INSTALLATION &
OPERATION MANUAL

Fan Filter Unit

FFDE / FFDER / FFDERA

Redefine your comfort zone. ™ | www.titus-hvac.com

Titus

Table of Contents

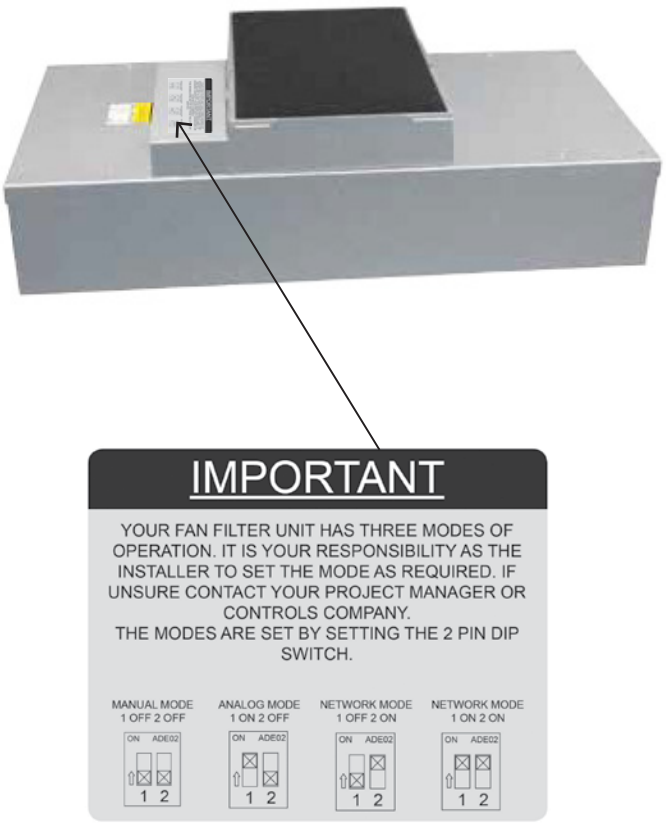
Critical Operation Conditions of FFD, FFDR, & FFDRA models

1. Touching of the HEPA filter will damage it, voiding the warranty on the filter. The screen is only to protect against an accidental 'touch' of the filter. Never place a hand or tool on the filte . Never lie filter face flat down on a surface alwa have filter on its side to protect from damage.
2. Prior to powering the unit, verify voltage on label and that the unit has been wired into the correct voltage. The serial number label on the top of the unit has the required voltage.
3. To insure you order the proper replacement parts or complete unit, record the part number and serial number. This information is located on the serial number label, located adjacent to the electrical box. If you can't locate the Sales Order Number, please contact Titus for this information. Once obtained, record the information for reference.

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.



Units come set in manual mode from the factory. Please review installation requirements and set up with your end user (See page 8 for complete set up instructions).

Installation

Note: Titus fan filter units are completely assembled at the factory with the exception of the optional ¼"-20 eyebolts that are used when hanging the unit from an engineered design support system and installation of the HEPA/ULPA filters (eyebolts not included and can 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 FFDR and FFDRA units, the HEPA filters may be shipped separately to be installed into units after the fan box has been installed.

Recommendation: Review mode settings at this time as specified for installation (see page 6 for controls).

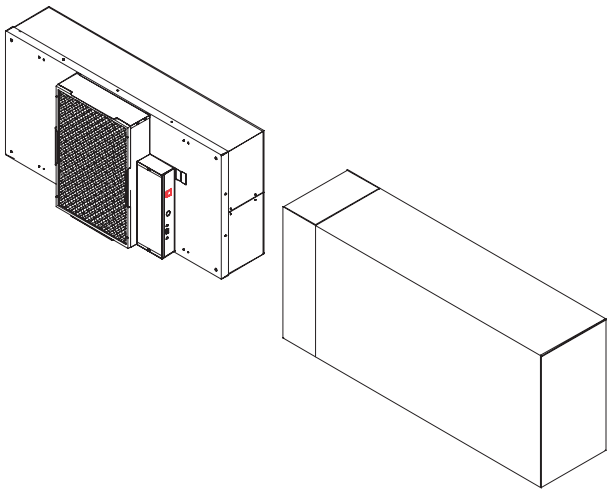


Figure 1: Unboxing

Step 2. 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 design support system with 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.

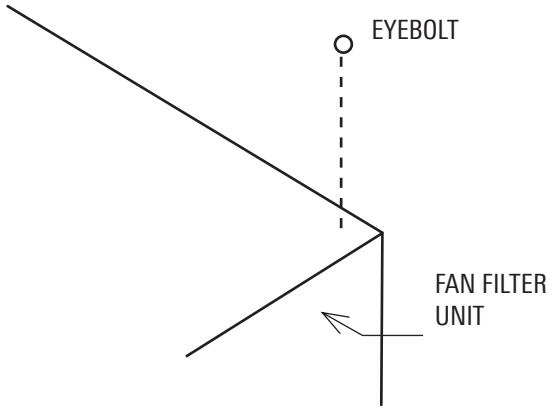


Figure 2: Hanger Supports

Step 3. Raise the unit and secure it into place using the chosen support system method suspended from a structural support bracing.

Step 4. Have an electrician wire the unit to the appropriate voltage, according to the wiring diagram (page 21-23), and all national and local electrical codes. All units are equipped with a three position terminal block for field onnection. Verify correct singlephase power, before energizing units.

Step 5. Turn on the power using the two position rocker switch (ON/OFF) located on the electrical box. For FFDR and FFDRA 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.

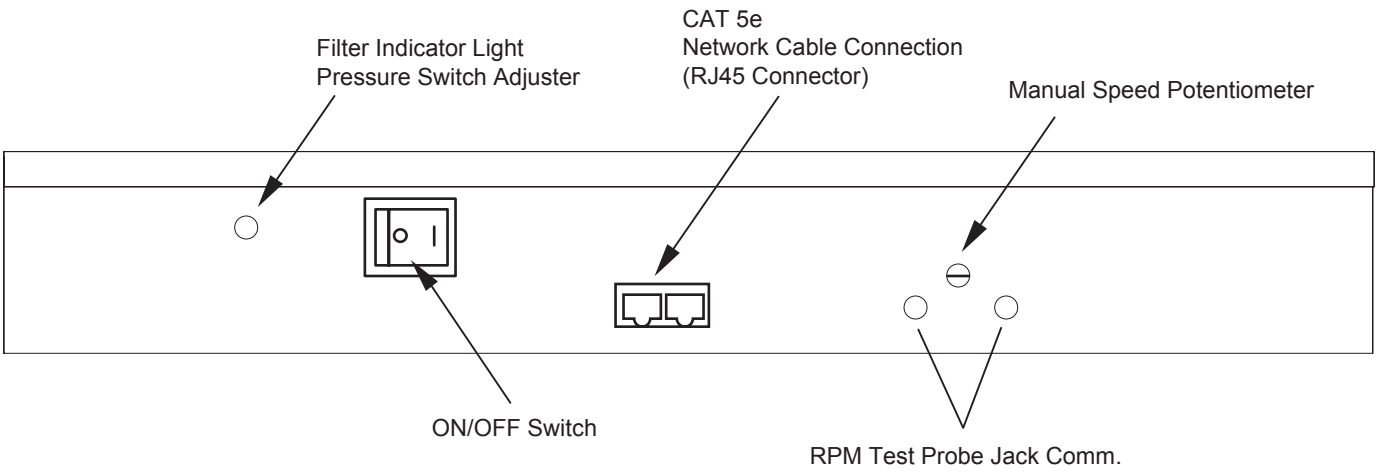
Note: Your fan filter may have been shipped separate. Controls have been shipped separately.

Unit Control Box

ON/OFF SWITCH - SPEED/AIRFLOW ADJUSTMENT

All units are equipped with a two-position rocker switch (ON/OFF), which is located on the side of the electrical box, on top of the unit. Unless specified otherwise units are furnished with a Universal Control Card to enable adjustment of airflow or set to your means of communication. (see Page 6 for CON4 Universal Card Card Set Up).

Note: The CAT5e/RJ45 network ports are non-directional (i.e. in or out). Be sure to examine your cabling to insure that there is no cross-over wired cables.



FILTER INDICATOR LIGHT OPTION:

The pressure switch for the filter indicator light option is set at 0.60 in wc from the factory. The set point for the pressure switch can be adjusted between 0.50 in wc and 3.00 in wc by turning the set screw, accessible for the front of the control enclosure. Counterclockwise rotation will increase the set point differential for switching; clockwise rotation will reduce the set point.

