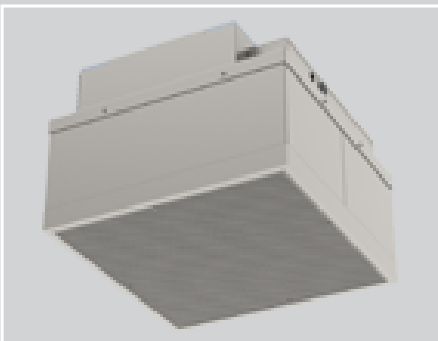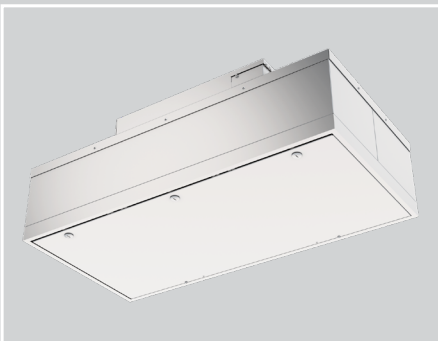Redefine your comfort zone.™

FAN FILTER DIFFUSER

INSTALLATION AND
OPERATIONS MANUAL

FFDE

FFDER

FFDE / FFDER / FFDERA / FFDERAC
FFDB / FFDBR / FFDBRA / FFDBRAC

TABLE OF CONTENTS

WARNING

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

1. Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
2. When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.
3. 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.
4. Use this unit only in the manner intended by the manufacturer. If you have any questions, contact the manufacturer.
5. 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.

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 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 voltage on label and that the unit has been wired into the correct voltage. The serial number label on the top of the FFDE/-R/-RA/-RAC unit has the required voltage.
3. To insure you order the proper replacement parts or complete FFDE/-R/-RA/-RAC 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.

Order Number:	H895
Serial Number:	12071386IA-NS1FH
Unit Model Number:	11074-106
Description:	FFDE/-R/-RA/-RAC 2X4 STD CON4 HEPA UL
Date:	08/5/2013

Titus
Redefine your comfort zone.™

FFDE/-R/-RA/-RAC

Fan Filter Unit
AC: 120v 60 Hz 5.0 amps

Covered by one or more of the following patents: nos. 4,560,395 & 5,470,363

UL LISTED AIR FILTER 2F82 E152685

Envirco
1-800-884-0002
www.envirco.com

| Order Number |
| H895 |
| Serial Number |
| 12071386IA-NS1FH |
| Unit Model Number |
| 11074-106 |
| Date |
| 08/5/2013 |

LABEL PN 63716-012

IMPORTANT

YOUR FAN FILTER UNIT HAS THREE MODES OF OPERATION. IT IS YOUR RESPONSIBILITY AS THE INSTALLER TO SET THE MODE AS REQUIRED. IF UNSURE CONTACT YOUR PROJECT MANAGER OR CONTROLS COMPANY.
THE MODES ARE SET BY SETTING THE 2 PIN DIP SWITCH.

| MANUAL MODE 1 OFF 2 OFF | ANALOG MODE 1 ON 2 OFF | NETWORK MODE 1 OFF 2 ON | NETWORK MODE 1 ON 2 ON |

Units come set in manual mode from the factory. Please review installation requirements and set up with your end user (See page 9 for complete set up instructions).
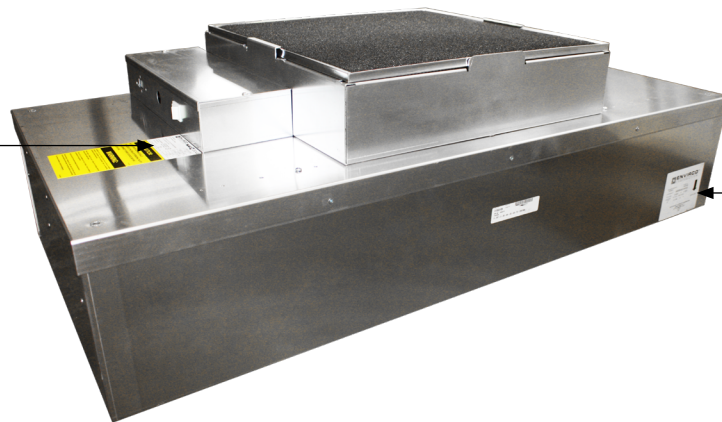
UNIT LABELS AND HANDLING

1. Touching the HEPA filter will damage it and void 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 filter. Never lie filter face flat down on a surface and always have filter on its side to protect from damage when not installed.
2. Prior to powering the unit, verify the voltage on the label and that the unit match what is on the box label. Next, verify the unit is the correct voltage desired. The serial number label on the top of the FFDB unit has the required voltage. More instructions on unboxing can be found on page 7.
3. To ensure you order the proper replacement parts or complete FFDB unit, record the part number and serial number. This information is located on the serial number label, located adjacent to the electrical box. Please locate the filter label and record filter serial number to go with unit serial number and part number. This information will also be on the certificates of conformance covered later in this manual. If you can't locate these labels, please contact TITUS for this information. Once obtained, record the information for reference.

BOX LABEL

OSHPD LABEL

FAN FILTER UNIT LABEL

FILTER LABEL

INSTALLATION

Note: The FFDB/FFDE Fan Filter Unit is completely assembled at the factory with the exception of the optional ¼" (0.64 cm)-20 eyebolts that are used when hanging the unit from an engineered support system (eyebolts not included and need to be ordered separately.

Step 1: Carefully remove the unit from the shipping carton and inspect for any damage that may have occurred during transportation. Verify voltage on the serial label matches what is on the box label. Examples of these labels can be seen on page 5. It is recommended to record the part number and serial number of the unit for future reference for parts or assistance. It is the responsibility of the installers and owners of the fan filter units to record serial numbers. Other documents may not be retrievable without this information. Certificates of Conformance are provided by Titus. The certificates will be on an envelope attached to the delivered fan filter units. Filter certificates will be located inside the fan filter unit boxes unless filters are shipped separately. Filter certificates in this scenario will be included with the filters. Keep these documents for your records. Contact Titus at techsupport@titus.com for more assistance.

UNBOXING

Note: When ordering FFDER/FFDBR, FFDERA/FFDBRA, & FFDERAC/FFDBRAC units, the HEPA filters may be shipped separately and not installed by the factory.

ORDER CERTIFICATE OF CONFORMANCE

Titus
Redefine your comfort zone.™

101 McNeill Road
Sanford, North Carolina 27330
Phone (800) 884-0002

Certificate of Conformance

This certifies that the products listed below, were manufactured and inspected per applicable specifications and drawings. Filter components are leak tested using a MET One particle counter, Model Number (2100B) and are certified to meet the criteria. Every filter has been tested and a certification label is affixed to the filter component of the unit.

CO Number	ModelNumber	UnitSerial	FilterSerial
594689	11206-030	2009753143-LA-NR3CH	H052225-085
594689	11206-030	2009753144-LA-NR3CH	H052225-081
594689	11206-030	2009753145-LA-NR3CH	H052225-105
594689	11206-030	2009753146-LA-NR3CH	H052225-077
594689	11206-030	2009753147-LA-NR3CH	H168330-052
594689	11206-030	2009753148-LA-NR3CH	H168330-081
594689	11206-030	2009753149-LA-NR3CH	H168330-082
594689	11206-030	2009753150-LA-NR3CH	H168330-051
594689	11206-030	2009753151-LA-NR3CH	H168330-022
594689	11206-030	2009753152-LA-NR3CH	H168330-080
594689	11206-030	2009753153-LA-NR3CH	H168330-100
594689	11206-030	2009753154-LA-NR3CH	H168330-078

FILTER CERTIFICATE OF CONFORMANCE

Certification of Conformance / US8 LEAK REPORT

camfil
1 North Corporate Drive
Riverdale, NJ 07457

Date: 9/4/2020	Time: 12:56:52 PM	Operator: 0000001
Filter Serial Number:	H168330-100	
Filter Name:	Q5-21.00-45.00-5-40-VU-1D-00-0	

This document certifies that the filter identified herein has been manufactured, inspected and found to be in compliance with specifications, drawings, approved samples and/or other requirements stated in your purchase order.

The filter meets the given efficiency and pressure drop and complies with IEST-RP-CC034.2 for scanning leak thresholds.

Customer Name: TRION, INC.
Customer Purchase Order: P22301-00

Sales Order: M28641
Part Number: 85502A974

Thomas Beyer - Quality Manager - Camfil USA, INC.
862-228-2521 Email: Thomas.Beyer@camfil.com

Leakage Factor (% Pen.)	2	Dillution Ratio:	15676
Scan Speed (mm/sec)	50	Volume Flow Rate:	926 (m³/h) / 545 (cfm)
Particle Limit:	95	Particles / CFM:	7.787283E+07
Pressure Drop Target (Pa)	102 / .409 (in w.g.)	Pressure Drop (Pa)	101 / .405 (in w.g.)
Efficiency Target (%)	99.99	Efficiency (%)	99.999
Lot No:	J	Roll No:	
No of Leaks:	0		
MeasizeX:	1152	MeasizeY:	533

INSTALLATION

Step 2: Carefully inspect the diffuser face screen for any damage. If standard filter, inspect the filter along the edges for any visible damage. Example of pleat shearing can be seen below. If the unit or filter is damaged, do not install in the ceiling. Document the damage with pictures. Record the serial number of the unit (located on the top of the unit next to the electrical box), description of the damage, and contact Titus at techsupport@titus.com for more assistance.
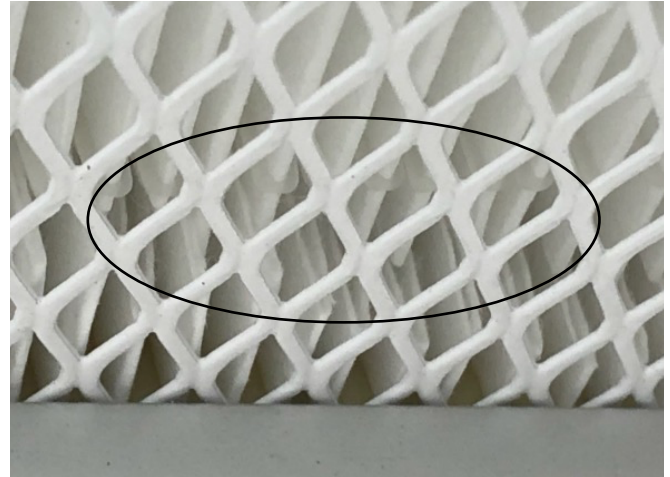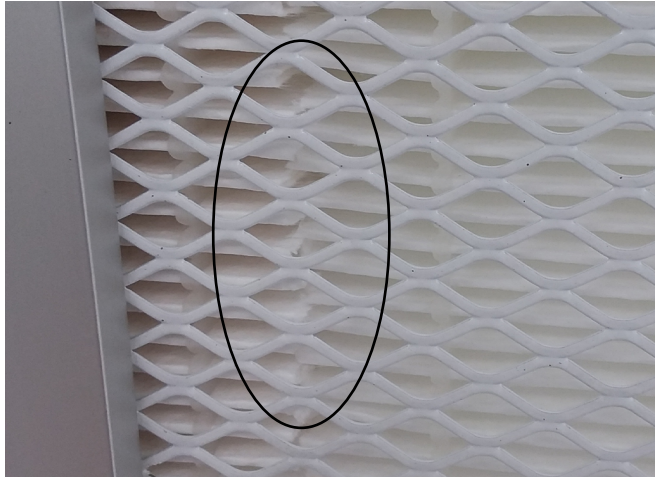
Recommendation: Verify unit runs properly before installing in the ceiling. If unable to provide power, it is recommended to remove the pre-filter and inspect the motor/blower installation for any damage that may have occurred in shipping.

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 s-hooks and chain. Screw the four eyebolts into the nutserts on the lid assembly before lifting into an overhead position.

Note: Confirm fan dimensions match T-grid dimensions before installing. Custom size units are available to fit cleanroom grid systems.

Eyebolt

Fan Filter Unit
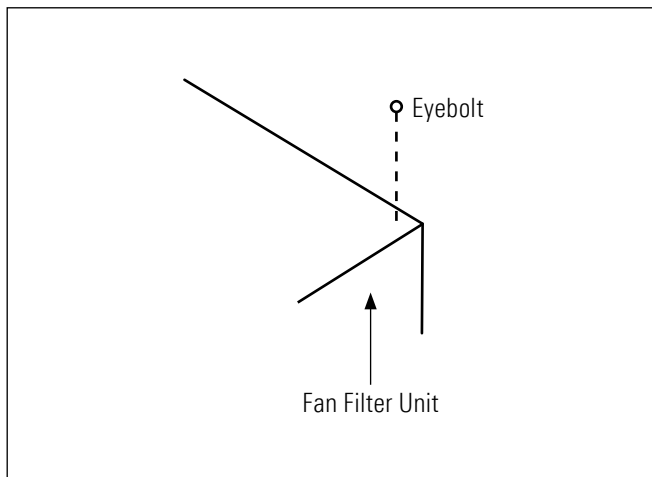
Step 4: Have an electrician wire the unit to the appropriate voltage utilizing the three position terminal block for field connection. Reference the wiring diagrams on pages 14 - 16 and all national and local electrical codes. Verify correct single-phase power, before energizing units.
Step 5: Turn on the power using the rocker switch (ON/OFF) located on the electrical box. For filters shipped loose, let the unit run for a few hours to purge off particulate 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 an overload condition.

Note: It is recommended to have at least 12" above the fan filter unit to remove motor/blower assembly and to allow the fan enough air circulation. If less than 12", please contact the manufacturer to ensure proper installation.

MOTOR PROGRAMS

FFDB PROGRAMS

The FFDB comes standard with a constant torque program. This program will try and maintain the torque setting chosen by the user through speed control options. Please refer to unit description codes on page 6 to determine motor program or contact the manufacturer for more information.

FFDE PROGRAMS

The FFDE comes standard with a constant CFM program. This program will try and maintain a constant air volume chosen by the user through speed control options. The constant air volume program is designed to compensate for filter loading. The FFDE with constant CFM program is **not recommended** in ducted, pressurized air applications and for use in series with CAV or VAV devices. The FFDE utilizes an EC motor designed to maintain a constant air volume. Two controllers that compensate the air volume in series may cause the motor to shut down or act erratically as it is unable to stabilize the airflow and locate a stable operating point. Titus advises to use a FFDB or different motor program for the FFDE in the above scenario.

Other programs are available for the FFDE including a constant torque, constant speed, and a low airflow constant torque program. Please refer to unit description codes on page 6 to determine program or contact the manufacturer for more information.

MOTOR STYLE

FFDE/FFDB MODEL STYLE

The FFDB/FFDE comes in four different style configurations. These include FFDE/FFDB, FFDER/FFDBR, FFDERA/FFDBRA, and FFDERAC/FFD-BRAC. Examples of these differences can be seen on the next page. Below is an explanation for the abbreviations and a table showing the differences between the style configurations and what is room-side accessible.

