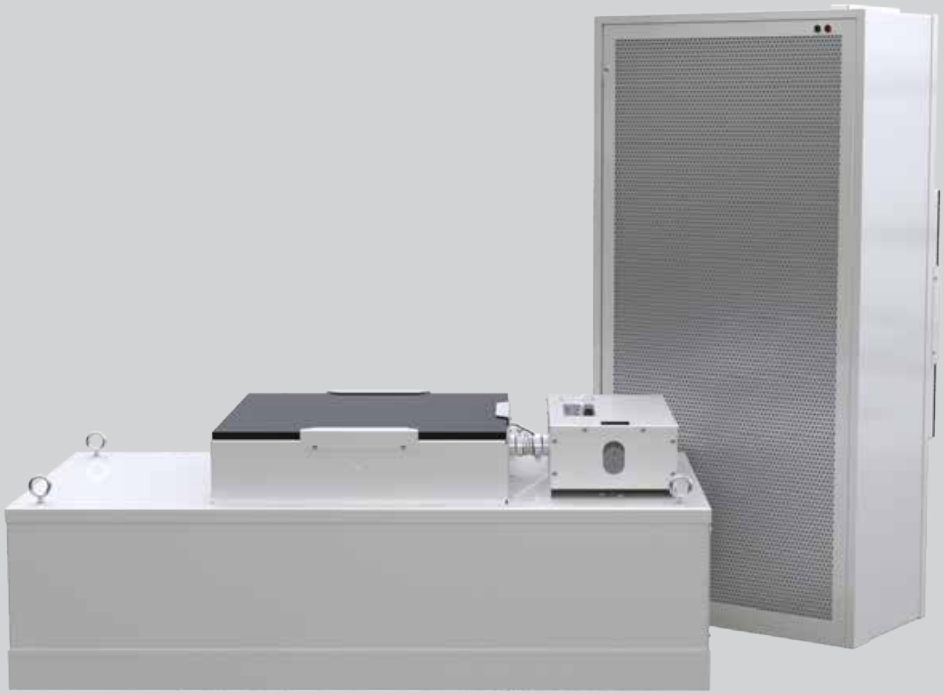
INSTALLATION, OPERATION & MAINTENANCE

MANUAL

Fan Filter Unit

Model 92FFU



Read completely and save these instructions for future reference.

Nailor® Industries Inc.

Nailor® Industries Inc.

IOM Manual
Fan Filter Unit
Model 92FFU

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WARNING – TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK OR INJURY TO PERSONS; ALLOW ONLY QUALIFIED TECHNICIANS TO INSTALL AND SERVICE THE UNIT. ALL PERSONS SHOULD OBSERVE THE FOLLOWING:

a) **Use this unit only in a manner intended by the manufacturer. If you have questions; contact the manufacturer.**

b) **Before servicing or cleaning unit, disconnect and lock-out power at the service panel to prevent electric shock or injury if the power is accidently turned on. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.**

- **Installation work and electrical wiring must be completed by qualified persons in accordance with all applicable codes and standards, to include fire rated constructions.**
- **When cutting or drilling into walls and ceilings, be careful not to damage electrical wiring and other hidden utilities.**
- **If this unit is to be installed within close proximity to water, mark the unit in accordance with applicable codes and standards.**
- **This unit is to be used only as intended by the manufacturer. If you have any questions regarding the use, installation or operation of this unit; contact the manufacturer:**

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CRITICAL OPERATION CONDITIONS OF THE FAN FILTER UNIT

- **DO NOT TOUCH** the HEPA filter media. Damage to filter media may void the filter warranty. The screen is to protect against accidental contact with the filter. Never place objects on the filter. Always transport or lift the filter by its frame.
- Prior to powering the unit, verify that it is wired to the correct power supply. The rating plate label located on the electrical box cover shows the electrical data.
- For replacement parts refer to the model number and serial number on the rating plate label located on the electrical box.

REPLACEMENT PARTS

- ❑ 43.5" x 19.5" (1105 x 495) HEPA Filter
- ❑ 20" x 20" x 1/2" (508 x 508 x 12.7) Aluminum Washable Pre-filter
- ❑ 20" x 20" x 1/2" (508 x 508 x 12.7) Throwaway Pre-filter
- ❑ 1/3 HP ECM Motor
- ❑ 18" (457) Backwards Inclined Blower and Inlet Ring
- ❑ Control Circuit Board
- ❑ LED Filter Indicator Kit
- ❑ 120/24 VAC Transformer
- ❑ 208/240/24 VAC Transformer
- ❑ 277/24 VAC Transformer
- ❑ 277/240/208/120 VAC Toggle Disconnect Switch

When ordering replacement parts, please include unit model & serial number and P.O.# if available.

Dimensions are in inches (mm).

92FFU INSTALLATION INSTRUCTIONS CHECKLIST

This is to provide a general overview of what steps should be taken to achieve a successful installation of the fan filter unit. These steps should be performed in the order listed. For more detail see applicable section in this instruction manual. Read the entire manual before beginning installation.