The process to adjust this for a specific application is detailed below:

Step 1. Adjust fan speed to highest setting

Step 2. Measure and note initial pressure differential between ceiling plenum and unit plenum (downstream of the fan & upstream of the filter)

Step 3. Restrict discharge airflow incrementally to increase differential pressure until measured value matches filter loading requirements for the project

a. If no specific filter loading requirements are specified a general recommendation is to use twice the pressure differential measured in step 2

Step 4. With the unit discharge blocked, adjust the set point of the pressure switch

a. If the indicator light is illuminated, increase the set point of the pressure switch (CCW rotation) until the is unilluminated
   i. Slowly decrease set point until light illuminates
b. If the indicator light is unilluminated, slowly decrease the set point of the pressure switch (CW rotation) until the light illuminates

Step 5. Remove obstruction(s) from the unit discharge

Step 6. Adjust fan speed to operational set point

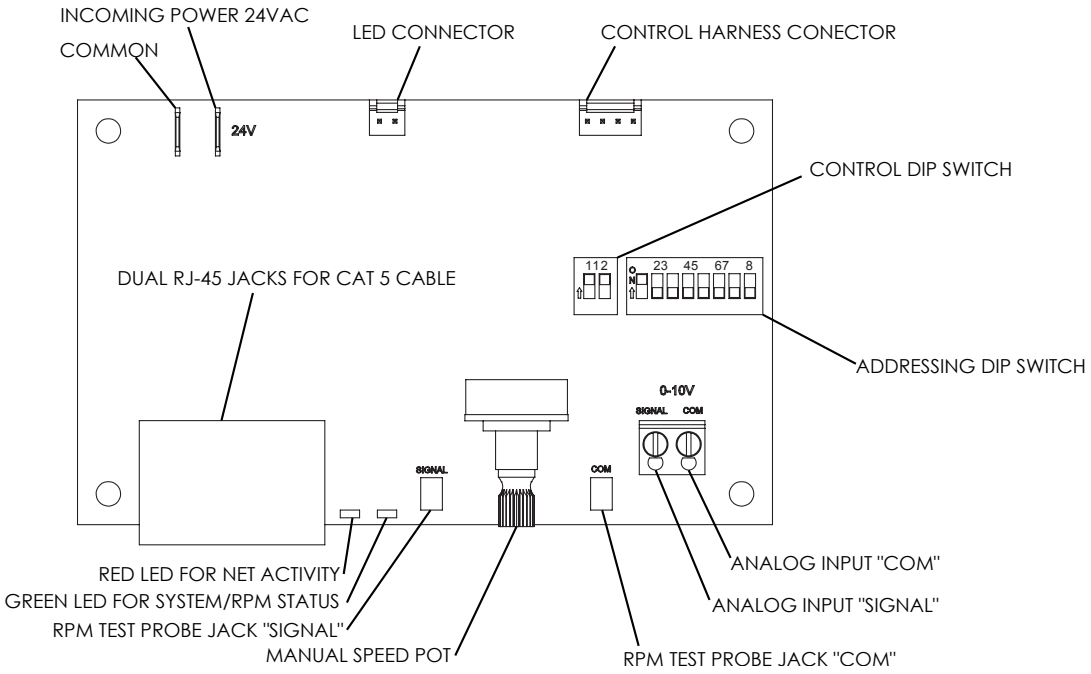
CON4 Universal Control Card Set Up (Model ENV1028)

CON4 UNIVERSAL CONTROL CARD - PRODUCT OVERVIEW

Titus's ENV1028 Universal Control Card provides MODBUS network and analog control capabilities to a Titus Fan Filter Unit equipped with an electrically commutated motor. Three different control modes provide installation versatility by allowing the FFU to be controlled via MODBUS RTU network, analog 0-10 VDC control signal, or by adjusting the onboard potentiometer. The ENV1028 Universal Control Card is fully compatible with all of Titus's plug & play System Control Consoles using MODBUS RTU. Additional details of the controls modes are provided on page 7.

FEATURES

- Networkable Via MODBUS RTU
- 0-10 VDC Analog Control
- Manual Control Via Onboard Potentiometer
- Simple Connections
  - RJ45 For Networking Connection
  - Screw Terminals For Analog Control
  - Test Probe Jacks For DC mV Signal Output Of The Following:
    - RPM
    - Motor Control Set Point
- LED Diagnostics
  - Support for external LED (10mA) remote status notification via 2 Pin MTA connector
  - Onboard green LED for Board Status notification
  - Onboard red LED for Network Traffic
- Powered from Network or Local Supply

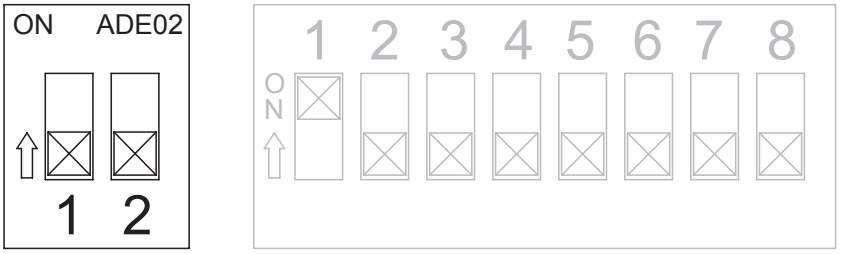


Control Modes

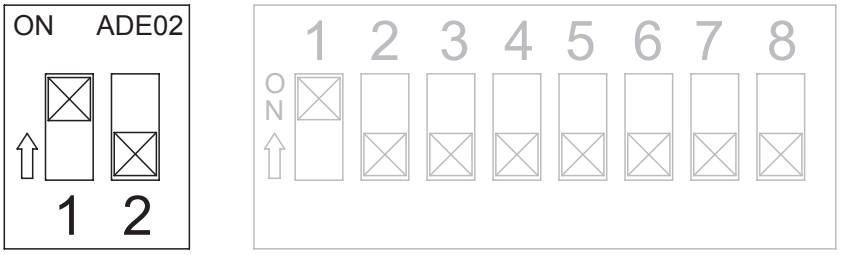
The ENV1028 operates in one of three selectable modes. The Mode is selected using DIP Switch S1.

- MANUAL control, on-board potentiometer
- ANALOG control, Remote 0-10 VDC
- NETWORK control, MODBUS RTU

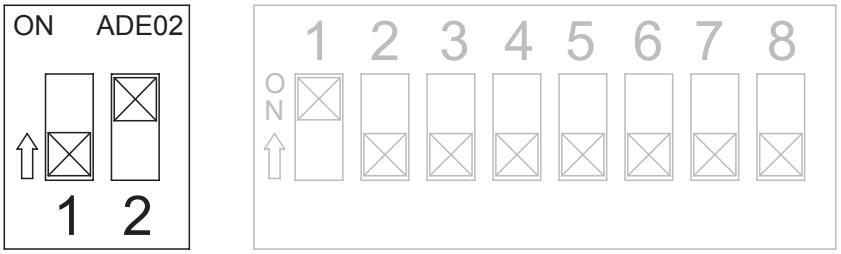
Manual Mode = 1 OFF 2 OFF



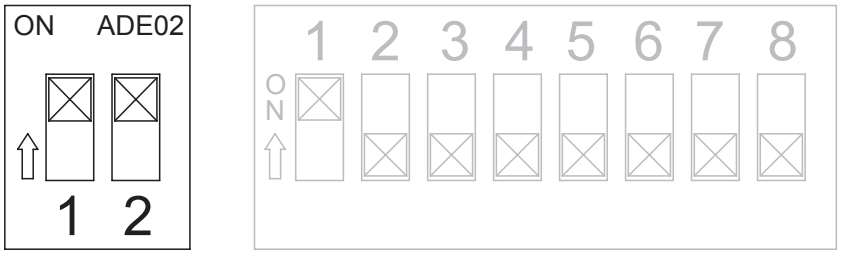
Analog Mode = 1 ON 2 OFF



Network Mode = 1 OFF 2 ON



Network Mode = 1 ON 2 ON



Note: Network mode can be configured using either DIP switch setting shown above. DIP switch pictorials are for reference and may be labeled differently by the manufacturer.

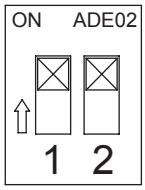
Control Modes (continued)

Manual Control Mode:

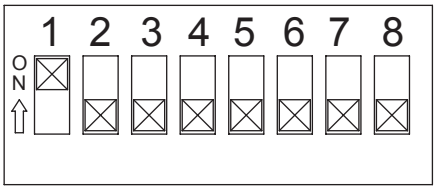
In Manual control mode, the motor speed is set using the onboard potentiometer. Onboard potentiometer rotation is CW to increase the motor output.

Analog Control Mode:

In ANALOG control mode, the motor output is set using an external 0-10 VDC demand signal.