FFDE/FFDB   - Standard Filter
FFDER/FFDBR   - Room-side Removable
FFDERA/FFDBRA   - Room-side Removable Motor and Filter
FFDERAC/FFDBRAC - Room-side Removable Motor, Filter, and Electrical Box Components

Room-side Removable Feature			
Model Style	Filter	Motor	Electrical Box Components
FFDE/FFDB	NO	NO	NO
FFDER/FFDBR	YES	NO	NO
FFDERA/FFDBRA	YES	YES	NO
FFDERAC/FFDBRAC	YES	YES	YES

STANDARD (FFDE/FFDB) STYLE CONFIGURATION
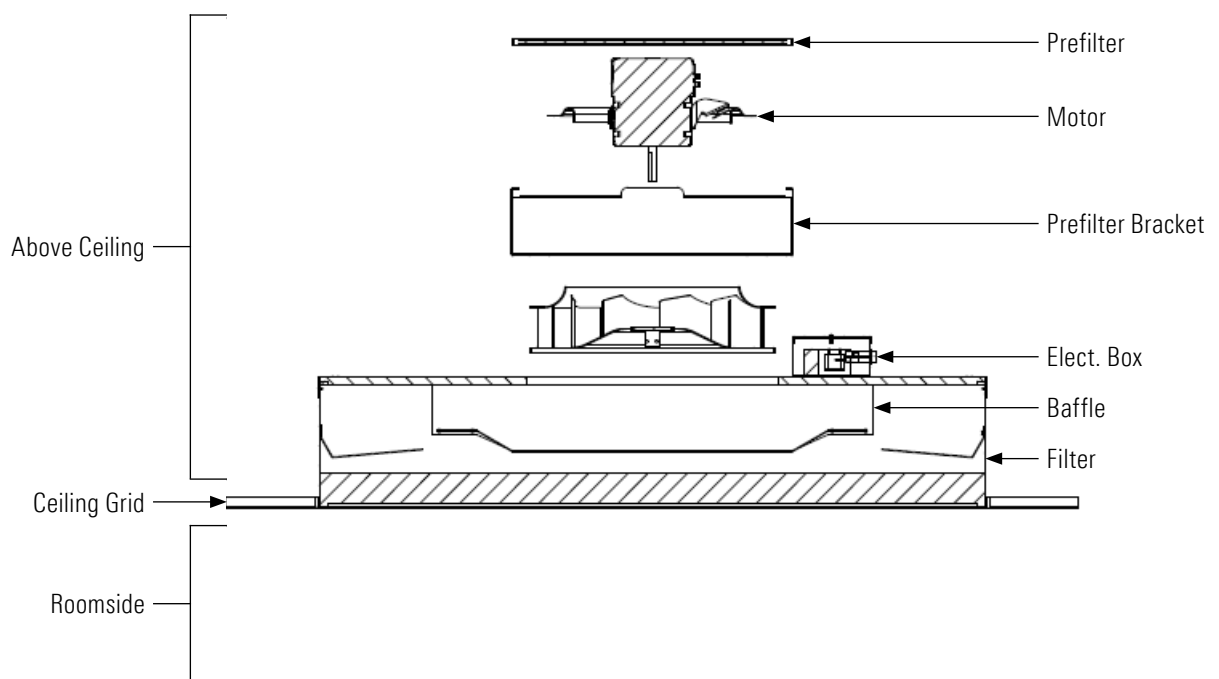
Standard filter configuration above. All components are only accessible from above the ceiling.

MOTOR STYLE

FFDER/FFDBR STYLE CONFIGURATION

Above Ceiling

Prefilter

Motor

Prefilter Bracket

Elect. Box

Baffle

Plenum

Ceiling Grid

Roomside
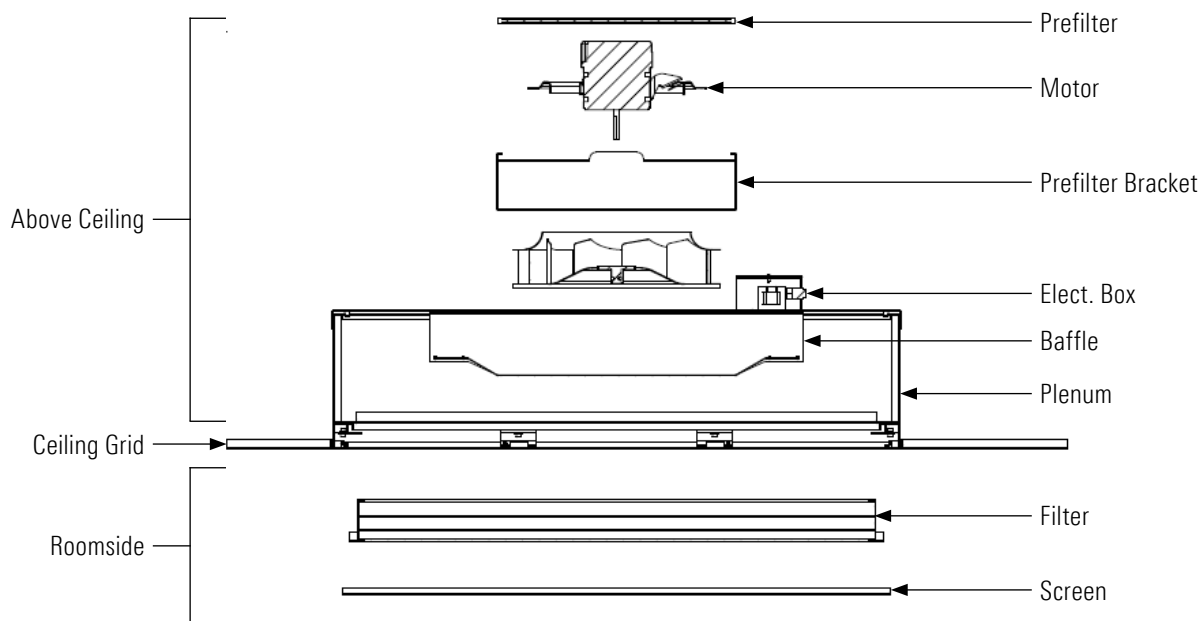
Filter

Screen

Room-side filter configuration above. The screen and filter can be removed from the room-side. All other components are only accessible from above the ceiling.

FFDERA/FFDBRA STYLE CONFIGURATION

Above Ceiling

Prefilter

Elect. Box

Plenum

Ceiling Grid

Motor

Roomside

Baffle
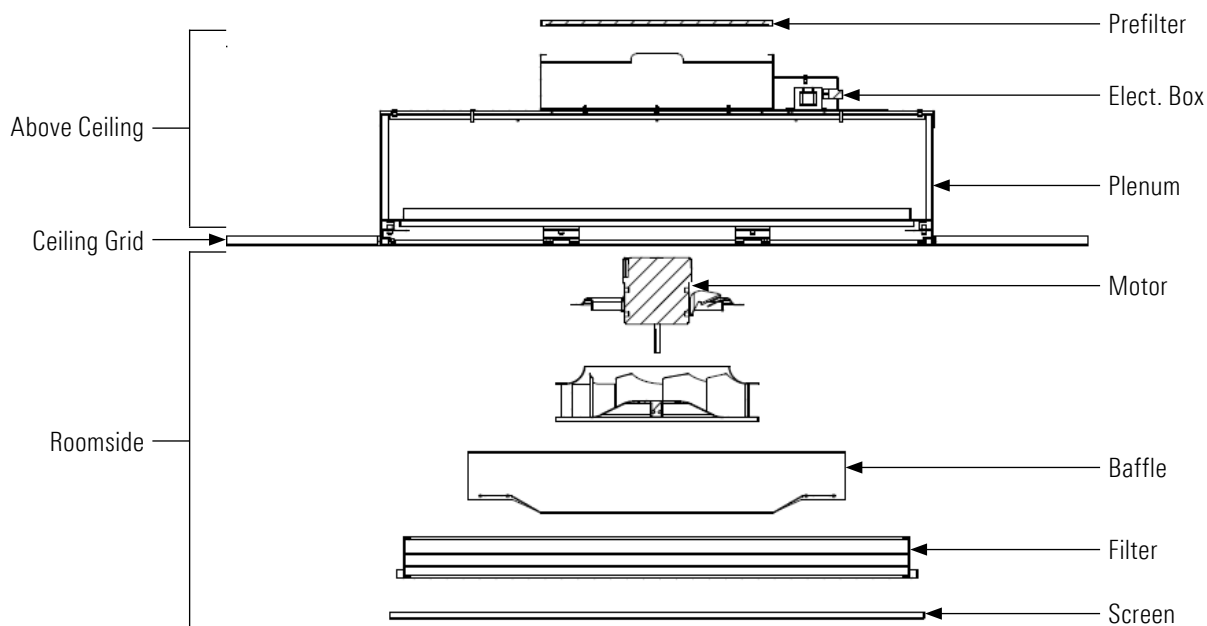
Filter

Screen

Room-side filter and motor configuration above. The screen, filter, baffle, and motor assembly can be removed from the room-side. All other components are only accessible from above the ceiling.

MOTOR STYLE

FFDERAC/FFDBRAC STYLE CONFIGURATION

Above Ceiling	Finger Guard
	Elect. Box
	Plenum
Ceiling Grid	Elect. Box Access Plate
	Motor
Roomside	Baffle
	Filter
	Screen
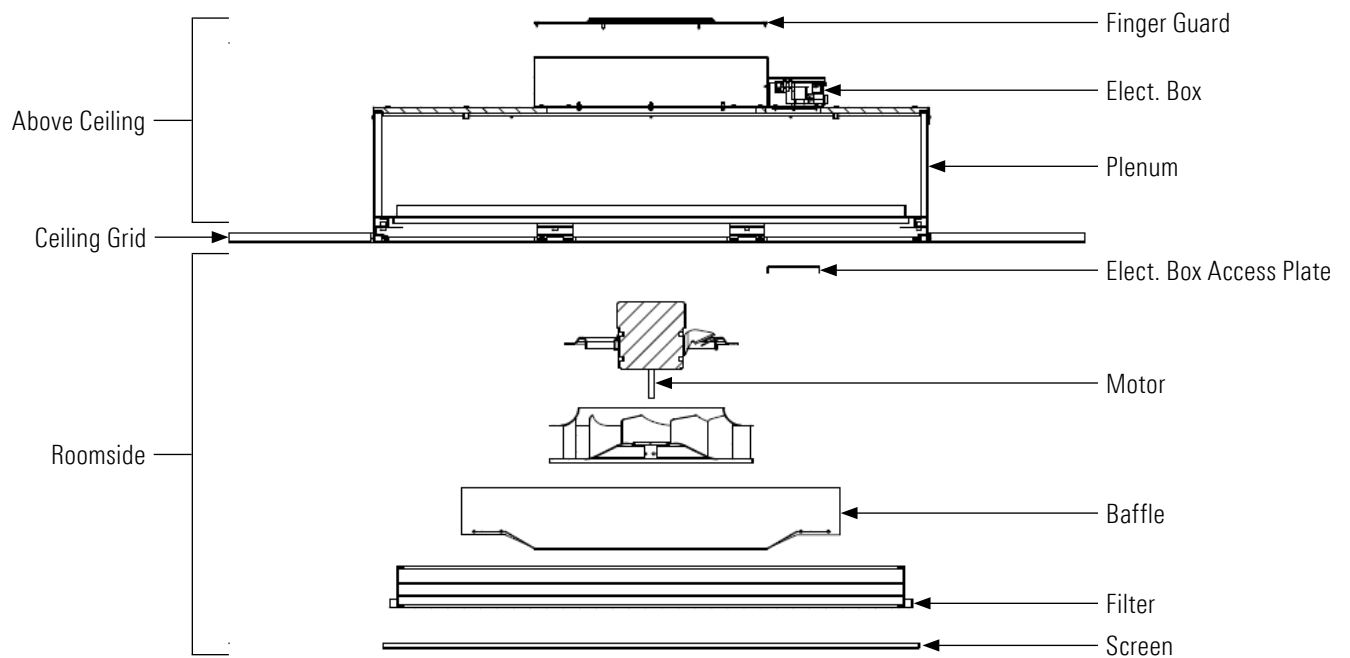
Room-side filter, motor, and electrical components configuration above. The screen, filter, baffle, motor assembly, and electrical components can be removed from the room-side. All other components are only accessible from above the ceiling.

UNIT CONTROL BOX AND WIRING DIAGRAMS

The FFDB/FFDE has a variety of available control configurations. The standard offering is the Universal Control Card. Infrared Control Card and the remote Visual Control Unit (ships separately) are also available options. Electrical box face examples are shown for all the control configurations below. Please see the FFDB/FFDE Description codes to determine the type of control you have or contact the manufacturer for more information.

ELECTRICAL BOX FACE AND WIRING DIAGRAMS

All FFDB/FFDE units are equipped with a two-position rocker switch (ON/OFF), which is located on the front side of the electrical box, on top of the unit.

UNIVERSAL CONTROL CARD ELECTRICAL BOX FACE

Electrical Knockout

On/Off Switch

Pressure Switch Adjust
ILS-PSS (Optional)

SPS Knockout (Optional)

RJ45 Network
Connection

RPM Test Probe
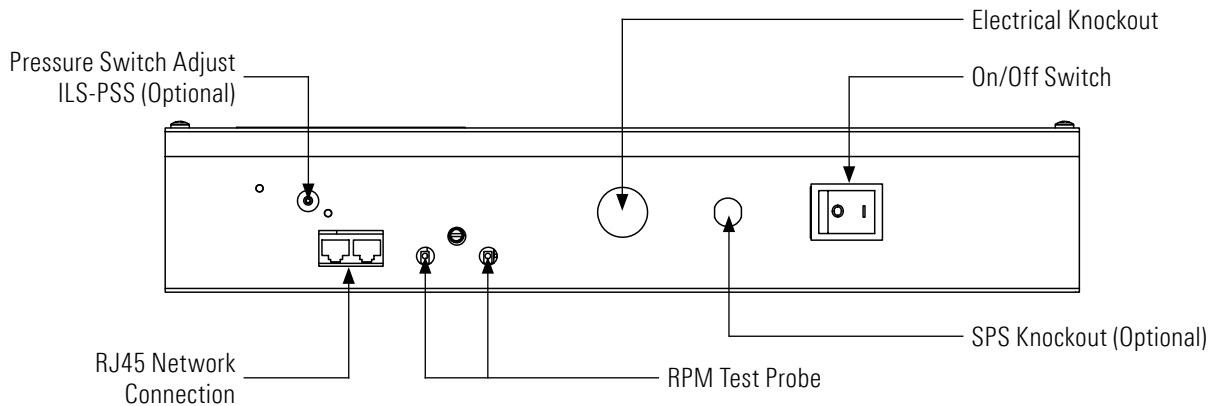
UNIVERSAL CONTROL CARD WIRING DIAGRAM
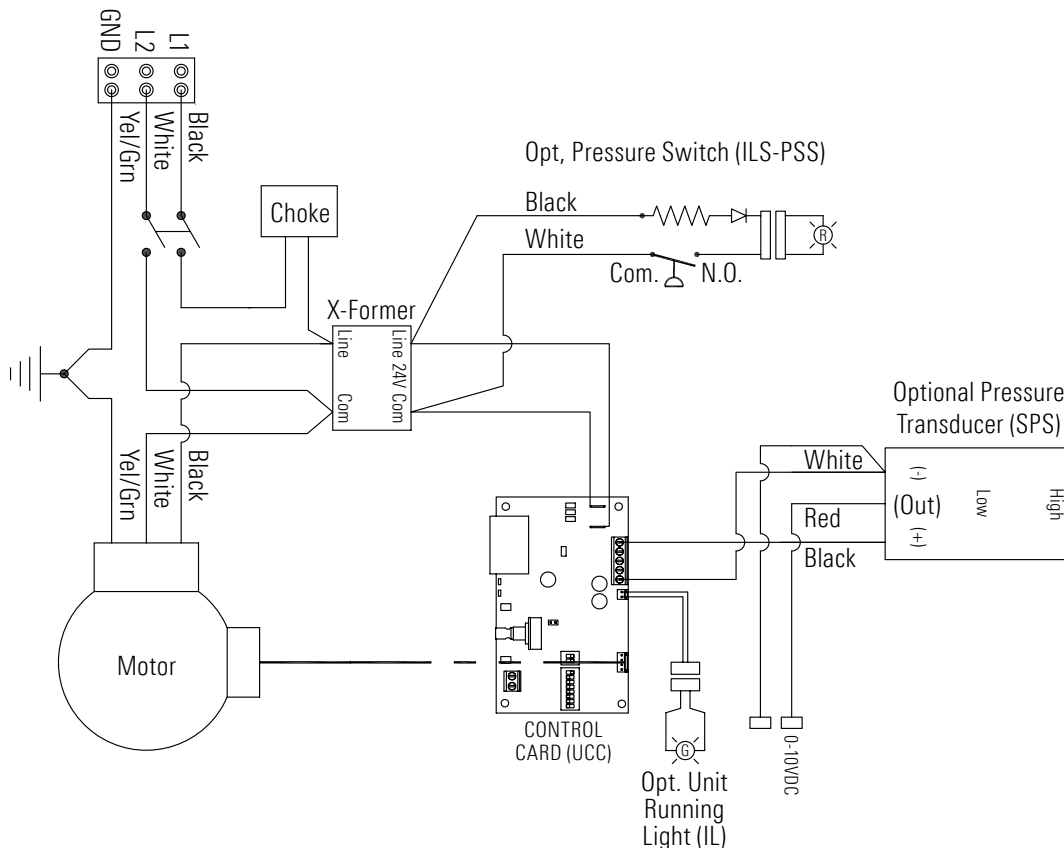
UNIT CONTROL BOX AND WIRING DIAGRAMS

INFRARED CONTROL CARD ELECTRICAL BOX FACE

Pressure Switch Adjust
ILS-PSS (Optional)

Electrical Knockout

On/Off Switch

SPS Knockout (Optional)

INFRARED CONTROL CARD WIRING DIAGRAM

GND
L2
L1

Yel/Grn
White
Black

Choke

X-Former

Line
Line 24V Com
Com

Black
White
Com.   N.O.