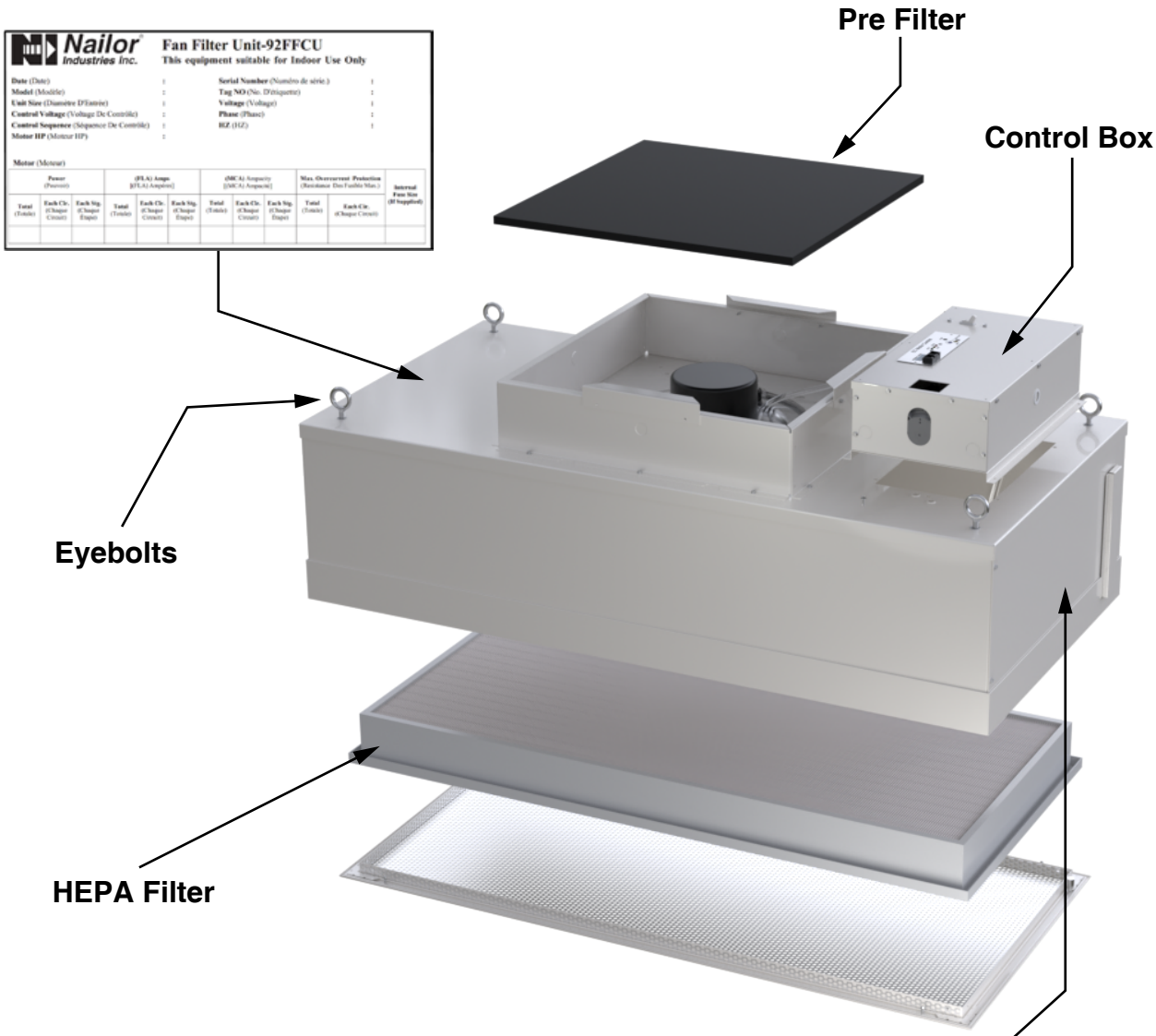
CHECKLIST

- ❑ Unbox and inspect the fan filter unit.
- ❑ If the unit is to be ducted, set upstream air device to produce 0.0" w.c. static pressure at the fan unit inlet. Use dampers if necessary when installing multiple fan units on the same duct line. (See page 7 for details).
- ❑ Install the fan unit into the ceiling. Support its weight from structure above.
- ❑ Connect ductwork to fan unit (if applicable).
- ❑ Seal the fan filter unit to the ceiling using gasketing and caulking (if required).
- ❑ Connect main power wiring.
- ❑ Connect control wiring (if applicable).
- ❑ Run the unit and/or upstream air device to flush out construction debris.
- ❑ Install the pre-filter (if applicable).
- ❑ Install the HEPA/ULPA filter.
- ❑ Turn unit on and adjust airflow to design cfm.
- ❑ Turn on the upstream airflow device.
- ❑ Leak test the fan unit and filter per local codes and building procedures (if required).
- ❑ Install the perforated face screen.
- ❑ Verify airflow with a flow hood (or by approved means).