Control Mode DIP Switches



Addess DIP Switches

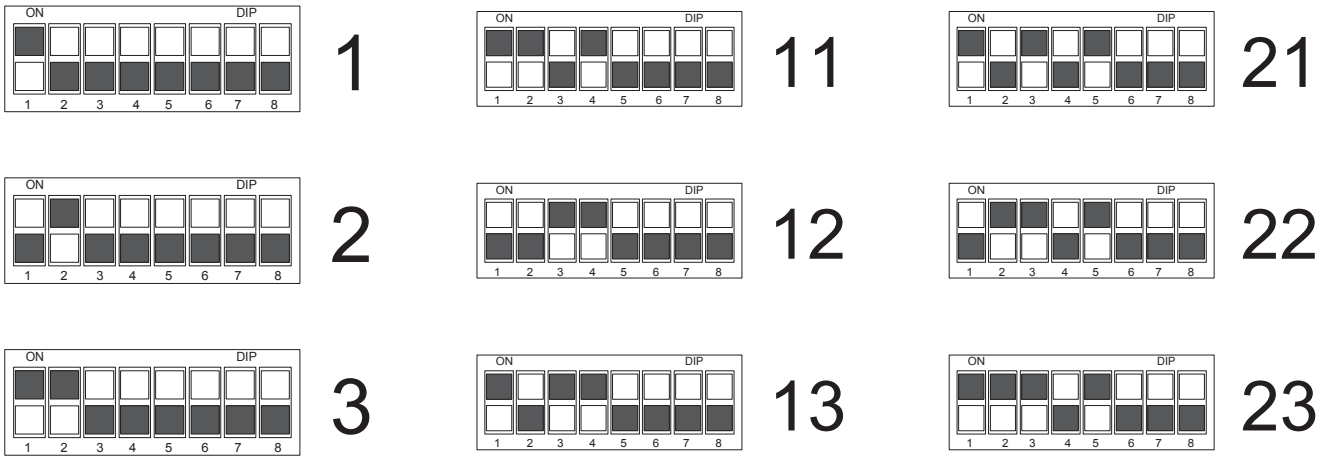
Note: Network mode can be configured using either DIP switch setting shown above. DIP switch pictorials are for reference and may be labeled differently by the manufacturer.

Network Control Mode:

In NETWORK control mode, the motor output is set using MODBUS Register 2. Motor output is specified as a value from 0 to 100 representing a percentage of motor torque output. Each ENV1028 in a MODBUS network must be set to a unique address. The address value is set in binary using the eight DIP switches of switch bank (S2). A maximum of 200 ENV1028 devices is recommended per local area network(LAN). If an Titus ACC Control Console is the MODBUS master, then addresses should be assigned within the address range supported by the Control Console. Address zero should not be used as it is reserved for global commands. Address switch settings are only checked by the ENV1028 at power-up. Power must be cycled (OFF/ON) before affected changes take place.

Registers relevant to this mode:

- Register 1 "Start/Stop" (R/W)
  - To enable motor, write a value of 1; To disable motor, write a value of 0
- Register 2 "Motor Set Speed" (R/W)
  - Motor Target speed value. Values may be written from 0 to 100
- Register 6 "RPM" (R)
  - Motor RPM. Read from the motor
- Register 12 "Actual Motor Speed Instruction" (R)
  - Speed control signal applied to the motor by the ENV1028. (R/W) = Read/Write, (R) = Read Only



Example of binary S2 switch settings

Electrical Specifications

Control and Interface Signals:

1. External Speed 0-10V Input
   - Input impedance 20k Ohms.
   - MIN ON-to-OFF threshold: 190mV*
   - MAX OFF-to-ON threshold: 240mV*
   - ON (~215mV) to 9.89V linearly scales 1 to 99% speed.
   - 9.89V or more deadbands to 100% speed.
2. External LED Output
   - 10mA regulated
   - LED forward voltages up to 5V
3. RPM Signal
   - Signal Value: mVDC = RPM
   - Ex: 900mV = 900RPM
   - RPM Output Range: ~ 0, 5 to 2000 RPM (0, 5mV to 2000 mV DC)
   - RPM Output Resolution: 5RPM (Zero, 400 steps from 5 to 2000 RPM inclusive)

Electrical and Environmental Specifications

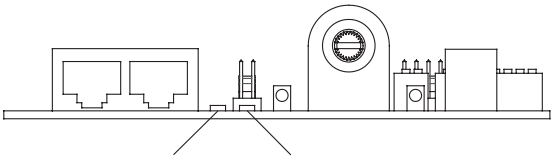
Specification	Min	Typical	Max	Units
Input Voltage	22	24	42	VAC
Supply Frequency	50	50/60	60	Hz
Input Power Consumption	na	na	0.5	VA
Ambient Operating Temperature	0	25	50	C

Test Probe JacksPoints:

The test probe jacks may be used to measure the motor rpm or the PWM signal that is being output to the motor.

- In Manual or Analog Control Mode with an Address setting of 1 or greater, the test probe jacks output 0-2000 mVDC representing motor RPM. By changing the address DIP switches to 0, the test probe jacks will output 0-1000 mVDC representing 0-100% demand signal to the motor. The address may be changed without interrupting power to the control card.
- In Network Control Mode, 0-2000 mVDC always represents RPM.

Net LED Status Definition	
LED OFF	Power Lost or No Communications
LED Flickering	Network Data Traffic In Progress
LED ON	A/B network wires are swapped



LED Indicators:

- Onboard Status LED:

  The Onboard Status LED is software controlled by the unit microcontroller. The Status LED is solid ON when RPM reported by the motor is greater than zero and OFF when RPM reported by the motor is zero.
- External Status LED:

  Support for an external Status LED (10mA current-controlled driver), via a 2-pin MTA connector, for remote system status notification. The external Status LED operates in the same manner as the Onboard Status LED.
- Onboard Net LED:

  The Onboard Net LED is driven directly by the receive data signal. The NET LED shows all network traffic on a 2-wire network. The NET LED is intended to confirm low-level network connectivity, independent of microcontroller or firmware functionality. If A/B network wires are swapped, the NET LED will be normally on, providing quick diagnostics of this common condition.

RJ45 Network Cable Connections:

Bus Power Pass Through	0V (GND)	RS-485				0V (GND)	Bus Power Pass Through

Communication Specifications

Overview:

- MODBUS RTU protocol over RS485 (serial)
- 9600 baud rate, word length is 8, parity is none(n), stop bits=1
- 255 unique address values selectable by DIP switch settings
- (recommended network node capacity 200 nodes)
- Slew rate limited transceivers for improved network performance MODBUS Register Summary Table

DO NOT USE CROSSOVER CABLES. THIS MAY DAMAGE THE CONTROL CARD OR RENDER IT NON-OPERATIONAL.

Register	Name	R/W	Values & Defaults	Units	Origin	Comments
1	RUN/STOP	RW	0,1	1	RAM	power up from REG 14
2	DEMAND	RW	0-100	%	RAM	power up from REG 10
6	SPEED	R	0,5-2000	RPM	LIVE	
7	ANA1	R	0-1000	-	LIVE	Onboard Pot 0-1000=0-100%
9	STATUS	R	see detail	-	LIVE	
10	DEFAULT SPEED	RW	0-100	50	EEPROM	applies to network only
12	CURRENT SPEED	R	0-100	-	LIVE	
14	DEFAULT RUN/STOP	RW	0,1	1	EEPROM	applies in network mode only
24	ANA2	R	0-1000	-	LIVE	0-10V input 0-1000=0-10VDC

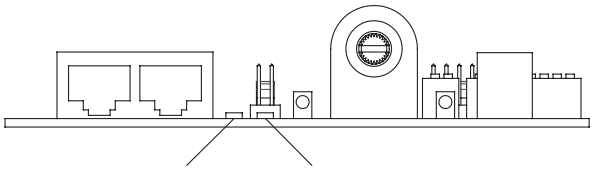
To reset non-volatile registers to factory default values, write 170 (AA hex) to Register 14, and then cycle power.

Note: Register 24 may be read in network mode to determine the value of 0-10VDC signal that may be connected. For example, a pressure transducer may be connected to indicate unit interal static pressure.

Troubleshooting

Mode Choice:
Verify mode setting choice to DIP switch S1 (Control Mode), which is manual mode and then retry.

Net LED Status Definition	
Green LED OFF	Power Lost or No Communications
Green LED Flickering	Network Data Traffic In Progres
Green LED ON	A/B network wires are swapped



Motor Issues in Manual Mode:
(If you are in a network or analog mode, contact your controls contractor for troubleshooting assistance; if you continue to
need assistance, contact the factory.)

Unit is not adjustable:

Step 1. Verify that rotation of the manual speed potentiometer does not change the RPM. If rotating does nothing, remove the electrical box cover, then remove the 4-pin motor connector from the control board and reinstall 180 degrees rotated. Also insure that the 4-pin connection wires are pushed down securely onto connector pins. Again adjust the knob to verify proper fan operation. Note: The 4 pin connector is on the 1/8" white cable from motor.

Low Air Velocity:

Step 1. Check to be sure that the manual speed potentiometer is set correctly.

Step 2. Check incoming power supply for proper voltage (120,208-240,277/24).

Step 3. Examine the HEPA filter.

High Air Velocity:

Step 1. Check to be sure that the air flow settings are correct

Filter Issues:
Non-Laminar Flow and/or Excessive Contamination:

Step 1. Insure that no large obstructions are upstream of airflow pattern

Step 2. Determine that no other air-moving devices are operating in or around clean room 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/ULPA filter. Seal or replace HEPA filter as necessary.

Infrared Speed Control (Optional)

The Flow-Set is a handheld infrared remote control configured to adjust the fan filter unit.

An EVO/ECM-IRC control sends the motors a FLOW INDEX and a GO signal. The motor sends back a status signal that is connected to a red lamp. The control includes an infrared remote receiver.