Opt, Pressure Switch (ILS-PSS)

0-10VDC

Optional Pressure
Transducer (SPS)

White

(Out)   Low   High

Red

Black

(–)

(+)

®

Control
Card (IR)

Yel/Grn
White
Black

Motor

IR Sensor

Includes Red Unit
Running Light
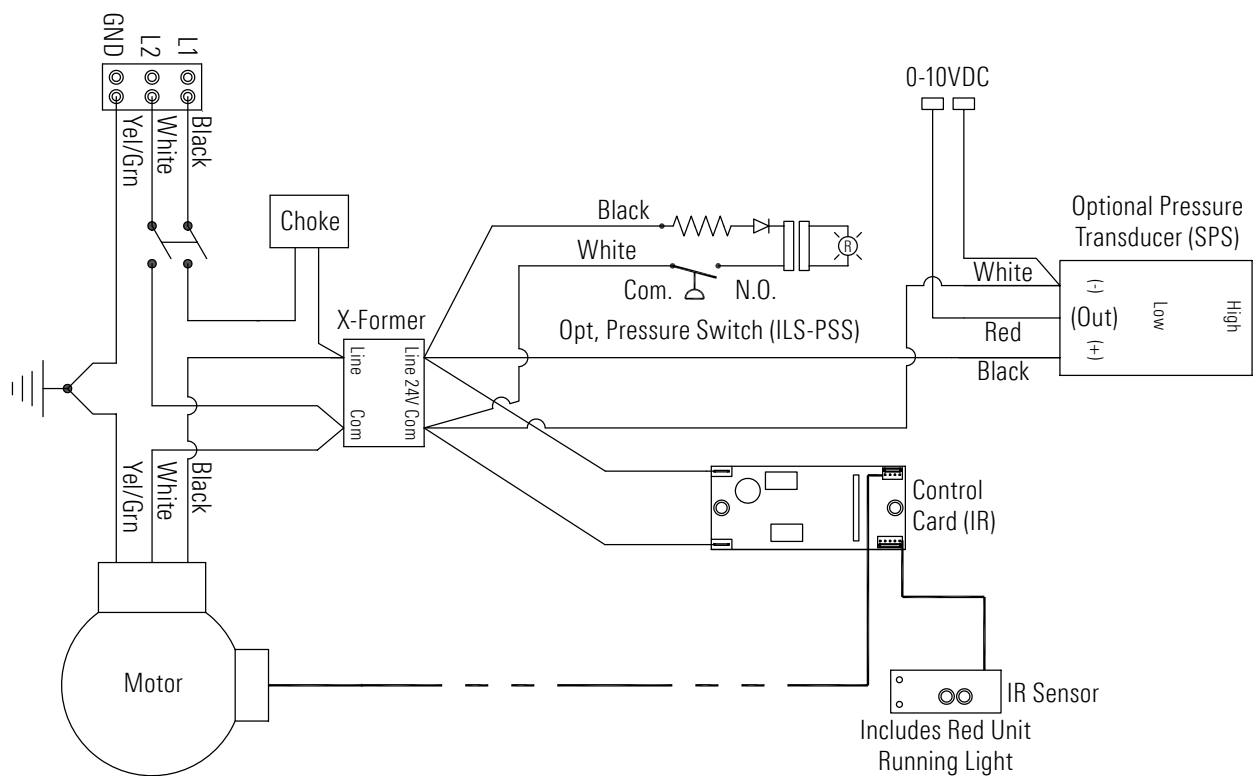
UNIT CONTROL BOX AND WIRING DIAGRAMS

REMOTE VISUAL CONTROL CARD ELECTRICAL BOX FACE

Electrical Knockout

On/Off Switch

Pressure Switch Adjust
ILS-PSS (Optional)

SPS Knockout (Optional)

VCU Wiring Knockouts

REMOTE VISUAL CONTROL CARD WIRING DIAGRAM

GND
L2
L1

Yel/Grn
White
Black

Opt. Pressure Switch (IL)

Black
White
Com.   N.O.

0-10VDC

Choke

Black
White
Com.   N.O.
Opt. Pressure Switch (ILS-PSS)

Optional Pressure
Transducer (SPS)

White
Red
(Out)
Black

(−)
Low
High
(+)

X-Former

Line
Com
Line 24V Com

Black
White

24V To
Remote Control

Yel/Grn
White
Black

Motor

To Remote Control
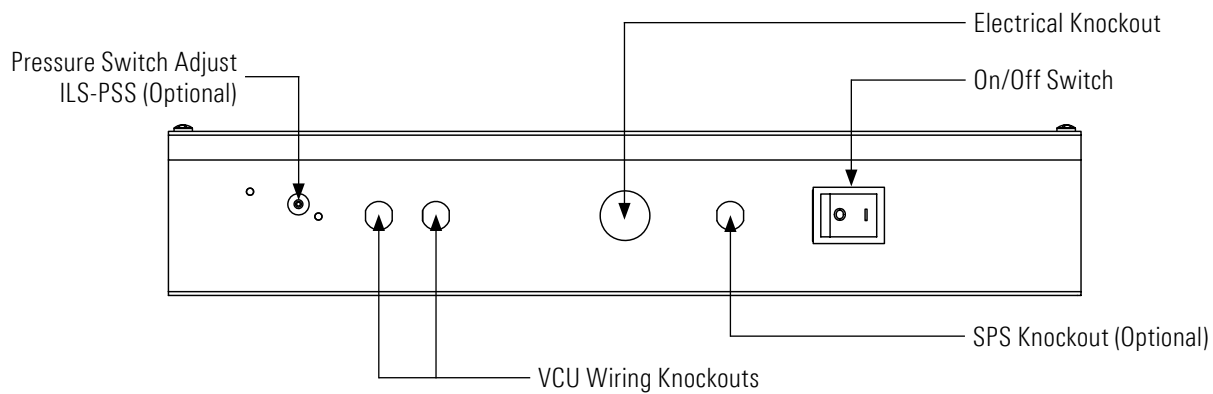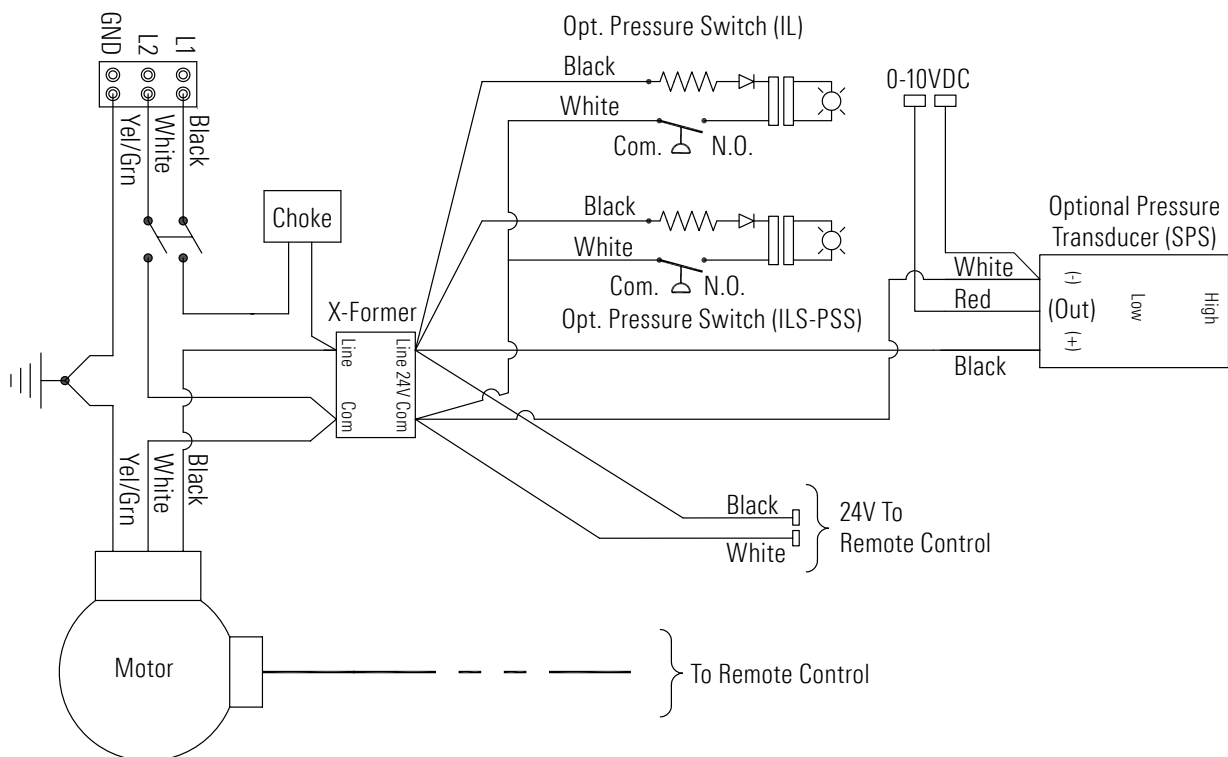
UNIVERSAL CONTROL CARD

The Universal Control Card is the standard control option for the FFDB and FFDE. This section will cover the features, control modes, dip switch setting, specifications, and more in depth information for the control.

FEATURES

- Networkable via an RJ45 serial bus with MODBUS RTU protocol
- Has AC and DC output power available connecting to and for activating external pressure sensors
- 0 -10 VDC analog control
- Manual control via onboard potentiometer
- Simple connections
  - Two RJ45 connections for daisy-chain network connections
  - Screw terminals for analog control
  - Text probe jacks for DC mV signal output of RPM and motor control set points
- 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

Sensor Input, Common

Sensor Power

Input Power

External LED Connector

EC Motor Cable Connector

Control Mode DIP Switch
Manual: 1&2 Off
Analog 0-10V: 1 ON, 2 OFF
Network: 2 ON

Addressing DIP Switch
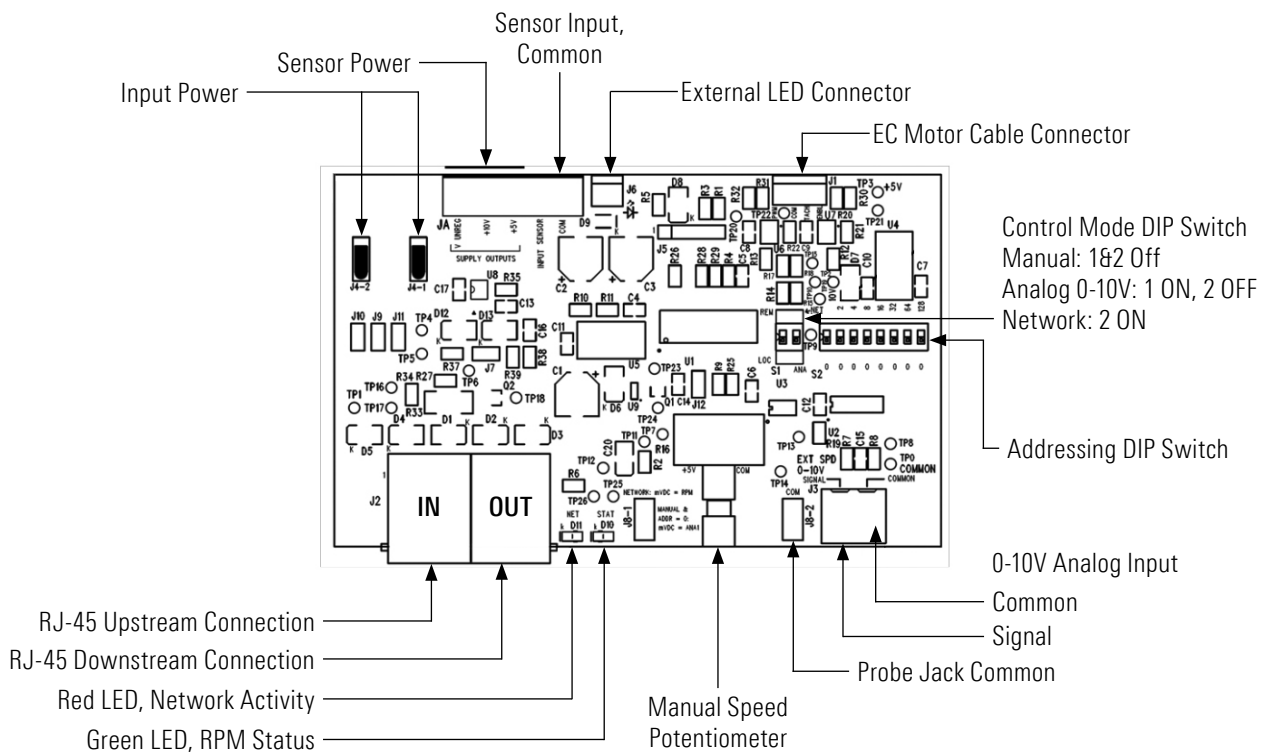
0-10V Analog Input
Common
Signal
Probe Jack Common

RJ-45 Upstream Connection
RJ-45 Downstream Connection
Red LED, Network Activity
Green LED, RPM Status

Manual Speed Potentiometer

IMPORTANT

YOUR FAN FILTER UNIT HAS THREE MODES OF OPERATION. IT IS YOUR RESPONSIBILITY AS THE INSTALLER TO SET THE MODE AS REQUIRED. IF UNSURE CONTACT YOUR PROJECT MANAGER OR CONTROLS COMPANY.
THE MODES ARE SET BY SETTING THE 2 PIN DIP SWITCH.

