, re-installation and transportation of Goods to TITUS and back to Buyer. These warranties and remedies are conditioned upon (a) the proper storage, installation, operation, and maintenance of the Goods and conformance with the proper operation instruction manuals provided by TITUS or its suppliers or subcontractors, (b) Buyer keeping proper records of operation and maintenance during the applicable Warranty Period and providing TITUS access to those records, and (c) modification or repair of the Goods only as authorized by TITUS. TITUS does not warrant the Goods or any repaired or replacement parts against normal wear and tear or damage caused by misuse, accident, or use against the instructions of TITUS. Any modification or repair of any of the Goods not authorized by TITUS shall render the warranty null and void. EXCEPT AS EXPRESSLY SET FORTH HEREIN, TITUS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE WHICH ARE HEREBY DISCLAIMED TO THE EXTENT PERMITTED BY APPLICABLE LAW.

TESTING

Each FFDL Series filter unit is thoroughly tested at the factory before shipment. However, because of the “rigors” of shipping, TITUS encourages its re-test after installation.

TITUS recommends that the customer contact an independent organization, with technicians trained and experienced in performance evaluation and maintenance of clean air equipment.

HEPA filters (Type J) are tested to IEST-RP-00034. ULPA filters are tested to (Type F) IEST-RP-00034. All filters are UL 900 recognized. Your filters may have special requirements; please see original engineering specifications for your specific project.

All units that are airflow tested at TITUS are tested using a Shortridge Airdata Multimeter 870 with a Velgrid head. The recommended method of reading is to place one corner of the Velgrid head 1-1/4” from the corner of the filter face, take four readings evenly spaced along the four foot side, then repeat these reads three additional times. This gives a total of eight readings to test the unit. All advertised data is based on using the Velgrid with eight readings (128 velocity points). TITUS recognizes that using eight readings during a cleanroom start-up may be time-consuming and recommends that using four Velgrid readings taken on each 2x2 filter section will approximate the same as eight readings.