The Flow-Set handheld remote sends infrared remote commands to the EVO/ECM-IRC control, allowing remote adjustment of the Motor. (See Figure 10). Using the Flow-Set, you can turn the motor on/off, adjust the flow index from 1-100 and read the current settings.

Point the Flow-Set at the Flow-Set target (red lamp if the motor is on) on the equipment. Operate the on/off button or any of the four buttons. The green lamp near the Flow-Set target lights, indicating you are in an adjustment session. Continue to operate the on/off button or any of the four buttons to achieve the desired settings.

Press the Enter button to save your new settings and exit the adjustment session. Press the Clear button to delete your new settings, revert to the IQ settings and exit the adjustment session. If you enter an adjustment session and do not make any adjustments for 15 minutes, the adjustment session automatically clears.

Use the Clear button to read the current settings. Point the Flow-Set at the Flow-Set target and press the Clear button. A green lamp begins to flash indicating the signal was received. The flash sequence indicates the current flow index. The sequence occurs in two sets. The tens (1st) set uses long flashes to indicate the tens digit. The units (2nd) set uses short flashes to indicate the units digit. An extra long flash in the tens set or the units set indicates the value of the corresponding digit is zero

- A flow index of 24 flashes two longs, then 4 short
- A flow index of 89 flashes 8 longs, then 9 short
- A flow index of 30 flashes 3 longs, then an extra long
- A flow index of 04 flashes an extra long, then 4 short
- A flow index of 100 flashes 10 longs, then an extra long

Use the On/Off button to turn the motor on or off. Point the Flow-Set at the Flow-Set target on the equipment and press the on/off button. If you press Enter while the motor is off, the motor stays off, even through a power on/off cycle.

Adjust the flow index using the ↑↓ buttons. The ↑↓ button pair on the left adjusts the index ↑↓ 10. The ↑↓ button pair on the right adjusts the flow index ↑↓ 1. Using the ↑↓ 10 pair, you can quickly move the index up and down. Using the ↑↓ 1 pair, you can precisely set the index to achieve the desired flo . During an adjustment session, the green lamp blinks each time you make a valid entry. If the flow index is already 100, and you try to increase the flow index, the green lamp does not blink, and the increase does not occur. If the flow index is at 91 and you press the ↑↓ 10 buttons, the green lamp does not blink and the increase does not occur because your entry would take the index above 100. When the flow index is greater than 90, use the ↑↓ 1 button to increase the index. The ↑↓ 1 and ↑↓10 keys respond in a like manner when you try to set the flow index below 1. (Zero is not a valid flow index)

Batteries:

Two AA batteries power the EVO/IRC-Handheld Controller. (See Figure 10). Remove the sliding door on the back of the unit to expose the battery compartment. Remove the old batteries. Insert the new batteries in the position indicated by the battery pictures molded into the bottom of the battery compartment. The battery spring clips are difficult, so you may need to use a small screwdriver to “shoehorn” the batteries into place.

For maximum battery life, store the EVO/IRC- Handheld Controller so the buttons are not pressed. While current drain is minimum when the unit is not sending infrared signals, some battery current is drawn to sense the pressed key.

Cleaning the Pre-filter (foam)

Tools Required: None.

Note: To keep the filter in top operating condition, washing the foam prefilter 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.

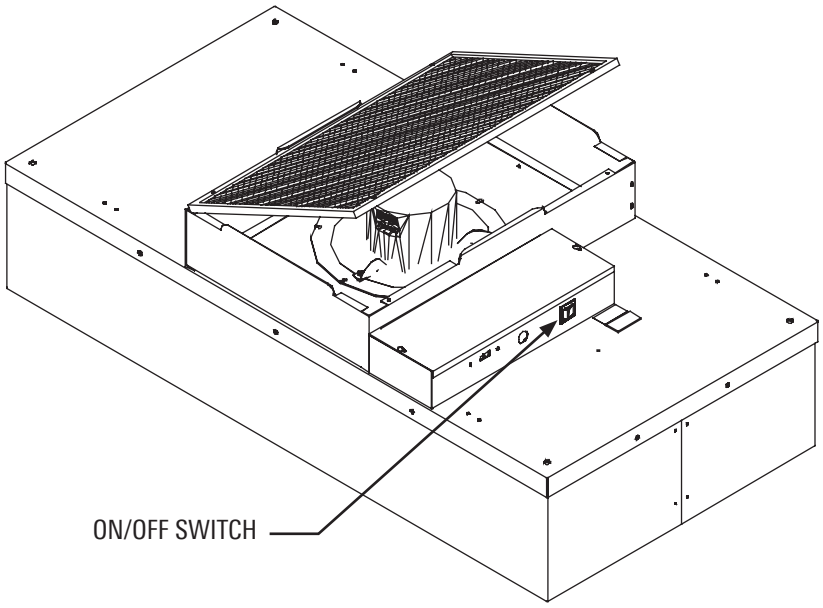
Step 2. Switch the ON-OFF switch to the off position.

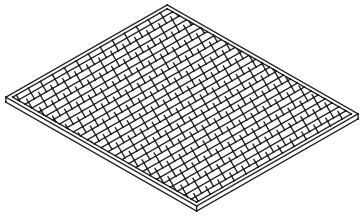
Step 3. Remove the 16"x23" prefilter from the snap-in frame. (See figure below)

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.

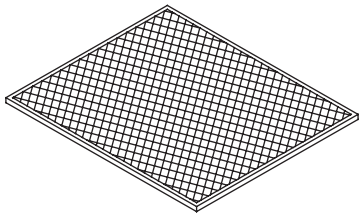
Step 5. Reassemble by reversing the above steps.

WARNING
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE





PREFILTER SURFACE ON TOP SIDE



SUPPORT SCREEN ON BOTTOM SIDE

Service: Removal and Replacement of FFDE HEPA/ULPA Filters

WARNING
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE

WARNING
THE STANDARD FILTER IS PROTECTED WITH AN EXTENDED METAL FACE SCEEN. 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 STANDARD FILTERS:

Tools Required: Phillips Head Driver, Battery Operated Drill with 5/32 drill bit, Rivet Hand Tool, Ø5/32 aluminum rivet grip range.126-.187

Step 1. Remove unit from ceiling.

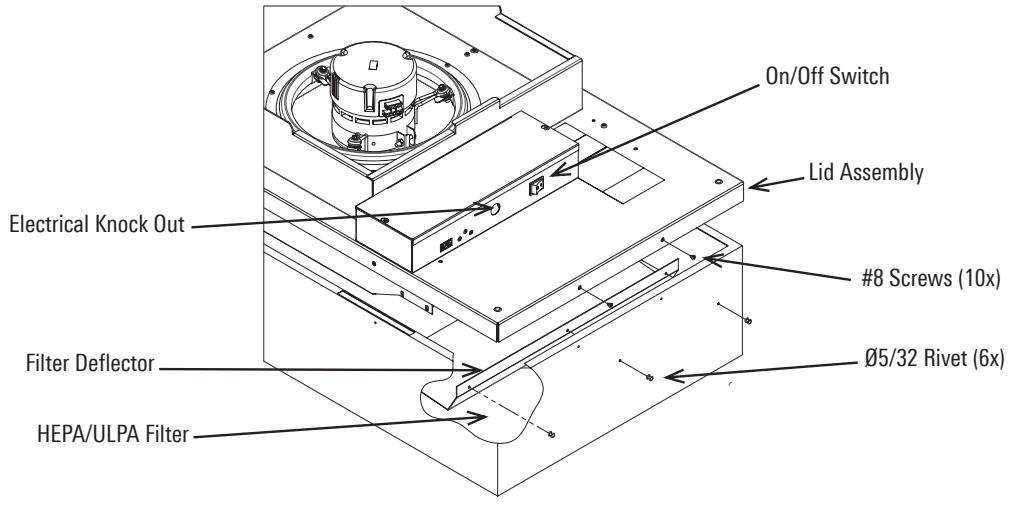
Step 2. Remove the 10 screws holding the HEPA/ULPA filter to the lid assembly.

Step 3. Lift the lid assembly off the HEPA/ULPA filter (see figure). Remove filter deflectors using 5/32 drill bit. Keep filter deflectors to install in new filter. Discard the used filter as per requirements of the applicable regulations. Carefully install the filter deflectors into the new filter using the 5/32 rivets. Do not touch or place the filter deflectors on the HEPA/ULPA media pack. This could cause tears in the filter pack.

Step 4. Before replacing with the new filter, carefully inspect the new filter for any visible damage. Also inspect the gasket and the T-Bar to insure a tight seal. Replace if necessary.

Step 5. To replace a filter, raise the filter and rotate into position in the ceiling grid (with power off), then lower the plenum housing into place. Reconnect wiring and hardware from previous steps that have been removed.

Step 6. Restore power and verify proper operation of FFU.