MANUAL MODE
1 OFF 2 OFF

ANALOG MODE
1 ON 2 OFF

NETWORK MODE
1 OFF 2 ON

NETWORK MODE
1 ON 2 ON
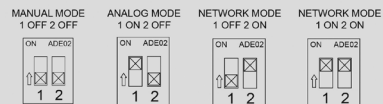
Example of label on unit for Universal Control card. Units come set in manual mode from the factory if equipped with Universal Control Card Option. Please review installation requirements and set up with end user.

UNIVERSAL CONTROL CARD

CONTROL MODES

The UCC2 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
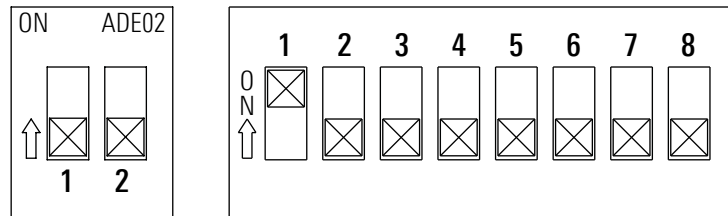
Analog Mode = 1 ON 2 OFF
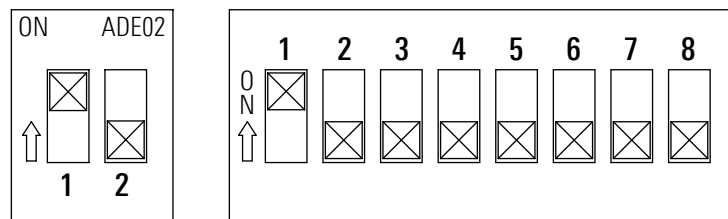
Network Mode = 1 OFF 2 ON
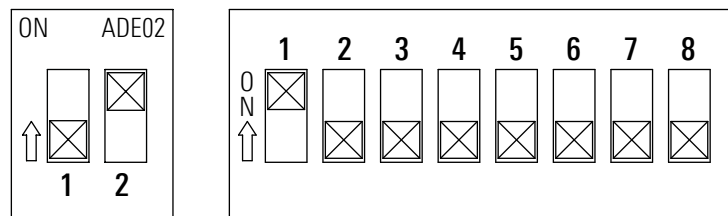
Network Mode = 1 ON 2 ON
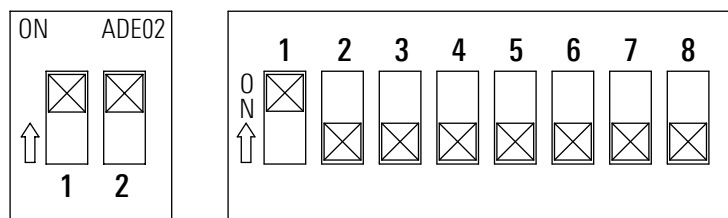
Note: Network mode can be configured using either DIP switch setting shown above. DIP switch pictorials are for reference and may be labeled differently by the manufacturer.

UNIVERSAL CONTROL CARD

MANUAL CONTROL MODE

In Manual control mode, the motor speed is set using the onboard potentiometer. Onboard potentiometer rotation is clockwise 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.

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 output based on the motor program. Each UCC2 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 UCC2 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 UCC2 at power-up. Power must be cycled (OFF/ON) before any changes take effect. It is recommend to have network cables unconnected while changing switch settings to eliminate possibility of network power.

ADDRESS DIP SWITCHES S2
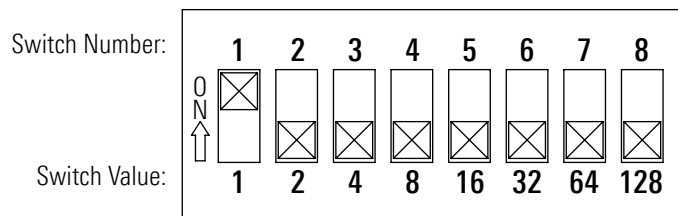
EXAMPLE OF BINARY S2 SWITCH SETTINGS
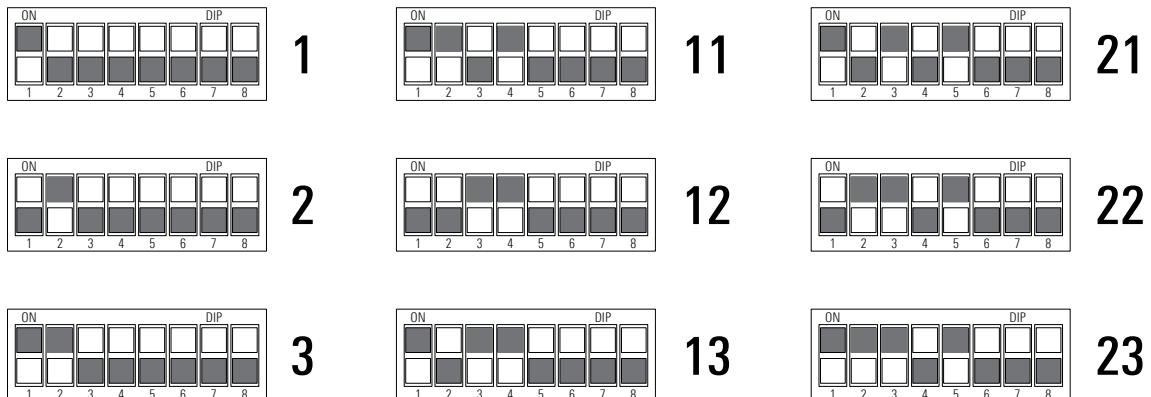
UNIVERSAL CONTROL CARD

Daisy-chain networking connection overview:

1. The overall control console's RJ45 downstream control cable is connected to the "IN" marked RJ45 connector of the first FFU in the group, to be noted as FFU #1.
2. Then, a CAT5 network cable is connected from FFU #1's RJ45 "OUT" connector to FFU #2's "IN" connector.
3. All of the subsequent UCC2-equipped FFUs will be daisy-chain connected as noted in steps #1 and #2 above.
4. The final FFU in the system to be controlled will have no cable connected to its "OUT" connector.

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)
   - RPM Accuracy: +/- 3%

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 JACKS POINTS

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.

UNIVERSAL CONTROL CARD

LED INDICATORS

- Onboard Status LED (green):
  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. This Onboard Status LED will flash when PWM signal is sent to the motor but no RPM is reported by the motor.

- 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 (red):
  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.

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

Red Network LED ———————— Green Status LED
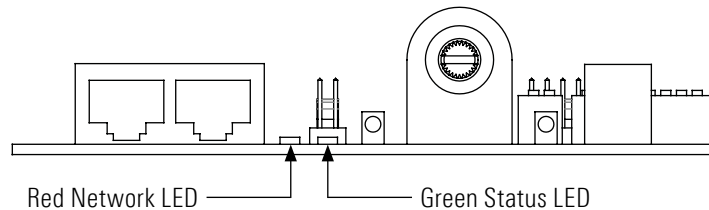
RJ45 NETWORK CABLE CONNECTIONS

1	2	3	4	5	6	7	8
Bus Power Pass Through	0V (GND)	RS485				0V (GND)	Bus Power Pass Through
		+	NC	NC	-		

UNIVERSAL CONTROL CARD

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.

MODBUS REGISTER SPECIFICATIONS:

Register	Name	R/W	Values	Default	Origin	Comments
1	RUN/STOP	R, W	0,1	1	RAM	read-only in analog
2	DEMAND SETPOINT	R, W	0-100	50	RAM	read-only in analog
6	SPEED/RPM	R	0,5-2000	-	LIVE	RPM feedback
7	ANALOG_INPUT_1	R	0-1000	-	LIVE	external 0-10V, analog input
8	MINIMUM SETPOINT	R, W	0-100	0	EEPROM	manual and analog only
9	RUNSTOP STATUS	R	0,2	-	RAM	2=Run; 0=Stop
10	NETWORK DEFAULT	R, W	0-100	50	EEPROM	applies in network mode only
12	ACTUAL SETPOINT	R	0-100	-	RAM	value same as Register 2
14	NETWORK RUNSTOP DEFAULT	R, W	0,1,0 x AA	1	EEPROM	On startup, 0=Stop, 1=Run, 0XAA=Restart Factory Default
24	ANALOG_INPUT_2	R	0-1023	-	RAM	sensor input (SPSC if applicable)

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

INFRARED SPEED CONTROL CARD

The infrared speed control is an optional control available on FFDERAC/FFDBRAC units. Please see the FFDB/FFDE Description codes to determine the type of control you have or contact the manufacturer for more information.

A Flow-Set handheld infrared remote control is required to adjust the infrared speed control card. Only one remote is required to control all the fan filter units you have in one location. The Flow-Set handheld remote sends infrared remote commands to the EVO/ECM-IRC control, allowing remote adjustment of the Motor. Using the Flow-Set, you can turn the motor on/off, adjust the flow index from 1-100, and read the current settings.

There are two lamps on the unit. A red lamp indicates motor running. A green lamp is used for motor feedback controlling the unit. This will be covered in more detail below.

HOW TO USE:

Point the handheld remote at the sensor located near the lamps (red lamp if the motor is on) on the equipment. Operate the on/off button if the unit is off. Press the Enter button after every adjustment if the setting is intended to be saved. If not, the unit will go back to the previous setting after 15 minutes. The red lamp will light up for motor running and the green lamp will light up indicating you are in an adjustment session. Use the Clear button to read the current settings. Point the handheld remote at the sensor 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 feedback uses long flashes to indicate the tens digit. The next feedback uses short flashes to indicate the singles digit. An extra long flash in the tens set or the singles set indicates the value of the corresponding digit is zero. Examples of the flow index feedback is below:

- A flow index of 24 flashes two longs, then 4 shorts.
- A flow index of 89 flashes 8 longs, then 9 shorts.
- 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 handheld remote at the sensor 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.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. The green lamp responds similarly when controlling less than 10 (zero is also not a valid flow index). Remember to press the Enter command to save any adjustments. The Clear button will delete new adjustments and revert back to the previous settings during an adjustment session.

BATTERIES

Two AA batteries power the handheld remote. 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 handheld remote 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.

VISUAL SPEED CONTROL CARD

The visual speed control (VCU) for remote control is an optional control available on all FFDB/FFDE units. Please see the FFDB/FFDE Description codes to determine the type of control you have or contact the manufacturer for more information.

One visual speed control card is required per fan filter unit. The visual speed control features a 4-digit LED numerical display. The flow index can be adjusted with a screwdriver. Clockwise speeds up the flow index and counterclockwise slows down the flow index. The flow index is a value between 0-100 and can be seen when adjusting with a screwdriver. The LED readout on the visual speed control will alternate between displaying the flow index and the motor RPM.
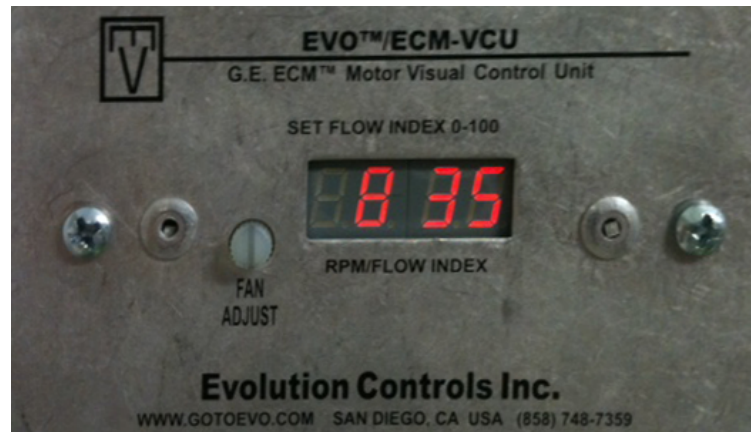
INSTALLING THE VCU:

Please refer to the depiction of the electrical box and VCU installation connections and the wiring detail information below.

Please make sure all power is off before making the connections.

- The six leads exiting the FFU electrical box have 1/4" female quick connectors.
- The six leads attached to the control have 1/4" female quick connectors.
- Please follow all applicable local codes for low voltage wiring. Conduit or plenum rated cables may be required.
- The wiring between the FFU electrical box and the VCU require the 18 gauge black and white leads (24VAC) from the electrical box to be connected to the same 18 gauge wire colors on the VCU (white to white & black to black).
- The 22 gauge communication wiring (0-22VDC) is also color coded to assist in installation. Connect the correct wire from the electrical box to the correct wire on the VCU. Red to red, green to green, black to black, and white to white.
- 1/4" male connectors have been supplied with the control to connect between the FFU electrical box and the VCU.
- The VCU board has two ECM connection points. It is recommended to use the ECM Motor 1 connection location. The 4-pin connection is keyed for correct installation orientation.

VISUAL SPEED CONTROL CARD

1/4" Male Connectors have been supplied with the control to connect between the FFU electrical box and remote mounted control where 1/4" male quick connectors are required

1/4" Male Quick Connector
(10 Supplied) (AMP P/N 2-520103-2)

Communication Wiring (0 - 22VDC)
22 GA Red, Green, Black, and White Wires by others

Communication Cable Harness
(Supplied with Control)

Electrical Box FFU Not Shown

1/4" Male Quick Connector

Visual Speed Control (VCU)
(Supplied W/ 2x4 J-Box)

Transformer Voltage (24VAC) Black and
White 18 GA Wires
(BLK to 24VAC, WHT to Neutral) by Others

1/4" Female Quick Connectors (2 Supplied) (AMP P/N 2-520184-4)

ECM Motor 1 Control Cable

ECM Motor 2 Control Cable

EVO/ECM-VCU-S2.0
EC Motor
Visual Control Unit
Dec 2017 by DySE

Evolution
Controls Inc.
San Diego, CA. USA
www.gotoEVO.com

~24V Neu

~24V Neu

FFDB/FFDE DUCT COLLAR

Fan filter units have the ability to be ducted and duct collars can be purchased from Titus. FFDERAC/FFDBRAC style units will not utilize a pre-filter, but instead have a finger guard. The pre-filter to the fan filter unit can be removed and discarded when ducting to the fan filter unit. If a pre-filter is still required at the unit, Titus has side-inlet pre-filter extension brackets sold separately.

DUCT COLLAR DIMENSIONS

Dia A	Dia B	Diameter	Titus P/N
23.25"	16"	8"	11226
23.25"	16"	10"	10691
23.25"	16"	12"	10789
23.25"	16"	14"	11232
20"	20"	8"	11231-004
20"	20"	10"	11231-001
20"	20"	12"	11231-002
20"	20"	14"	11231-003
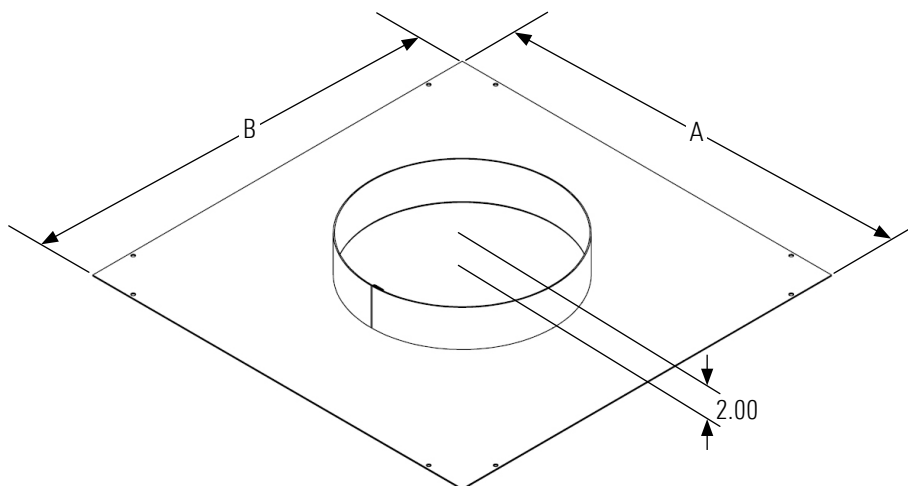
INSTALL PROCEDURE

Tools Required: Phillips Head Driver.