Standard Filter Change

Service: Removal and Replacement of FFDER & FFDERA Filters

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 FFDER & FFDERA FILTERS:

Tools Required: Phillips Head Driver, Battery Operated Drill, 3/16" hex head ball driver (2ea)

Step 1. With the power off, remove the diffuser screen by removing the 6 each 10-32x1/2 screws, then carefully place in a safe location.

Step 2. Loosen the six 1/4x12 socket head screws far enough to rotate the eight filter clips 90°. The filter may be loose enough to drop during this operation. If not, 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 away from the seal, so that the gel remains in the filter gel track.

Step 3. Carefully clean plenum assembly knife edge surface of residual gel material.

Step 4. Inspect filter for visible damage, if damaged set aside for replacement or repair.

Step 5. Inspect the gel seal, if reinstalling the removed filter. Determine if the gel has lost its ability to seal (i.e. the gel should reform to cover the track without voids or openings), if so repair the gel material or consider replacement of filter.

Step 6. Place the filter evenly against the filter-sealing surface of the unit. Reposition filter clips and screws. The clips should be rotated and angled into place. It is recommended that four workers work on each corner of the filter simultaneously, holding the filter seated into the track. Hand tighten clips from opposite corners evenly until all clamps are tightened.

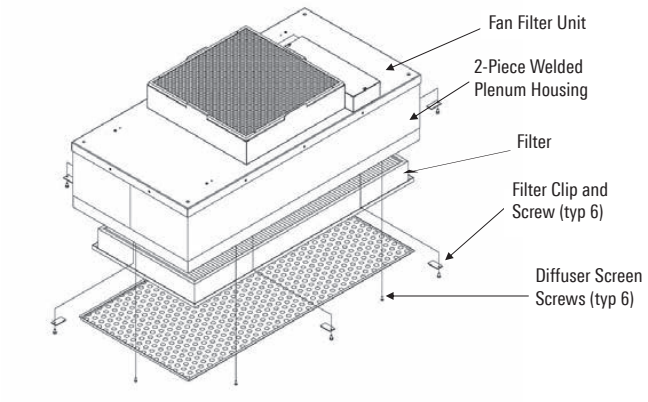
Step 7. Reinstall diffuser screen by hand-tightening the screws.

Step 8. Determine if recertification or testing of replacement is required.

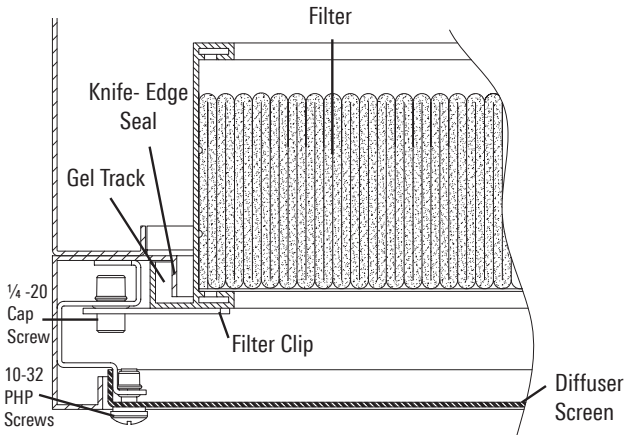
Step 9. Restore power to FFU and verify proper operation of FFU.

WARNING
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE

WARNING
THE STANDARD FILTER IS PROTECTED WITH AN EXTENDED METAL FACE SCEEN. 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



FFDR & FFDRA Filter Change



FFDR & FFDRA Filter Replacement

Service: FFDE and FFDER Motor Removal and Installation

WARNING
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE

WARNING
ELECTRICAL SERVICE SHOULD ONLY BE PERFORMED BY A LICENSED OR QUALIFIED ELECTRICIAN

Tools Required: Phillips Head Driver, Battery Operated Drill, (2) 8" adjustable wrenches, 10 mm hex head wrench, #2 screwdriver, and slip joint pliers.

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. Loosen the electrical box cover screws (2), and slide/lift off cover.

Step 4. Make note of all wire routing and locations for later reinstallation.

Step 5. Disconnect 5-pin and 16-pin wire harnesses from the electrical box housing and remove the tubing for test port, if installed.

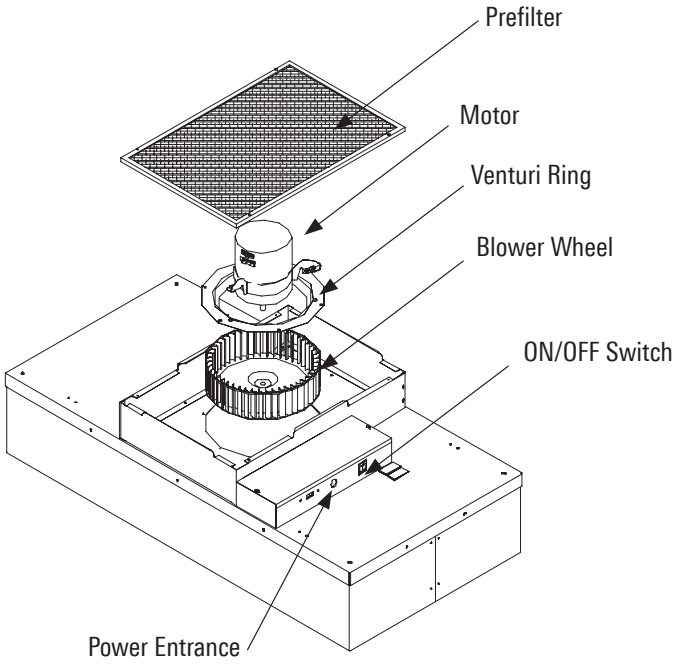
Step 6. Remove the eight mounting screws to free the motor/blower assembly from the lid assembly. If using power drivers, set the unit to a low torque setting to avoid stripping the sheet metal screws. Carefully remove housing assembly, paying attention to wire routing.

Step 7. Using an adjustable wrench loosen the two set screws that attach the blower wheel to the motor shaft.

Step 8. Mark the location of the motor support bracket (belly band), then loosen the bolt just enough to allow the motor support bracket to slid off the motor.

Step 9. Using the removed motor, mark the new motor with the location of the motor support bracket.

Step 10. Replace with the new motor and reassemble by reversing the above steps 1-8. Set the spacing at 0.25" (6.35 mm) clearance between the blower and the upper motor plate/prefilter frame. This will give a 0.11" overlap between the venturi ring and the blower.



Motor/Electrical Removal

Service: FFDERA Motor Removal and Installation

WARNING
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE

WARNING
ELECTRICAL SERVICE SHOULD ONLY BE PERFORMED BY A LICENSED OR QUALIFIED ELECTRICIAN

Note: Minimum 2 person project.

Tools Required: 3/16 Ball Driver, Phillips screw bit, Head Driver, Battery Operated Drill, (2) 8" adjustable wrenches, 10 mm hex head wrench, #2 standard screwdriver, and slip joint pliers.

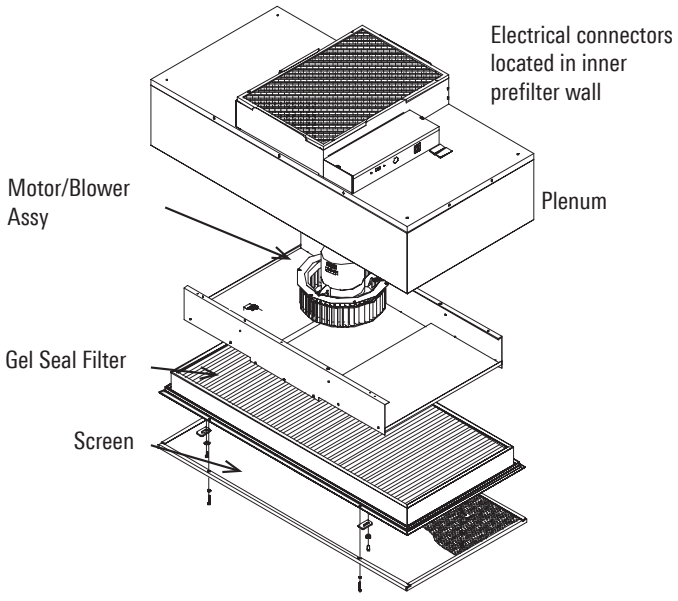
Step 1. To gain access to the motor, remove the gel seal filter.

Step 2. Prior to removing motor/blower assembly, remove blower wheel to expose motor connectors on motor. Using an adjustable wrench loosen the two set screws that attach the blower wheel to the motor shaft. Disconnect the two brown wires from the capacitor, using a pair of pliers. Disconnect 5-pin and 16-pin wire harnesses from the electrical box housing and remove the tubing for test port, if installed.

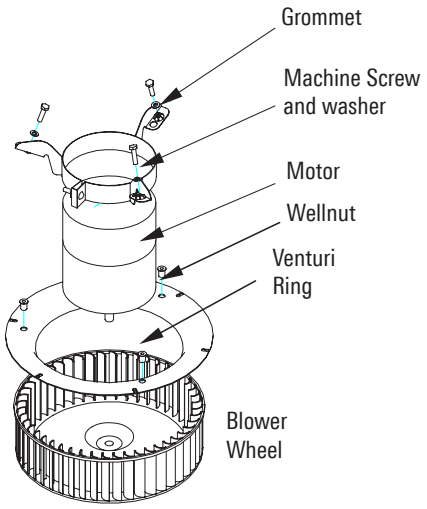
Step 3. While supporting the motor blower assembly from below, remove the six screws on the underside of the venturi ring and lower the assembly. (See figure). Note the baffle does not have to be removed to remove the motor/blower assembly.

Step 4. Before removal of the motor mount bracket, measure the precise location of the bracket on the motor. Remove the bracket.

Step 5. Replace with the new motor and reassemble by reversing the above steps. Set the location of the motor mount bracket as measured (see above Step 6). Set the spacing at 0.25" (6.35 mm) clearance between the blower and the upper motor plate/prefilter frame creating a 0. 1" (2.80 mm) overlap between the wheel and the venturi ring. When reinstalling the assembly, align the plate to insure that the leads will reach the electrical box.



Motor/Electrical Removal



Motor Assembly

Technical Notes

Changing out from GE 2.3 to Nidec PerfectSpeed DC Motors in the field

The Titus family of Fan Filter Units has previously used the GE 2.3 motor that was purchased by Regal Beloit. The older models have GE 2.3 motors that have become obsolete and are replaced with the new Regal Beloit model EON. The EON motor is currently being evaluated and you will be receiving a new manufactured motor named Nidec PerfectSpeed.

When you order a replacement motor they will be a form and fit replacement, except for the cable that connects to the control board and the motor. The new Nidec motor will require you to replace the cable. The old cable was a sixteen pin connector while the new motor cable will have a four pin connector as shown in the photo to the right.

Please use the new cable with the new four pin connector to connect your new motor. The cable number will be determined by the build style of your unit.

Nidec Part References

- 18 in Standard Build 63751-015
- 12 in FFDERA Build 63751-016
- 15 ft Whip 63751-017

Old Cable References

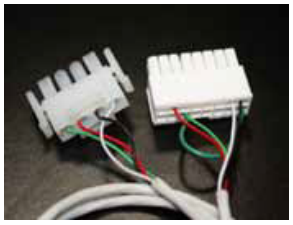
The power cable, has remained the same for the new motor and will be reused. The rest of the fit and function will be a direct replacement. Follow the procedure in the IOM for motor swap for your particular FFU.

Contact Us

Contact Titus sales or technical team for any assistance needed.

New Cable Style

Old Cable Style



Old Cable Style

Note: GE 2.3 motors are obsolete.

Motor Cable Configurations

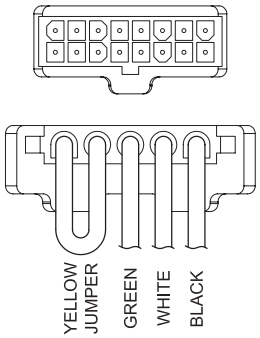


FIGURE 1
120V GE Motor
(with yellow jumper)

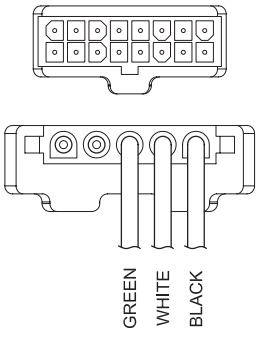


FIGURE 2
208-240V or 277V GE Motor
(without yellow jumper)

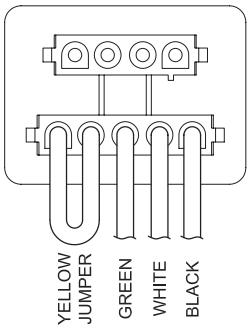


FIGURE 3
120V Nidec Motor
(with yellow jumper)

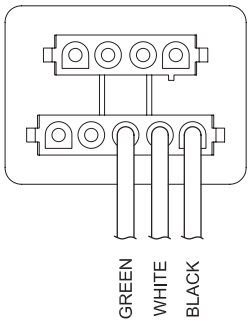


FIGURE 4
208-240V or 277V Nidec Motor
(without yellow jumper)

Technical Notes (continued)

Designs with Duct Collar, VAV or constant air box and fan coils

For applications requiring powered fan filter units and a ducted connection our recommendation would be to use FFD, FFDR, or FFDRA units equipped with PSC motors.

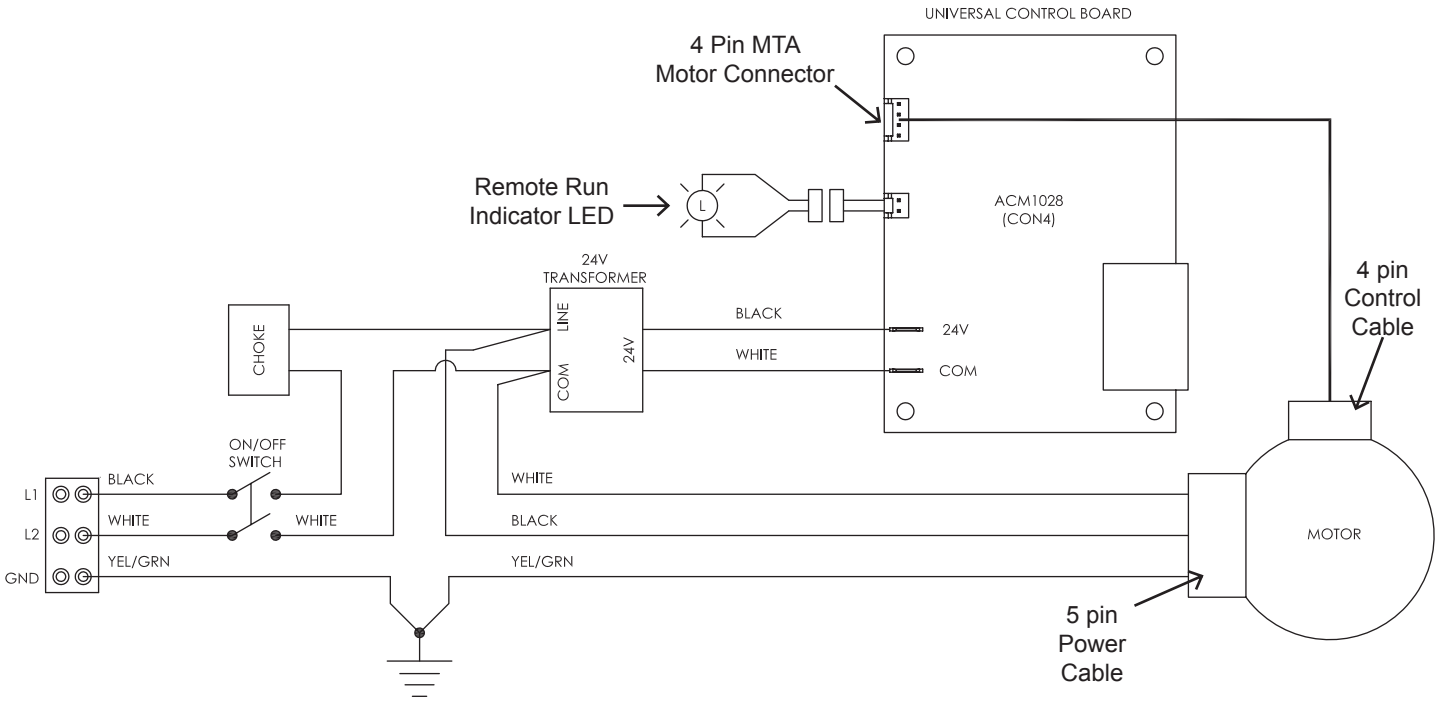
Caution

FFDE, FFDER, and FFDERA units are not recommend for use with ducted systems, and cannot operate with inlet static pressure exceeding 0.30 in wg.

For applications when you use a VAV box or Constant Airflow Terminal, Duct Collars or Fan coils. The design engineer must advise the contractor or air balancer that the air supply needs to be balanced. If you do not balance the air supply properly you have the potential to starve or over feed the fan with air causing the motor to stall which can damage the fan motor. This also can be minimized by notifying Titus beforehand for assistance. The ECM motors used in the FFDE, FFDER, and FFDERA designs are a Microprocessor controlled motor and are designed to maintain a constant air volume. When two controllers are compensating the air volume at the same time, the motor microprocessor is unable to stabilize the airflow and will shut itself down if it cannot find a stable operating point.