Step 1. Switch the ON-OFF switch to the off position.

Step 2. Remove the 4 screws securing the 20" x 20" prefilter or 16" x 23.25" pre-filter to the frame. Keep the removed screws. Discard the pre-filter. If pre-filter is still required, install side-inlet pre-filter expension bracket (sold separately).

Step 3. Slide duct collar in place. Screw down onto bracket using the 4 screws kept from previous step.

SHEETROCK ADAPTERS

Fan filter units must be placed in a gasket grid or frame for proper sealing. A sheet rock adapter frame can be used for hard ceiling application. When using a sheet rock adapter frame it is impertive to make a proper seal. This can be done by applying gasket to the adapter frame prior to placing the fan filter unit (FFU) into it. <u>Metal to metal will not make a proper seal.</u>

INSTALL PROCEDURE

Step 1. Frame the proper opening in the ceiling for the fan filter unit size you have, per the table blow.

Step 2. Apply gasket (sold separately, see parts list) to the fan filter unit metal to gasket flange. (Metal to metal will not seal).

Step 3. Secure the adapter to the rough opening using the appropriate hardware.

Step 4. It is recommended to caulk the perimeter of the adapter.

Step 5. Test the fan filter units to ensure they are fully operational before placing in the sheet rock adapter frame.

Step 6. Place the fan filter unit into the sheet rock adapter frame. FFDERAC/FFDBRAC style units will allow replacement of the gel seal filters through the adapter opening.

Step 7. It is recommended to create as many access panels as possible in the ceiling for the ability to access units from above as required.

Ceiling

Caulk Perimeter as needed to seal adapter to ceiling

Fan Filter Unit

Gasket (Sold Separately)

Sheet Rock Adapter
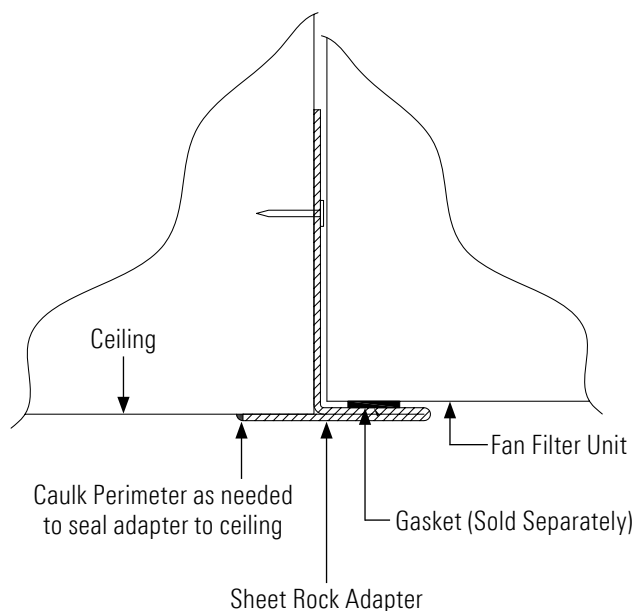
ROUGH OPENING SIZES (INCHES)

Adapter Size (FFU Actual)	A	B
4' x 4' (47.63" x 47.63")	48"	48"
2' x 4' (23.63" x 47.63")	24"	48"
2' x 3.5' (23.63" x 41.63")	24"	42"
2' x 3' (23.63" x 35.63")	24"	36"
2' x 2' (23.63" x 23.63")	24"	24"

Tolerance = + 1/8" / - 0

A

B

Sheet Rock Adapter

Rough Opening
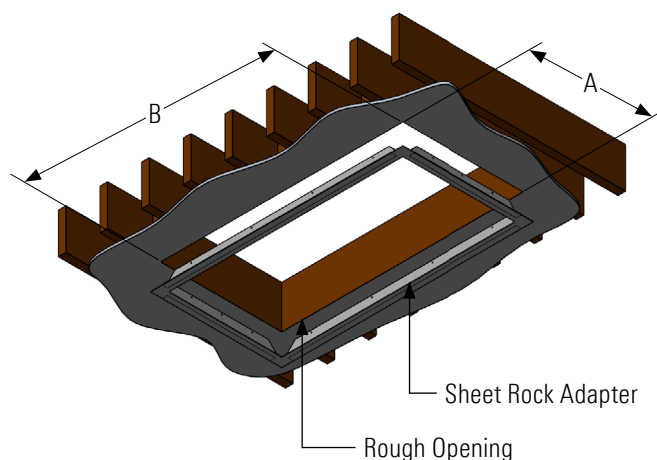
SERVICE: CHANGING THE FFDE/FFDB PRE-FILTER (FORM)

Tools Required: Phillips Head Driver.

Note: To keep the filter in top operating condition, washing and/or cleaning the foam pre-filter is recommended every three to six months. Frequency is unique to each application.

Step 1. Switch the ON-OFF switch to the off position.

Step 2. Remove the four screws securing the 20" x 20" prefilter or 16" x 23.25" pre-filter to the frame.

Step 3. Replace clean the pre-filter by hand washing in water with a mild detergent or by using a vacuum cleaner. Allow pre-filter to dry completely before replacing.

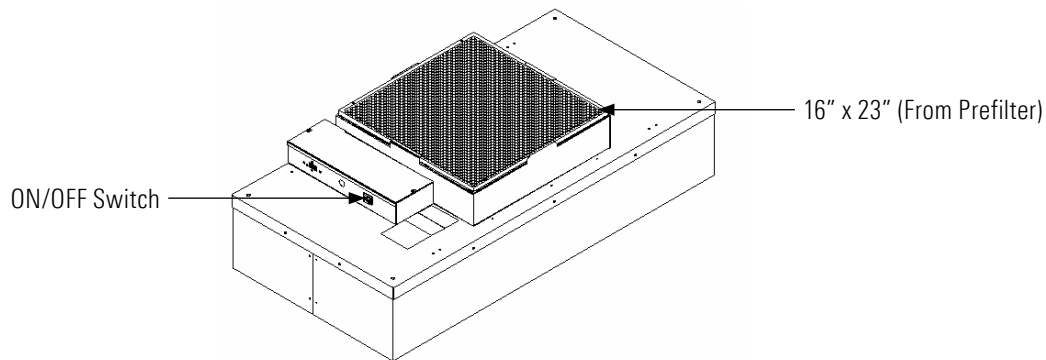**Step 4.** Reassemble by reversing the above steps.

16" x 23" (From Prefilter)

ON/OFF Switch

SERVICE: CHANGING THE FFDE/FFDB PRE-FILTER (PLEATED)

Tools Required: None.

Note: To keep the filter in top operating condition replacing the pleated pre-filter is recommended every twelve months or sooner. Frequency is unique to each application.

Step 1. Switch the ON-OFF switch to the off position.

Step 2. Remove the 20" x 20" prefilter or 16" x 23.25" pre-filter from the snap-in frame. The beverage board frame has slots that have to be depressed to release the filter from the pre-filter housing.

Step 3. After removing the new pleated pre-filter from the box, remove the die cut slots from the beverage board frame and install on pre-filter bracket.

Step 4. Reassemble by reversing the above steps.
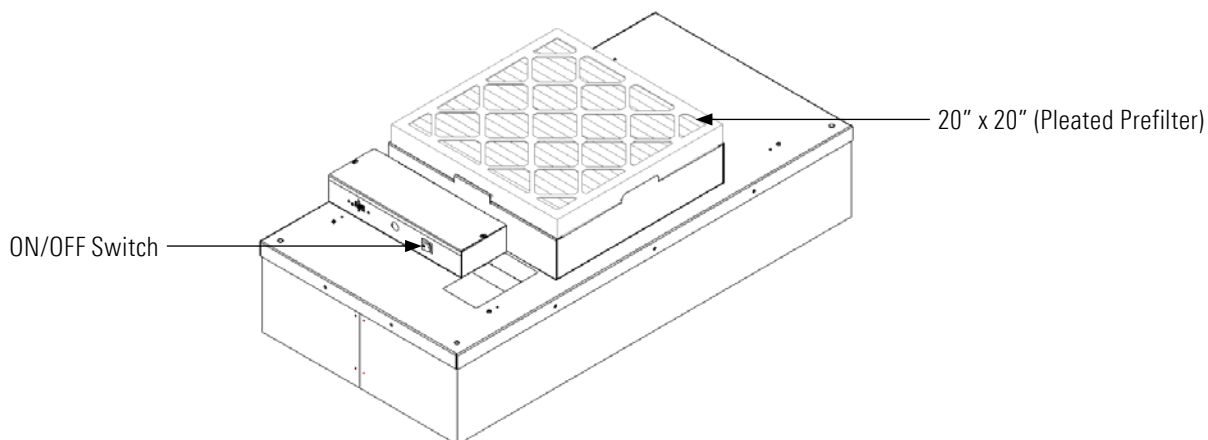
20" x 20" (Pleated Prefilter)

ON/OFF Switch

> ⚠ **Warning** — Disconnect the unit from the electrical power source before attempting any service

> ⚠ **Warning** — The Standard 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 (see page 7). 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. Disconnect power connections and any hardware required to remove unit from ceiling. Remove unit from ceiling.

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

Step 3. Lift the lid assembly off the HEPA/ULPA filter. Remove filter deflectors using 5/32 drill bit. Keep filter deflectors to install in new filter. Discard the used filter as per requirements of 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.

Note: Filters with deflectors installed can be ordered from the factory.

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

Step 5. To replace 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

On/Off Switch
Lid Assembly
Electrical Knock Out
#8 Screws (10x)
Filter Deflector
Ø5/32 Rivet (6x)
HEPA/ULPA Filter
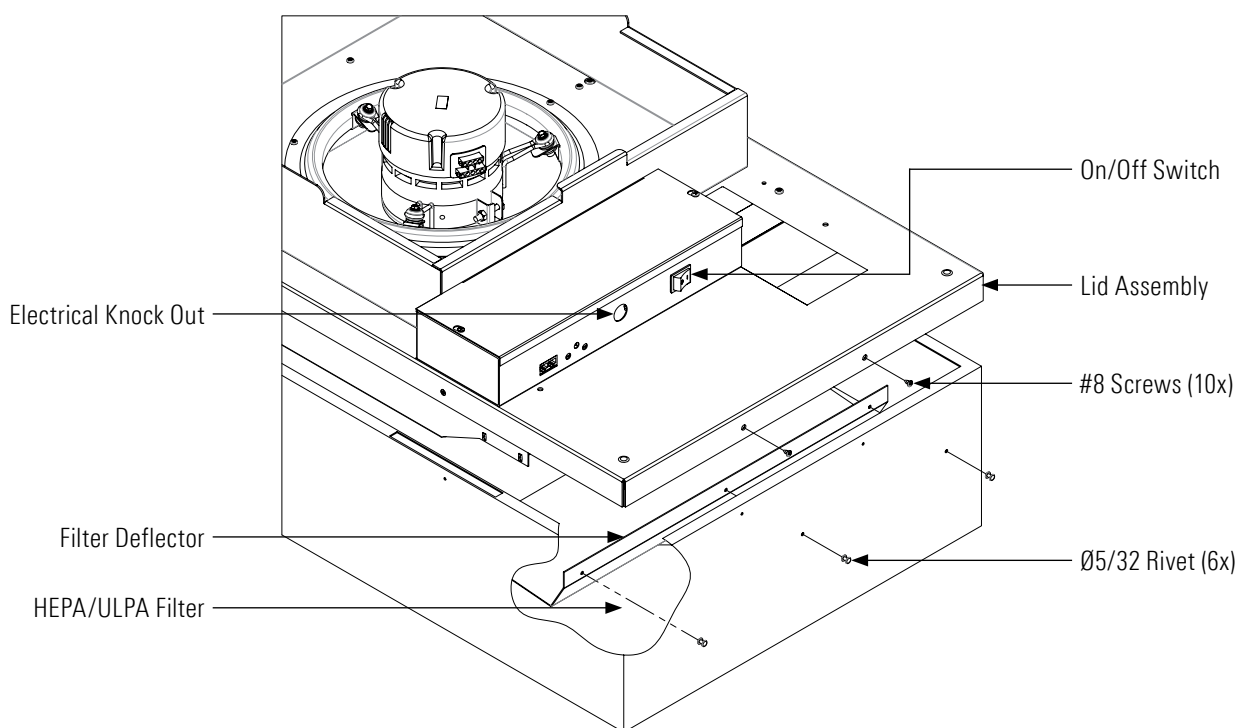
SERVICE: REMOVAL AND REPLACEMENT OF FFDERAC/FFDBRAC FILTERS

⚠ **Warning** Disconnect the unit from the electrical power source before attempting any service

⚠ **Warning** The Filter is protected with an expanded metal face screen. This is never to be used to handle the filter. It is only for protection against an accidental touch of the filter. Only handle the filter by the frame.

Note: All filters should be visually inspected for freight damage before installation (see page 7). It is necessary to use two workers when removing and installing the filter 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 FFDERAC/FFDBRAC Filters:

Tools Required: Phillips Head Driver, Standard Screwdriver (latch screen) , Battery Operated Drill, 3/16" hex head ball driver.
Step 1a (if FFDERA/FFDBRA). With the power off, remove the diffuser screen by removing the quantity 6 of 10-32 x 1/2 screws, then carefully place hardware in a safe location.
Step 1b (if FFDERAC/FFDBRAC or has latch screen). With the power off, open the diffuser screen by rotating the 3 quarter-turn latches.

SCREW AND NYLON WASHER

QUARTER-TURN LATCH
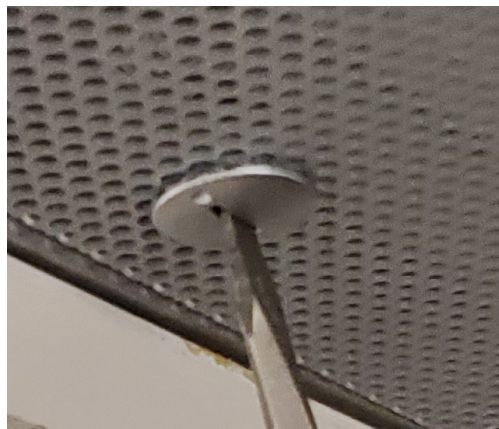
Step 2. Loosen the six (4 on 2 X 2 size) 1/4-20 X 1/2 socket head screws far enough to rotate the six filter clips 90°. The filter may be loose enough to drop during this operation. If not, slowly pull the filter away from the knife-edge seal, taking care not to touch the filter face during this operation. It is important to pull the filter slowly away from the seal, so that the gel remains in the filter gel track.

<table>
<tr>
<td>⚠ **Warning**</td>
<td>Disconnect the unit from the electrical power source before attempting any service</td>
<td>⚠ **Warning**</td>
<td>The Filter is protected with an expanded metal face screen. This is never to be used to handle the filter. It is only for protection against an accidental touch of the filter. Only handle the filter by the frame.</td>
</tr>
</table>

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

For Removal and Reinsertion:

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

Step 5. Inspect the gel seal. 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.

For Installation:

Step 6. Place the filter evenly against the filter-sealing surface of the FFDER/FFDBR unit. Reposition filter clips and screws. The clips should be rotated and angled into place. It is recommended that 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. Do not overtighten.