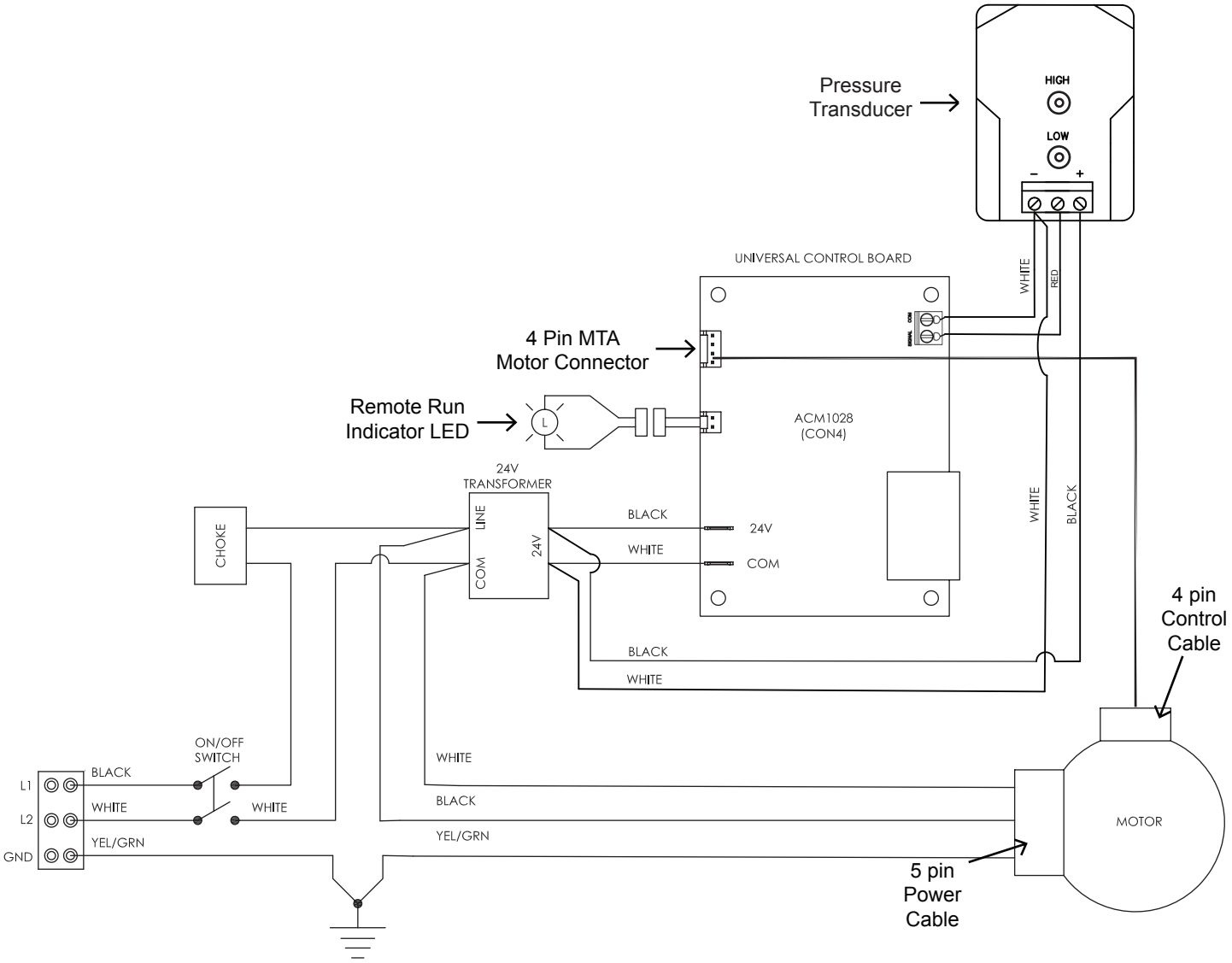
In addition to properly balancing the airflow to the Fan: you should prepare a sequence of operations turning on FFU's prior to energizing the Air Handler to prevent potential backward rotation of the blower wheel which can prevent motor rotating in the proper direction and will reduce airflow and cause eventual shutdown. The drive components inside the ECM motors are self-testing and sized for the motor being used inside the unit they can't compete with the airflows from a duct blower motor.

Wiring Diagrams



Universal Card Wiring Diagram

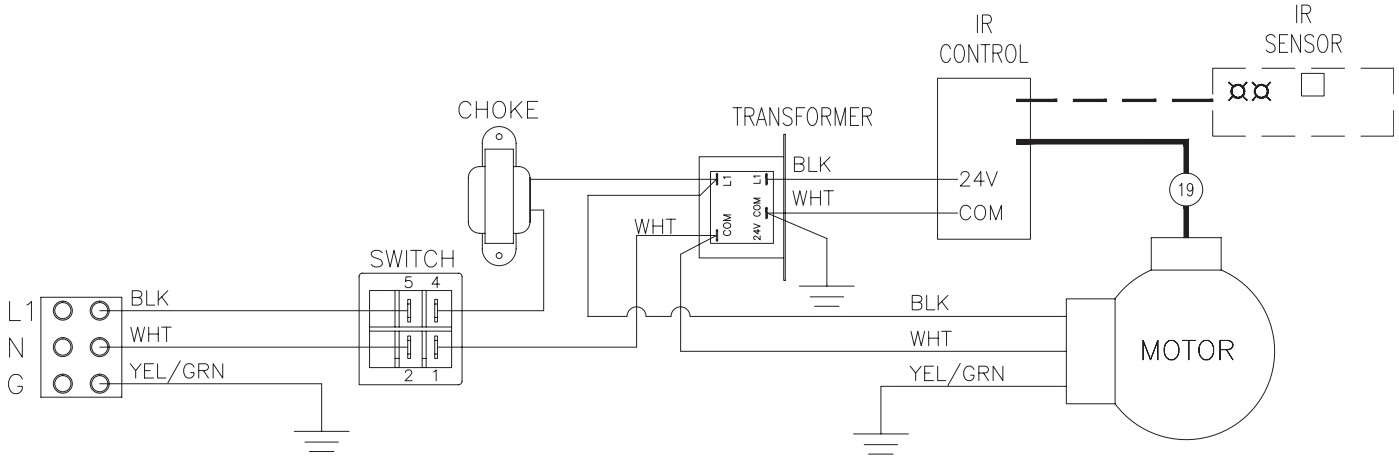
Wiring Diagrams (continued)



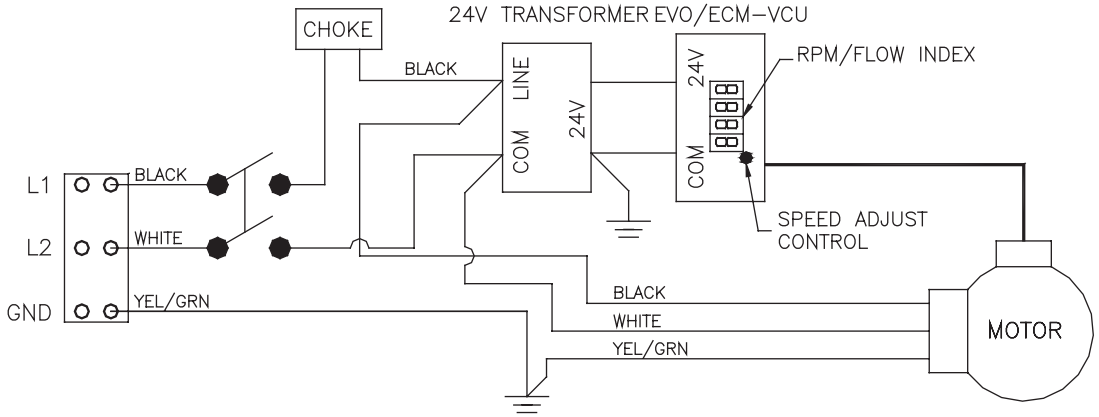
Note: Register 24 may be read in network mode to determine the value of 0-10VDC signal from the pressure transducer connected to indicate unit interal static pressure.

Universal Card Wiring Diagram
w/ Continous Filter Monitoring

Wiring Diagrams (continued)



Infrared Speed Control



Remote Mounted Visual Control Unit

Replacement Parts List

Model	Size/Voltage	Description	Part Number
FFDE FFDER FFDERA	N/A	Disconnect Switch	63739-002
	N/A	Pre-filter (foam)	62981-001
	N/A	Deflector - Filter	38532-001
	N/A	Gasket, Neop .125x.5	62968
	N/A	Grommet 5/8 Id 1 1/8 Od	63388
	N/A	Choke 3.0 Amps	63720
	120V	Transformer 24V	63667
	208V-240V		63666
	277V		63665
	N/A	Blower Wheel	63270
	N/A	Ventiri Ring	62964
	N/A	Universal Control Card (FFDE, FFDER, & FFDERA)	265888
	N/A	Visual Speed Control Card (FFDE, FFDER, & FFDERA)	63951-002
	N/A	IR Sensor Harness	63759-001
	N/A	IR Sensor without Harness	63758

FFDE FFDER	2x2 - 120V	ECM Motor Assembly (FFDE & FFDER)	S266587-005
	2x2 - 208V-240V		S266587-005
	2x2 - 277V		S266587-006
	4x2 - 120V	ECM Motor Assembly (FFDE & FFDER)	S266587-001
	4x2 - 208V-240V		S266587-001
	4x2 - 277V		S266587-002

FFDERA	2x2 - 120V	ECM Motor Assembly (FFDERA)	S266587-015
	2x2 - 208V-240V		S266587-015
	2x2 - 277V		S266587-016
	4x2 - 120V	ECM Motor Assembly (FFDERA)	S266587-011
	4x2 - 208V-240V		S266587-011
	4x2 - 277V		S266587-012