Step 7. Reinstall diffuser screen by hand-tightening the screws or use a standard screwdriver to rotate the quarter-turn latches.

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

Step 9. Restore power to FFU and verify proper operation of FFU.
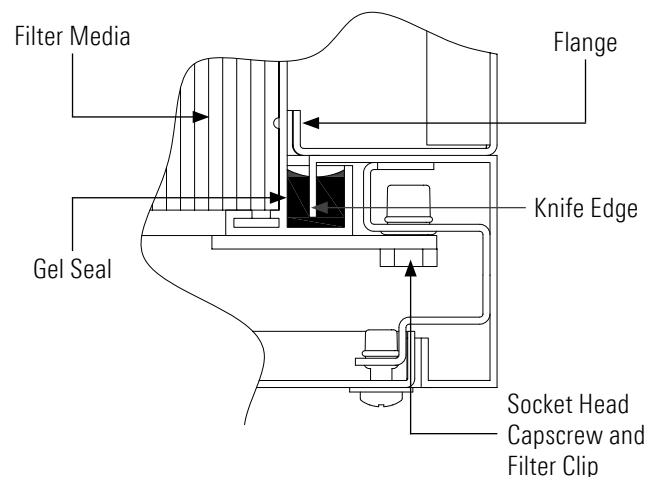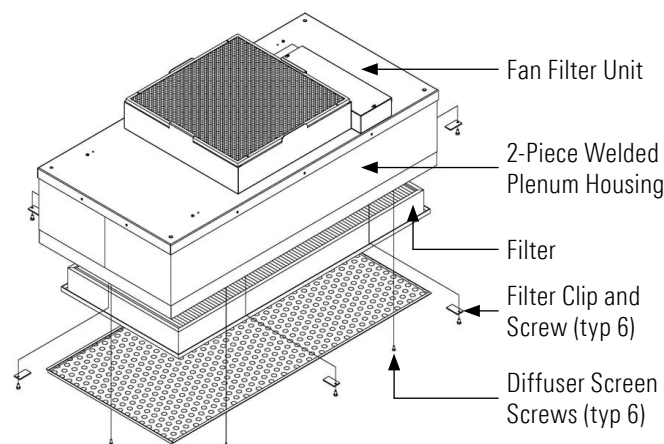
SERVICE: FFDE/FFDER MOTOR REMOVAL AND INSTALLATION

⚠️ **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, 5/32" hex head wrench

Step 1. To gain access to the motor, remove the ceiling panel next to the unit, if applicable. The unit may need to be removed from the ceiling to access components.

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

Step 3. Remove the four screws securing the pre-filter. Remove the pre-filter and set aside or replace.

Step 4. Disconnect motor wire harnesses from the motor.

Step 5. Remove the six mounting screws to free the motor/blower assembly from the lid. If using power drivers, set the unit to a low torque setting to avoid stripping the sheet metal screws.

Step 6. Pull the motor/blower assembly upward utilizing the motor mount to remove from fan filter unit.

Step 7. Remove the blower wheel from the assembly by loosening the set screw in the blower wheel hub.

Step 8. Motor can be removed from assembly by loosening bolt on belly band (motor support bracket). Before removing motor, mark location of the belly band on the motor. If replacing motor, mark the new motor with the recorded location and install accordingly.

Step 9. Replace with new components as required and reassemble using reverse steps. The spacing is 0.08" (2.03 mm) clearance between the blower wheel and the venturi ring.

STEP 3

STEP 4

STEP 5

STEP 6

⚠ **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, 1/4" drive bit for SST screws, (2) 8" adjustable wrenches, 5/32" hex head wrench, 3/8" drive bit.

Step 1. To gain access to the motor, remove the ceiling panel next to the unit, if applicable. The unit may need to be removed from the ceiling to access components.

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

Step 3. Remove the four screws securing the pre-filter. Remove the pre-filter and set aside or replace.

Step 4. Loosen the electrical box cover screws (2), and slide/lift off cover. Make note of all wire routing and locations for later reinstallation.

Step 5. Disconnect motor wiring and motor harnesses from the electrical box housing and remove the tubing for test port, if installed.
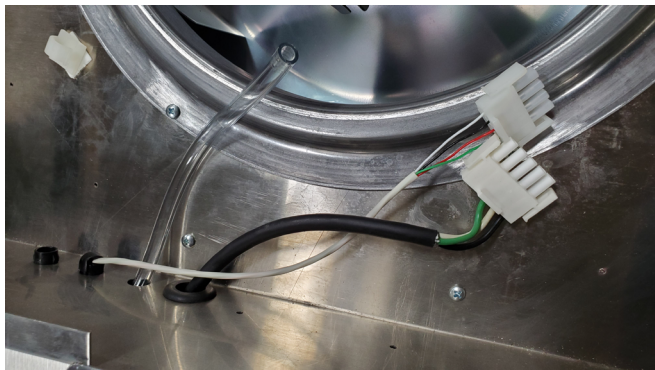
⚠ **Warning** Disconnect the unit from the electrical power source before attempting any service.

⚠ **Warning** Electrical service should only be performed by a licensed or qualified electrician.

Step 6. Remove the ten mounting screws to free the pre-filter bracket with motor/blower assembly from the lid assembly. Two mounting screws are located near baffle screws. Do not remove baffle screws. 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. Loosen the set screw that attaches the blower wheel to the motor shaft to remove blower wheel.

Baffle Screw
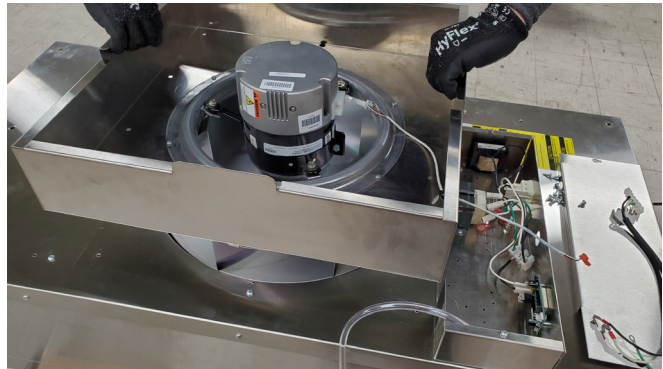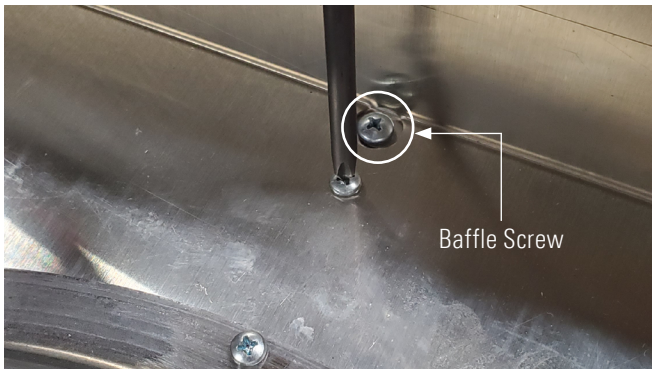
Optional Step. Remove the six mounting screws to free the motor/blower assembly from the pre-filter bracket.

Step 8. Motor can be removed from assembly by loosening bolt on belly band (motor support bracket). Before removing motor, mark location of the belly band on the motor. If replacing motor, mark the new motor with the recorded location and install accordingly.

Step 9. Replace with new components as required and reassemble using reverse steps. The spacing is 0.23" (5.84 mm) clearance between the blower and the upper motor plate/prefilter frame.

⚠ **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 Head Driver, Battery Operated Drill, (2) 8" adjustable wrenches, 5/32" hex head wrench, 3/8" socket

Step 1. To gain access to the motor, remove the gel seal filter (see page 30).

Step 2. Remove the baffle by removing the four 1/4-20 collar nuts. Take care to support baffle while removing the fasteners.

Step 3. Prior to removing motor/blower assembly, remove blower wheel to expose motor connectors on motor. Remove the blower wheel from the assembly by loosening the set screw in the blower wheel hub.

Step 4. Disconnect motor wire harnesses from the motor.

Step 5. While supporting the motor blower assembly from below, remove the six screws on the underside of the venturi ring and lower the assembly.

Step 6. Motor can be removed from assembly by loosening bolt on belly band (motor support bracket). Before removing motor, mark location of the belly band on the motor. If replacing motor, mark the new motor with the recorded location and install accordingly.

Step 7. Replace with new components as required and reassemble using reverse steps. The spacing is 0.08" (2.03 mm) clearance between the blower wheel and the venturi ring.

STEP 2

STEP 4
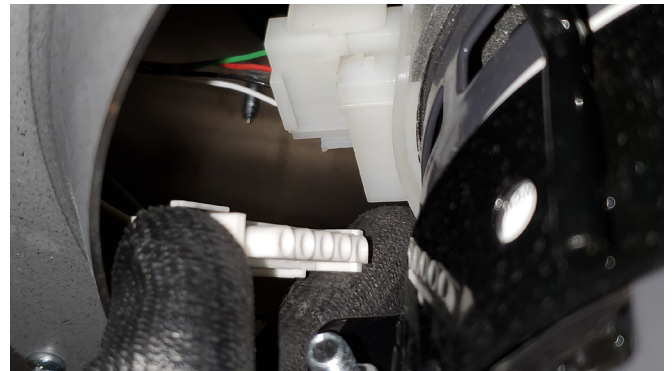
STEP 5

STEP 5

SERVICE: FFDBRAC 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 Head Driver, Battery Operated Drill, (2) 8" adjustable wrenches, 5/32" hex head wrench, 3/8" socket

Step 1. To gain access to the motor, remove the gel seal filter (see page 30).

Step 2. Remove the baffle by removing the four 1/4-20 collar nuts. Take care to support baffle while removing the fasteners.

Step 3. Prior to removing motor/blower assembly, remove blower wheel to expose motor connectors on motor. Loosen the set screw that attaches the blower wheel to the motor shaft to remove blower wheel.

Step 4. Disconnect motor wire harnesses from the motor.

Step 5. While supporting the motor blower assembly from below, remove the six screws on the underside of the venturi ring and lower the assembly.

Step 6. Motor can be removed from assembly by loosening bolt on belly band (motor support bracket). Before removing motor, mark location of the belly band on the motor. If replacing motor, mark the new motor with the recorded location and install accordingly.

Step 7. Replace with new components as required and reassemble using reverse steps. The spacing is 0.23" (5.84 mm) clearance between the blower and the upper motor plate/prefilter frame.

STEP 3

STEP 4
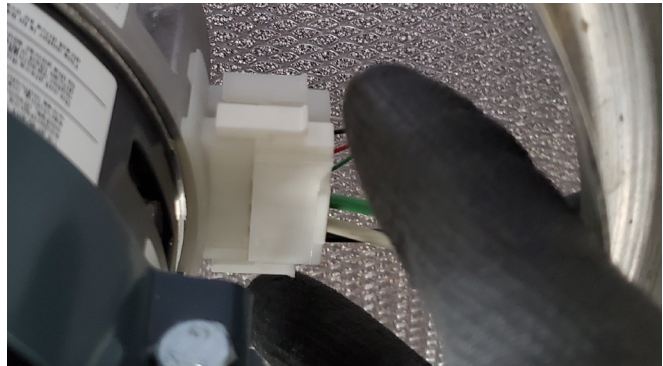
STEP 5

STEP 5

⚠ **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

Step 1. Remove the gel seal filter (see page 30).

Step 2. Remove the baffle by removing the four 1/4-20 collar nuts (see page 35).

Step 3. Electrical box plate can now be seen near the motor/blower assembly. Remove the two #8-32 X 1/2" screws holding the plate. Once removed, access to the electrical box is available.

To remove any components in the electrical box, make all connector and wire disconnections before removing hardware. Components removable in Electrical box include: control board, transformer, choke, and terminal block.

Note: Access to the ON-OFF switch is not available from the room-side. Be sure to disconnect power and follow proper lock-out tag-out procedure.
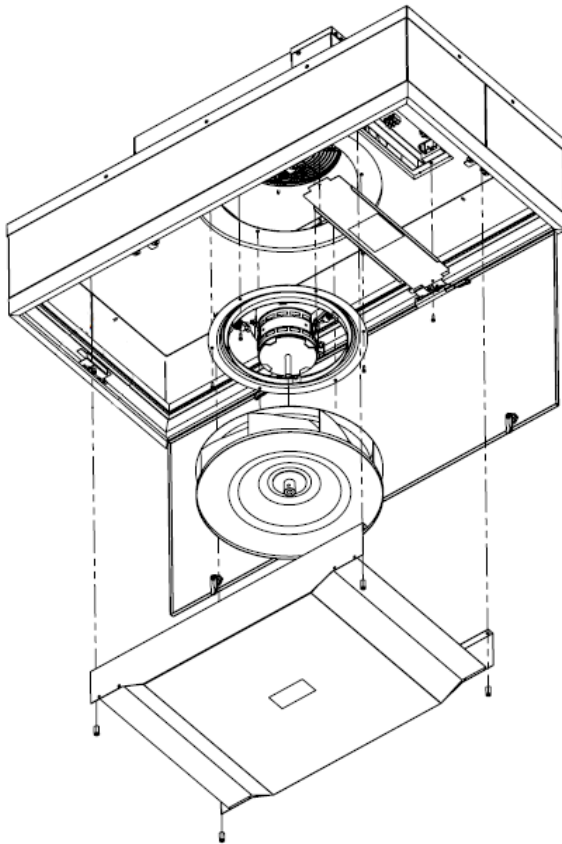
STEP 3

CHALLENGE/CONCENTRATION PORTS

Challenge and concentration ports are an available option on fan filter units. Every FFDERAC/FFDBRAC comes with these ports as a standard option. Standard style units do not come with challenge and concentration ports, although it may be an available option. On standard style units, the ports are located on the center bar of the filter. On FFDERAC/FFDBRAC style units, the ports are located beneath the diffuser screen along the housing outer channel. Remove the diffuser screen by removing the six 10-32 X 1/2 screws. If the unit is equipped with the latch screen, rotate the 3 quarter-turn latches to access the ports. The concentration and challenge tubing has dimensions of 3/8" O.D. x 1/4" I.D. This tubing connects to barbed fittings with hex-head plugs that can be removed for access.

Concentration/Static
Pressure Port

Downstream Filter Face
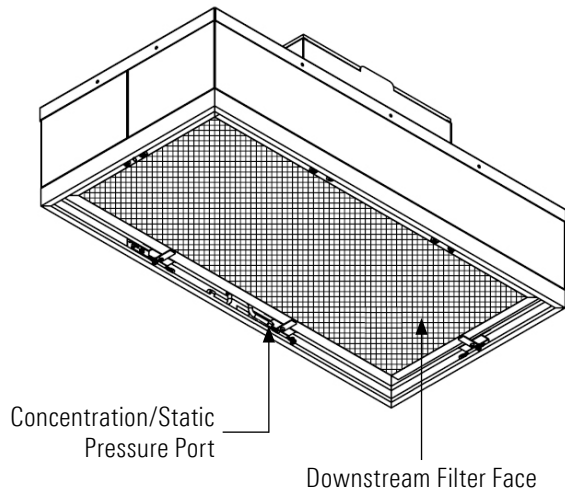
CHALLENGE/CONCENTRATION PORTS

INDICATOR LIGHTS

Indicator lights are an available option on fan filter units. To determine if your unit has lights, please refer to the description code of the unit and reference page 6 of this manual. Standard style units may come with lights which would be located in the center bar on the filter. Lights on FFDERAC/FFDBRAC u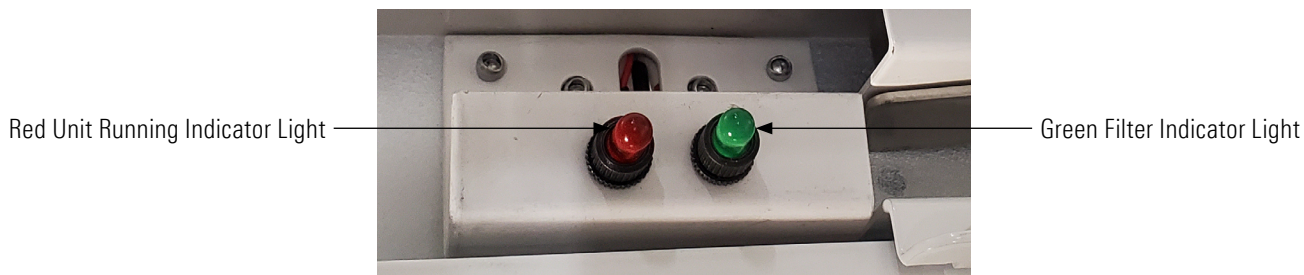nits will be located along the housing outer channel. Follow the protective wire chase along the outside of the unit to determine the location.

Red Unit Running Indicator Light ———— ———— Green Filter Indicator Light

The green indicator light should be illuminated when the unit is running. The red indicator light utilizes a pressure switch that has been set at the factory. It is recommended to adjust the pressure switch during initial installation as each application has unique pressure balances that may affect the pressure switch.

The filter change indicator differential pressure switch is located inside the electrical box with access for adjustment through the front of the electrical box.

Filter Load Indicator Light
(ILS-PSS)
Pressure Switch Adjustment
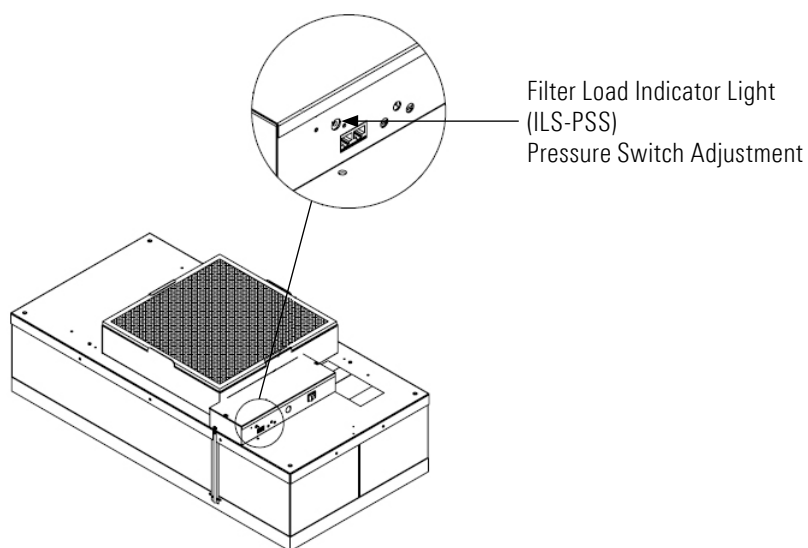
Adjustments can be made using a small flat head screwdriver and turning the adjustment screw CW or CCW. Take care not to overtighten the screw as this could damage the pressure switch. It is recommended to change the filter at twice the initial static pressure of the filter. The initial static pressure can be located on the label on the side of the filter. The initial static pressure can also be measured across the filter using a magnehelic gauge if the fan filter unit is equipped with a concentration/static pressure port.

TO SET THE PRESSURE SWITCH:

Simulate filter loading to set the light indication point. To simulate filter loading, use a piece of carboard, plexiglas, etc. to block off airflow on the downstream side of the filter face. If using a magnehelic gauge, block the filter face until twice the initial static pressure is registered. Adjust the pressure switch for the indicator light to flicker on and off at this point. If not using a magnehelic gauge, block the filter face approximately 90% and adjust the pressure switch for the indicator light to illuminate. To test indicator light, block the filter face 95% and the light should illuminate. Remove the blockage from the filter face and the light should turn off.

PRESSURE TRANSDUCER

A pressure transducer is an available option on fan filter units. The pressure transducer allows for real-time monitoring of pressure values across the motor/blower assembly. The pressure transducer is installed and pre-piped in the factory by Titus and has a pressure range of 0 to 1 iwc. The pressure transducer can be wired directly to a building automation system or to the Universal Control Card. This can be specified at time of order. For wiring directly to a buidling automation system, the description code is SPS. A red signal out and white com. wire will be provided at the electrical box for others to wire to the building automation system . For wiring to the Universal Control card, the description code is SPSC. All wiring is done in factory for SPSC and the pressure value is stored in the Universal Control Card. Please see page 21 for the appropriate register. The value stored in this register will need to be converted to iwc by dividing the stored value by the max register value. Wiring to the Universal Control Card can be seen below.

Connections:

Pressure Transducer	UCC
COM	COM
OUT	INPUT SENSOR
EXC	V UNREG

J7 Jumper Required
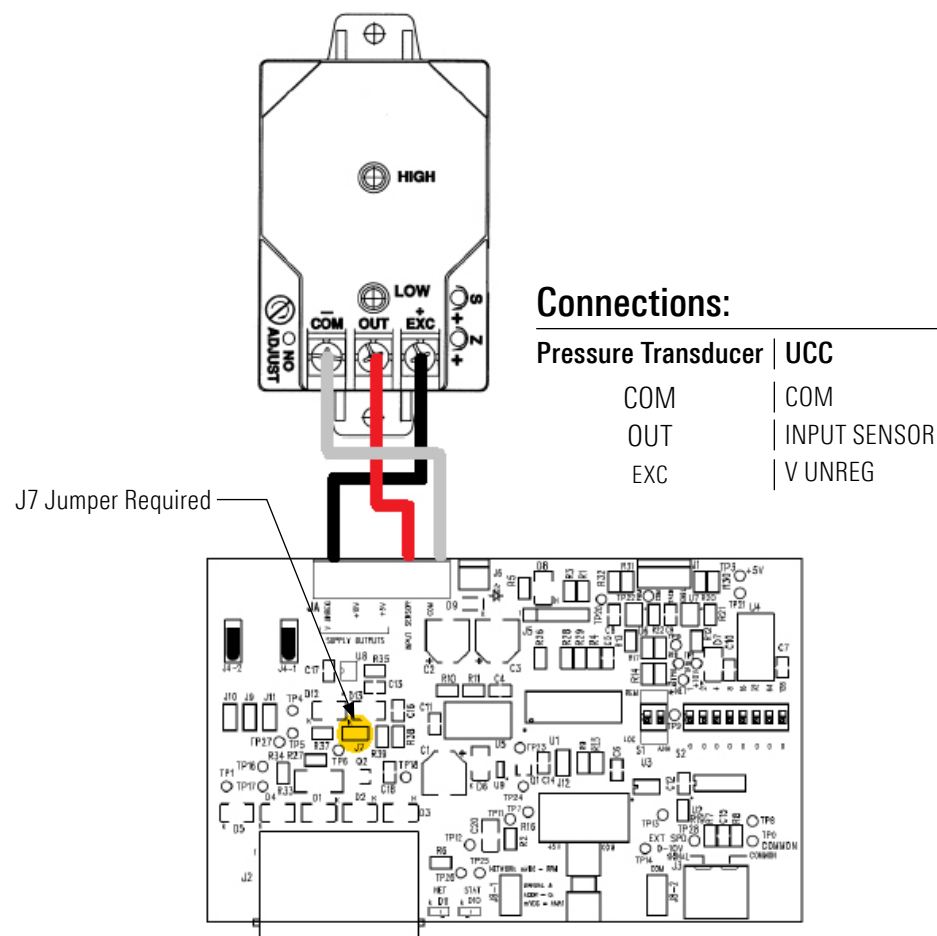
TROUBLESHOOTING FFDB/FFDE

Please reference the different sections below for potential issues with the FFDB/FFDE. Not every issue can be solved with the guides below. If unable to get the fan filter unit to function properly, please contact Titus by phone or email to resolve the issue.

Problem: Unit Not Running
Potential Issues: No Power, Bad Electronics (switch, transformer, board), Faulty Motor Harness, Faulty Motor, Mechanical Issue, Network Control Issues
Useful Documents: TN1013 - ECM Control Test Procedure

The following steps below work for all controls (IR, CSL, UCC). There will be an individual section for each of the controls with further in depth instruction.
Step 1. Confirm power (primary voltage). See **TN1013** High Voltage Test.

Step 2. Check electrical components for functionality. See **TN1013** High Voltage Test.

Step 3. Confirm output voltage from control board to motor (see individual sections below).

FOR UCC:
-   Turn off rocker switch on fan filter unit.
-   Put the unit in manual mode. First set of switches should be in off position (1 off, 2 off). Reference lid label for dip switch settings or see page 18-19 in manual.
-   Verify orientation of the 4 pin connector from **TN1013** for the Universal Control Card.
-   Turn on rocker switch.
-   Green light on board should turn on briefy and then turn back off. Light will stay on if motor is running.
-   Adjust the potentiometer on the board. Slow unit down = turn counter-clockwise. Speed unit up = turn clockwise.
-   If unit does not start up and green light does not illuminate on the control board, perform Motor ON Test from **TN1013.** Verify voltage at control board and motor.
-   If correct voltage found, perform Variable SpeedTest from **TN1013.** Verify voltage at control board and motor.
-   If voltage not found at control board output: Replace control board (265888).
-   If voltage found at control board, but not motor: Replace Motor Harness for control (see parts list on page 45-46).
-   If voltages are correct on board and motor and motor still does not run: Reference troubleshooting section for mechanical issues and perform steps.

FOR IR:
-   Turn off rocker switch on fan filter unit.
-   Verify orientation of the 4 pin connector from **TN1013** for the IR control card.
-   Turn on rocker switch.
-   Verify IR remote has power and illuminates when buttons are pressed. If not, replace batteries. If this does not work, replace IR remote (63760).
-   Point remote at IR sensor on fan filter unit. Press On. Press Enter. Red light should illuminate and stay On for motor running. Green light should flash when commands are pressed on the remote. Press Clear on the remote for the flow-set feedback. Refer to IR control on page 23 for operation.
-   If green light on fan filter unit does not illuminate, recommend cleaning IR sensor. If green light does not illuminate to commands from IR remote, recommend replacing IR sensor (63759-005) and IR control board (63758).
-   If green light illuminates with commands from IR remote, but unit does not run, perform Motor ON Test from **TN1013.** Verify voltage at control board and motor.
-   If voltage not found at control board output: Replace control board (63758).
-   If voltage found at control board, but not motor: Replace Motor Harness for control (see parts list).
-   If voltages are correct on board and motor and motor still does not run: Reference troubleshooting section for mechanical issues and perform steps.

FOR CSL:

- Turn off rocker switch on fan filter unit.
- Verify orientation of the 4 pin connector from **TN1013** for the remote VCU control board (CSL).
- Turn on rocker switch.
- Verify Visual Speed control readout display illuminates. If display does not illuminate, verify control board has correct power (24VAC from transformer in fan filter unit electrical box). If control board has confirmed power, but display screen does not work: Replace control board (63951).
- Adjust flow index with screwdriver. Slow unit down = turn counter-clockwise. Speed unit up = turn clockwise. LED readout display should show higher flow index that corresponds to the rotation of the pot. RPM will increase as well.
- If flow index and RPM do not increase, perform Motor ON Test from **TN1013**. Verify voltage at control board and motor.
- If voltage not found at control board: Replace control board (63951).
- If voltage found at control board, but not at motor: Verify wiring between motor and control board. This wiring is done by others.
- If voltages are correct on board and motor: Reference troubleshooting section for mechanical issues and perform steps.

Problem: Mechanical Issues
Potential Issues: Broken Motor Mount, Broken Inlet Ring Connections, Damaged Blower Wheel, Wheel Fallen Off Motor Shaft, Failing Motor Bearings

Step 1. Turn off rocker switch on fan filter unit. Turn off power connections to the fan filter units.

Step 2. Take off pre-filter or duct to inspect motor.

Step 3. Visually inspect motor assembly for damage. Inspect venturi inlet ring connection points for any potential issues (3 in total). Inspect the motor mount bracket (belly band) for damage. If damage is found, contact Titus for further assistance.

Step 4. Put on protective glove and try to turn the blower wheel (verify power is off before doing so). If unable to, find the cause. Is the wheel physically damaged? Does it contact the housing? Has the blower wheel fallen off the motor shaft? Access to the blower wheel is different depending on the model. Reference the manual pages for motor replacement for assistance on access, removal, and installation.

Step 5. If permanent damage found, please contact Titus for further assistance.

Step 6. If no mechanical issues found and motor is not running after performing Unit Not Running and Mechanical Issues troubleshooting, please contact Titus for further assistance. Motor/blower will likely need to be replaced.

Problem: Low Airflow
Potential Issues: Dirty Media, Air Supply Issue, Unit Not Running, Low Speed Setting, Other Environmental Restrictions

Dirty Media: Check filter media. Pre-filter can be cleaned or replaced. HEPA/ULPA media may need to be replaced.

Air Supply Issue: Verify air supply is adequate to provide airflow required. Recommend starting fan filter units before air handlers.

Unit Not Running: Refer to Unit Not Running troubleshooting and/or Mechanical Issues troubleshooting.

Low Speed Setting: Increase speed control setting to fan filter units.

Environmental Restrictions: Verify there are no environmental restrictions. Environmental restrictions can also cause non-laminar flow from the fan filter unit.

Problem: High Airflow
Potential Issues: Air Supply Issue, High Speed Setting

Air Supply Issue: Verify air supply is adequate to provide airflow required. Recommend starting fan filter units before air handlers.
High Speed Setting: Decrease speed control setting to fan filter units.

Problem: Leaking Filter
Potential Issues: Damaged Filter, Improper Installation/Bypass
Useful Documents: TN1012 - Leaking Filters Determination

Damaged Filter: Inspect the filter for any physical damage before installing in the ceiling. Damage can occur in shipping that would cause the filter to leak. Please reference the unboxing/installation section on page 7 and the filter installation procedure on pages 29-31.
Bypass: Please see **TN1012** to help determine if the filter is leaking or if there is bypass coming from another location.

Problem: Unit Acting Erratically/Unable to Balance
Potential Issues: Incorrect Motor Program, Air Supply Issue
Useful Documents: TN1002 - MAC10 Design with VAV Boxes

Incorrect Motor Program: Constant volume programming available to the FFDE is incompatible with ducted, pressurized air applications for use in series with CAV or VAV devices. Please refer to **TN1002.**

Air Supply Issue: Providing too much or too little air to the fan filter units can cause issues with the fan filter units. The fan filter unit may react by speeding up rapidly and eventually shutting down as it is unable to meet the required setpoint determined by the program in the motor.

Problem: Indicator Light Not On (Light On for ILS-PSS)
Potential Issues: No Power, Non-working Light, Pressure Switch Closure

There are multiple indicator lights that can be included on your fan filter unit. The universal control card has a green and red indicator light located on the card which can be seen in the electrical box. The green light is for motor running and the red light is for network communication. Please see the Universal Control Card section starting on page 17 for more information. The IR control sensor has two indicator lights which can be seen from the roomside. The red light is for motor running and the green light is for status feedback. Please see the IR Control card section starting on page 23 for more information. Fan filter units can also be provided with a green uniti running indicator light and a red filter status indicator light which are visible from the roomside. See the sections dedicated to these two indicator lights for more information. Please identify what type of lights you may have on your unit to better troubleshoot.