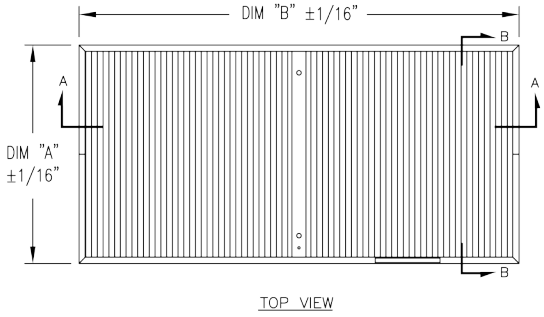
FFDE Filter Drawing

69600S – XXX X X X X X

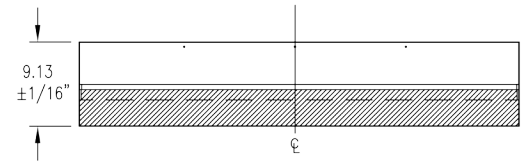
SIZE:	MEDIA:	CONSTRUCTION:	SCREEN:	INDICATOR LIGHT	CHALLENGE PORT
SEE CHART	[H] HEPA 99.99% [U] ULPA 99.9995%	[A] ALUMINUM [P] PAINTED [S] STAINLESS	[P] PAINTED [S] STAINLESS [L] PLASTIC [Z] PAINTED ALUMINUM	[I] INDICATOR LIGHT [X] NONE	[C] CHALLENGE PORT [X] NONE

CODE	NOMINAL SIZE	DIM. "A"	DIM. "B"
[001]	2X4	23.625	47.625
[003]	2X3	23.625	35.625
[004]	2X2	23.625	23.625

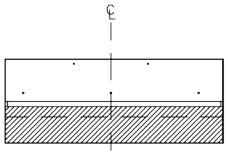
NOTES:
1. FILTER MEDIA: MICROGLASS FIBER WITH ACRYLIC LATEX BINDER
2. PLEAT DEPTH: 3" OR 53 MM PLEAT
3. EFFICIENCY: H= HEPA = 99.99% EFFICIENT @ 0.30µm (IEST-RP-C007)
   4= HEPA = 99.995% EFFICIENT @ 0.20µm (IEST-RP-C007)
   U= ULPA = 99.9995% EFFICIENT @ 0.12µm (IEST-RP-C007)
   S= ULPA = 99.99999% EFFICIENT @ 0.12µm (IEST-RP-C007)
4. RESISTANCE: H= HEPA = 0.45" ±0.02" W.G. AT 100 FPM (715 CFM)
   4= HEPA = 0.50" ±0.02" W.G. AT 100 FPM (715 CFM)
   U= ULPA = 0.52" ±0.02" W.G. AT 100 FPM (715 CFM)
   S= ULPA = 0.62" ±0.02" W.G. AT 100 FPM (715 CFM)
5. SEPARATOR MATERIAL: PER MANUFACTURES SPEC
6. FRAME MATERIAL: ANODIZED ALUMINUM
7. GRILLE MATERIAL: EXPANDED METAL PAINTED WHITE
8. SEALANT MATERIAL: FIRE RETARDANT TWO-PART URETHANE
9. EFFICIENCY TEST: HEPA = TYPE J FILTER (IEST-RP-C034)
   ULPA = TYPE F FILTER (IEST-RP-C034)
10. FIRE RATING: GRADE 4 UL-900

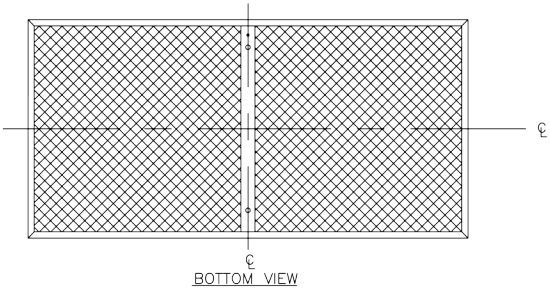


TOP VIEW



SECTION A–A


SECTION B–B


BOTTOM VIEW

FFDER and FFDERA Filter Drawing

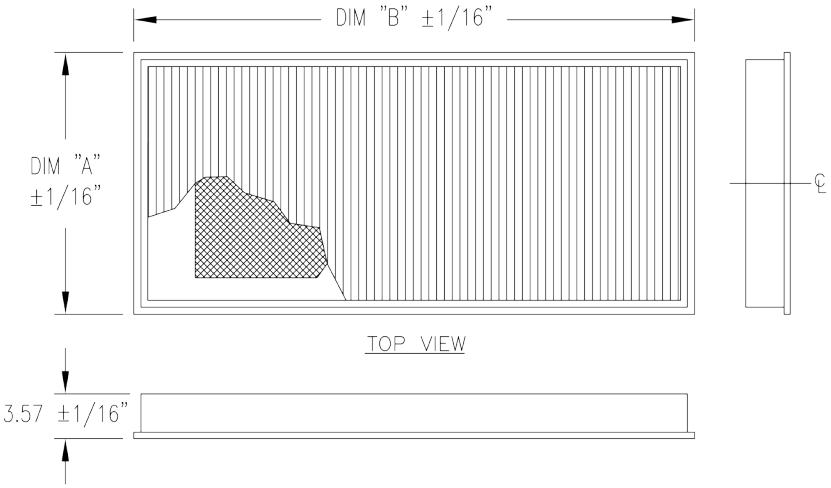
69601 – XXX X

SIZE:
SEE CHART

MEDIA:
[H] HEPA
[U] ULPA

CODE	NOMINAL SIZE	DIM. "A"	DIM. "B"
[001]	2X4	21.000	45.000
[003]	2X3	21.000	33.000
[004]	2X2	21.000	21.000

NOTES:
1. FILTER MEDIA: MICROGLASS FIBER WITH ACRYLIC LATEX BINDER
2. PLEAT DEPTH: 3" PLEAT OR 53MM
3. EFFICIENCY: H= HEPA = 99.99% EFFICIENT @ 0.30µm (IEST-RP-C007)
   U= ULPA = 99.9995% EFFICIENT @ 0.12µm (IEST-RP-C007)
4. RESISTANCE: H= HEPA = 0.32" ±0.02" W.G. AT 100 FPM (560 CFM)
   U= ULPA = 0.40" ±0.02" W.G. AT 100 FPM (560 CFM)
5. SEPARATOR MATERIAL: PER MANUFACTURES SPEC
6. FRAME MATERIAL: ANODIZED ALUMINUM GEL SEAL
7. GRILLE MATERIAL: EXPANDED METAL PAINTED WHITE
8. SEALANT MATERIAL: FIRE RETARDANT TWO-PART URETHANE
9. EFFICIENCY TEST: HEPA = TYPE J FILTER (IEST-RP-C034)
   ULPA = TYPE F FILTER (IEST-RP-C034)
10. FIRE RATING: GRADE 4 UL-900



Testing

Each fan filter unit is thoroughly tested at the factory before shipment. However, because of the "rigors" of shipping, Titus encourages units are re-tested after installation.

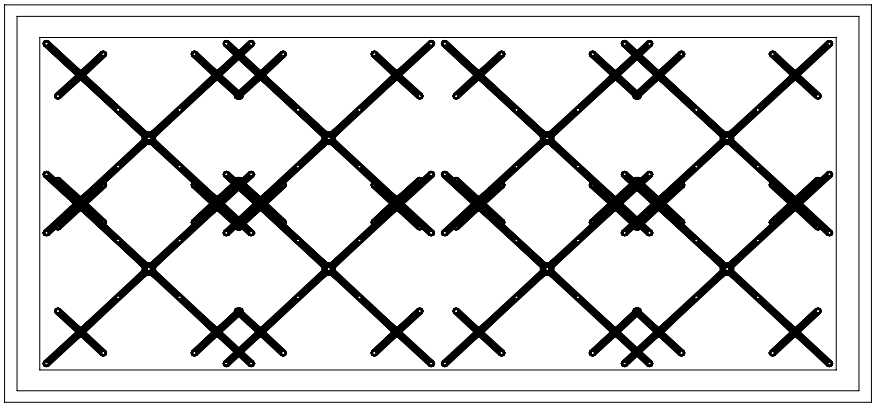
Titus recommends that the customer contact an independent organization, with technicians trained and experienced in performance evaluation and maintenance of clean air equipment.

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 you 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 and then take four reading evenly spaced along the four foot side, then repeat these reads three additional times. This gives a total of 8 reading to test the unit. All advertised data is based on using the Velgrid with 8 readings (128 velocity points). Titus recognized the using 8 reading during a cleanroom start-up may be time consuming and recommends using 4 Velgrid readings taken on each 2x2 filter section will approximate the same as 8 readings.

Recommended Testing – 8 readings with a Velgrid

Additional independent testing on the Titus fan filter units show that using one-2x4 or two-2x2 hoods simultaneously give airflow data (cfm) with 5 percent of a duct traverse using 10 diameters of straight duct upstream of the fan intake.



Recommended Testing – 8 readings with a Velgrid

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

Titus
Redefine your comfort zone.™