No Power: If there is an issue with the electrical components the indicator lights will not function. It is recommended to look over the Unit Not Running troubleshooting to verify all electrical components are working as intended. The unit running indicator lights require the fan filter unit motor to be running to illuminate.

Non-working Light: The green unit running indicator light visible from the roomside is polarized. It is recommended to unscrew the bezel, take out the bulb, turn it 180 degrees, and reinsert the bulb. If a nearby unit running light is working, test the non-working bulb on that unit to identify if the bulb is the issue. Replace the bulb if found to be non-working. This process can also be used for the red filter status indicator light to verify a bulb is working.

Pressure Switch Closure: The red filter status indicator light may be on the first day of installation. The pressure switch must be adjusted when first installed to work for that application's specific conditions. See appropriate section in this manual for adjusting this pressure switch. If the red light, visible from the roomside, is on (not IR sensor red light), the pressure switch has closed to indicate the filter is loaded and may need to be replaced soon.

Problem: Network Issues (Universal Control Card Only)
Potential Issues: Non-working Cables, Unit Not Running, Incorrect Board Settings

It is recommended to test a fan filter unit with the Universal Control Card set in manual mode before attempting to control over a network. A majority of network related issues are due to non-working cables and incorrect board settings. It is recommended to establish connection with one fan filter unit before attempting to connect to a large chain of units. Once connection has been proven and established to one fan filter unit, other units can be connected for communication. Please reference the Universal Control Card section for more information. If a local controller was purchased from Titus, a manual and quick start guide should be available to help assist with operation. Contact Titus for further assistance.

Non-working Cables: Purchased plenum rated cables are recommended over field manufactured cables. A typical sign of non-working cables is the inability to communicate with any fan filter units or losing communication with a large amount of sequential fan filter units.

Unit Not Running: Refer to Unit Not Running troubleshooting and/or Mechanical Issues troubleshooting.

Incorrect Board Settings: For the ability to control fan filter units over the network, the Universal Control Card must be put into Network mode. Each Universal Control Card will also need a unique address. Both the mode and address are set with dipswitches located in the electrical box on top of the fan filter unit.

REPLACEMENT PARTS

Unit Model #	Model	Part Number	Description
All IQ/FFDB Models	All IQ/FFDB Models	63720	Choke 3.0 Amps 120/240/277V
		63667	Transformer 120/24V
		63666	Transformer 240/24V
		63665	Transformer 277/24V
		63739-002	Rocker Switch, DPST
		62968-12	Gasket - 1/8" x 1/2", 12' Length
		222449-001	1/4" - 20 Threaded Eye Bolts
		64078	Pressure Transducer
		265888	Universal Control Card
		63638	Terminal Strip 3 Position
		63027	Pressure Switch for Filter Monitoring
		63415-003	Pressure Switch for Run Indicator
		S24344-001	8' Power Cord
		63760	IR Remote
		11166-001	Remote Visual Control Unit (VCU)
		63758	IR Control Board
		63759-005	IR Sensor Board **(FFDERAC/FFDBRAC Only)**
		63820-001	IL Wiring Harness **(FFDERAC/FFDBRAC Only)**
		63820-004	ILS-PSS Wiring Harness **(FFDERAC/FFDBRAC Only)**
		133546-001	Red LED Indicator Light
		133546-002	Green LED Indicator Light

Unit Model #	Model	Part Number	Description
11202-XXX	2 X 2, 2 X 3, 2 X 3.5, 2 X 4 FFDB Standards	63752-001	120V Motor Harness for Power 15"
11203-XXX		63752-002	240/277V Motor Harness for Power 15"
11204-XXX		63751-015	120/240/27&V Motor Harness for Control 18"
11205-XXX			
11206-XXX	2 X 3, 2 X 3.5, 2 X 4 FFDB FFDERA/FFDBRA		
11207-XXX			
11208-XXX			
11074-XXX	2 X 2, 2 X 3, 2 X 3.5, 2 X 4 IQ Standards		
11083-XXX			
11084-XXX			
11085-XXX			

Unit Model #	Model	Part Number	Description
11209-XXX	2 X 2 FFDB FFDERA/FFDBRA	63752-003	3 Pin to 5 Pin 240/277V Motor Harness for Power 12"
11274-XXX	2 X 2, 2 X 3, 2 X 3.5, 2 X 4 FFDB FFDERAC/FFDBRAC	63752-005	3 Pin to 5 Pin 120V Motor Harness for Power 12"
11275-XXX		63752-004	3 Pin 120/240/277V Motor Harness for Power 8"
11276-XXX		63751-003	Board to 4 Pin 120/240/277V Motor Harness for Control 14"
11277-XXX		63751-016	4 Pin to 4 Pin 120/240/277V Motor Harness for Control 12"
11286-XXX	2 X 2, 2 X 3, 2 X 3.5, 2 X 4 IQ FFDERA/FFDBRA		
11287-XXX			
11088-XXX			
11089-XXX			
11270-XXX	2 X 2, 2 X 3, 2 X 3.5, 2 X 4 IQ FFDERAC/FFDBRAC		
11271-XXX			
11272-XXX			
11273-XXX			

REPLACEMENT PARTS: MOTOR/BLOWER

Motor/blower parts below. To verify correct parts, please visit our website or contact Titus at techsupport@titus.com.

Part Number	Description	Model
266824-001	FFD White Surface Mount Frame 2x4	ALL
266824-003	FFD White Surface Mount Frame 2x3	ALL
266824-004	FFD White Surface Mount Frame 2x2	ALL
64141-001S	FFD 304SS Surface Mount Frame 2x4	ALL
64141-003S	FFD 304SS Surface Mount Frame 2x3	ALL
64141-004S	FFD 304SS Surface Mount Frame 2x2	ALL
10691	10691 - FFD 10" Duct Transition Collar	FFD / FFDE / 2x2 FFDB
10789	10789 - FFD 12" Duct Transition Collar	FFD / FFDE / 2x2 FFDB
11231-001	FFDL(RA) 10" Duct Transition Collar	2x4 FFDB / FFDL
11231-002	FFDL(RA) 12" Duct Transition Collar	2x4 FFDB / FFDL
272246-002	FFD(E/B)RAC 10" Duct Transition Collar	RSRC
272246-003	FFD(E/B)RAC 12" Duct Transition Collar	RSRC
62981-001	62981-001 - Washable Pre-filter 16x23.25	FFD / FFDE / 2x2 FFDB
62981-038	62981-038 - Washable Pre-filter 20x20	2x4 FFDB / FFDL
63973	ACM 1008 Circuit Board Power Module	
RCFF	63760 - IR Remote Control	
PC120	S24344-001 - 8' 120V Power Cord	ALL
64078	Pressure Transducer	ALL
ACC1-125	ACC1-125 - ACC 1-125,125 address,PSC Motor	
269592-002	269592-002 - Bacnet Gateway	
11166-001	11166-001 - Remote Visual Control Unit (VCU) FFDE/FFDB	FFDE / FFDB
265888	265888 - Universal Control Card FFDE/FFDB	FFDE / FFDB
63951-002	63951-002 - Visual Control Card FFDE/FFDB	FFDE / FFDB
64083-001	64083-001 - Network ENAC 120V: FFD STD/R/A	Original / FFDL / FFDXS
64083-002	64083-002 - Network ENAC 208-240V: FFD STD/R/A	Original
64083-003	64083-003 - Network ENAC 277V: FFD STD/R/A	Original / FFDL / FFDXS
63976-001	63976-001 - Network TPC 120V: FFD STD/R/A	
63976-003	63976-002 - Network TPC 208-240V: FFD STD/R/A	
63976-003	63976-002 - Network TPC 208-240V: FFD STD/R/A	
63976-004	63976-004 - NWK TPC 120V: FFDL/RA & RFFFD/R	
63976-006	63976-006 - NWK TPC 277V: FFDL/RA & RFFFD/R	
63011	63011 - Speed Control 120V: FFD/L/XS STD/R/A	FFD / FFDL / FFDXS
63015	63015 - Speed Control 208-240V: FFD STD/R/A	FFD / FFDR / FFDRA
63016	63016 - Speed Control 277V: FFD/L/XS STD/R/A	FFD / FFDL / FFDXS
63667	63667 - Transformer 120/24V	FFDE

Part Number	Description	Model
63666	63666 - Transformer 240/24V	FFDE
63665	63665 - Transformer 277/24V	FFDE
S24332-001	S24332-001 - M/B Assy: FFD STD/R 120V	FFD
S24332-002	S24332-002 - M/B Assy: FFD STD/R 208-240V	FFD
S24332-003	S24332-003 - M/B Assy: FFD STD/R 277V	FFD
S24332-015	S24332-015 - M/B Assy: FFD STD/RA 120V	FFD
S24332-016	S24332-016 - M/B Assy: FFD STD/RA 208-240V	FFD
S24332-017	S24332-017 - M/B Assy: FFD STD/RA 277V	FFD
S266612-001	S266612-001 - M/B Assy: 2X4 FFDE/R/A,CAV	FFDE
S266612-003	S266612-003 - M/B Assy: 2X3 FFDE/R/A,CAV	FFDE
S266612-005	S266612-005 - M/B Assy: 2X2 FFDE/R/A, CAV	FFDE
S266612-013	S266612-013 - M/B Assy: Const Spd Prgm FFDE/R/A	FFDE
S266612-021	S266612-021 - M/B Assy: Const Torq Prgm FFDE/R/A	FFDE
S266612-023	S266612-023 - M/B Assy: Low Flow Prgm All FFDE/R/A	FFDE
S266613-001X	S266613-001X - M/B Assy: 2X4 FFDB/R/A	FFDB
S266613-005X	S266613-003X - M/B Assy: 2X3 FFDB/R/A	FFDB
S266612-017	S266612-017 - M/B Assy: 2X2 FFDB/R/A	FFDB
268171-115	268171-115 - M/B: FFDL/RA & RFFFD/R, 120V	FFDXS
268171-277	268171-277 - M/B: FFDL/RA & RFFFD/R, 277V	FFDXS

REPLACEMENT PARTS: PRIMARY FILTERS

Filter part numbers below. These are for most common filter part numbers and may not match the filter inside the fan filter unit. To verify correct filter, please visit our website or contact Titus at techsupport@titus.com.

Part Number	Description	Model
69600S-001HAPIC	69600S-001HAPIC - HEPA Filt: FFD,2X4,RL,CHP	
69600S-001HAPIX	69600S-001HAPIX - HEPA Filt: FFD,2X4,RL,CHP	
69600S-001HAPXC	69600S-001HAPXC - HEPA Filt: FFD,2X4,CHP	Non room side replaceable
69600S-001HAPXX	69600S-001HAPXX - HEPA Filt: FFD,2X4	Non room side replaceable
69600S-001HAPDC	69600S-001HAPDC - HEPA Filt: FFD,2X4, RFL,CHP	Non room side replaceable
69600S-001UAPIC	69600S-001UAPIC - ULPA Filt: FFD,2X4,RL,CHP	Non room side replaceable
69600S-001UAPIX	69600S-001UAPIX - ULPA Filt: FFD,2X4 RL	Non room side replaceable
69600S-001UAPXC	69600S-001UAPXC - ULPA Filt: FFD,2X4,CHP	Non room side replaceable
69600S-001UAPXX	69600S-001UAPXX - ULPA Filt: FFD,2X4	Non room side replaceable
69600S-001UAPDC	69600S-001UAPDC - ULPA Filt: FFD,2X4,RFL,CHP	Non room side replaceable
69600S-003HAPIC	69600S-004HAPIC - HEPA Filt: CRFF-STD,2X3,RL,CHP	Non room side replaceable
69600S-003HAPIX	69600S-004HAPIX - HEPA Filt: CRFF-STD,2X3,RL	Non room side replaceable
69600S-003HAPXC	69600S-004HAPXC - HEPA Filt: CRFF-STD,2X3,CHP	Non room side replaceable
69600S-003HAPXX	Standard, HEPA, 2X3	Non room side replaceable
69600S-003HAPDC	Standard, HEPA, 2X3, Both Indicator Lights, Challenge Port	Non room side replaceable
69600S-003UAPIC	Standard, ULPA, 2X3, Indicator Light, Challenge Port	Non room side replaceable
69600S-003UAPIX	Standard, ULPA, 2X3, Indicator Light	Non room side replaceable
69600S-003UAPXC	Standard, ULPA, 2X3, Challenge Port	Non room side replaceable
69600S-003UAPXX	Standard, ULPA, 2X3	Non room side replaceable
69600S-003UAPDC	Standard, ULPA, 2X3, Both Indicator Lights, Challenge Port	Non room side replaceable
69600S-004HAPIC	69600S-004HAPIC - HEPA Filt: FFD,2X2,RL,CHP	Non room side replaceable
69600S-004HAPIX	69600S-004UAPIX - HEPA Filt: FFD,2X2,RL	Non room side replaceable
69600S-004HAPXC	69600S-004HAPXC - HEPA Filt:FFD,2X2,CHP	Non room side replaceable
69600S-004HAPXX	69600S-004HAPXX - HEPA Filt: FFD,2X2	Non room side replaceable
69600S-004HAPDC	69600S-004HAPDC - HEPA Filt: FFD,2X2, RFL,CHP	Non room side replaceable
69600S-004UAPIC	69600S-004UAPIC - ULPA Filt: FFD,2X2,RL,CHP	Non room side replaceable
69600S-004UAPIX	69600S-004UAPIX - ULPA Filt: FFD,2X2,RL	Non room side replaceable
69600S-004UAPXC	69600S-004UAPXC - ULPA Filt: FFD,2X2,CHP	Non room side replaceable
69600S-004UAPXX	69600S-004UAPXX - ULPA Filt: FFD,2X2	Non room side replaceable
69600S-004UAPDC	69600S-004UAPDC - ULPA Filt: FFD,2X2, RFL,CHP	Non room side replaceable
69601-001H	69601-001H - HEPA Filt: FFDE/R/A/C & FFDB/R/A/C,2X4	Room side replaceable
69601-001U	69601-001U - ULPA Filt: FFDE/R/A/C & FFDB/R/A/C,2X4	Room side replaceable
69601-003H	69601-003H - HEPA Filt: FFDE/R/A/C & FFDB/R/A/C,2X3	Room side replaceable
69601-003U	69601-003U - ULPA Filt: FFDE/R/A/C & FFDB/R/A/C,2X3	Room side replaceable

REPLACEMENT PARTS: PRIMARY FILTERS

Part Number	Description	Model
69601-004H	69601-004H - HEPA Filt: FFDE/R/A/C & FFDB/R/A/C,2X2	Room side replaceable
69601-004U	69601-004U - ULPA Filt: FFDE/R/A/C & FFDB/R/A/C,2X2	Room side replaceable
273573-002	ACGW008 gateway (BGW8-100K) - Modbus RTU to BACnet IP/MSTP	FFDE / FFDB
63760	Hand-Held Infrared Control* FFDE & FFDB Only	FFDE / FFDB
11166-001	11166-001 - Remote Visual Control Unit (VCU) FFDE/FFDB	FFDE / FFDB
1166-003	Remote Mount Control for FFDE & FFDB - UCC	FFDE / FFDB

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 FFDB 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 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 recognizes the using 8 readings 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.

Additional independent testing on the TITUS FFDB 2x4, 2x2, 2x3, and 2x3½ shows that using one-2x4 or two-2x2 hoods simultaneously give airflow data (cfm) within 5 percent of a duct traverse using 10 diameters of straight duct upstream of the fan intake.