INTRODUCTION

The Nailor Fan Filter Units (FFU) are ceiling module diffusers consisting of a fan/motor assembly and Roomside Removable (RSR) filters. The module is designed to provide unidirectional vertical airflow of filtered, clean air over a cleanroom space.

Fan Filter Units (FFU) models will have 3 warning labels located on the side of the unit and 1 performance label located at the top; all on the plenum side of the unit. For ease of troubleshooting assistance, replacement parts, and general factory assistance, it is recommended that the order number, and model line string be used as reference. This information can be found on the performance label.



FFU Box Label

INSPECTION

Before starting the installation process of any configuration of the Nailor 92FFU it is critical to do a proper inspection to ensure the unit is in the right condition to operate. This section will cover the proper inspection of the 92FFU and the HEPA/ULPA filter.

Fan Filter Unit (FFU)

The 92FFU will arrive in a shipping box fully assembled, with the exception of the HEPA/ULPA filter. Depending on your configuration the unit will arrive with the pre-filter, duct collar and other optional features already installed.

Step 1 Carefully remove the unit from the box making sure to lay the box down in the proper orientation before removing the FFU. It is recommended to place the unit on top of the box with the face of the unit looking down to minimize contact with the floor.

Step 2 Inspect the unit for any signs of damage during shipping. Record the serial number on the unit for future reference, and verify that all of the features are accurate to the order. You may lay the unit on its side to access the hinged front plate.

If there is noticeable damage to the unit or missing parts do not proceed with installation of the unit. Contact Nailor at costumerservice@nailor.com

HEPA/ULPA Filter

CAUTION, 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 always have filter on its side to protect from damage when not installed

The HEPA or ULPA filter will arrive in a shipping box separate from the FFU.

Step 1 Carefully remove the filter from the box making sure to lay the box down in the proper orientation before removing the filter.

Step 2 Remove the plastic wrapping on the unit, being careful not to touch the filter media, and dispose of it. Be sure to keep the filter upright and not lay it face down in a way that could damage the face.

Step 3 Inspect the filter for any signs of damage during shipping. Record the serial number on the unit for future reference, labels can be found on the sides of the filter above the gel seal.

If there is noticeable damage to the unit or missing parts do not proceed with installation of the unit. Contact Nailor at costumerservice@nailor.com

INSTALLATION AND MOUNTING FOR TYPE L FRAME

This section will cover how to mount the 92FFU to a ceiling with a Lay-in T-bar system of up to 1.5" wide. A minimum of two (2) people will be required to install this product.

Step 1 After inspection raise unit into ceiling and lower onto gasketed grid. Gasket should be a closed-cell material approved for the environmental conditions. It is recommended to further support the unit from above by using hanger wire on the units eyebolts or any other field-approved support method.
Note: Confirm fan dimensions match T-bar grid dimensions before installing.

Step 2 Support the unit from above using hanger wire on the units eyebolts or any other field-approved support method.

Step 3 A qualified electrician should wire the unit to the appropriate power supply per applicable codes and standards. Refer to the wiring diagram.
Note: Reference the wiring diagrams on pages [17-19] and all national and local electrical codes.

Step 4 Turn on the power using the rocker switch (ON/OFF) located on the electrical box. 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 an at full speed as this may cause an overload condition.

INSTALLATION AND MOUNTING FOR TYPE S FRAME

The Fan Filter Unit is fully assembled from the factory with the exception of the HEPA filter which is shipped separately. A minimum of two (2) people will be required to install this product. This section will cover how to mount your unit to the ceiling with surface mount brackets.

Step 1 After inspection cut a ceiling opening to be consistent with the size of the mounting frame.

Step 2 Hang the frame using hanger wires passed through pre-punched holes on the frame (every 6" [152]). At least one (1) wire should be used near each corner of the frame.

Step 3 Raise unit through ceiling and lower onto the mounting frame.

Step 4 A qualified electrician should wire the unit to the appropriate power supply per applicable codes and standards. Refer to the wiring diagram.
Note: Reference the wiring diagrams on pages [17-19] and all national and local electrical codes.

Step 5 Turn on the power using the rocker switch (ON/OFF) located on the electrical box. 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 an at full speed as this may cause an overload condition.

FOR DUCTED APPLICATIONS; READ CAREFULY BEFORE PROCEEDING.

In applications where the Fan Filter Unit will be installed downstream of variable airflow devices such as VAV boxes, air valves, or variable air handlers, proper care in unit set-up needs to be taken. In ducted applications while the fan filter unit can handle some positive or negative static pressure, optimal performance and reliability will be achieved with an inlet static pressure of 0.0 w.c. or slightly negative.

To reach an accurate 0.0 w.c. inlet static, it is recommended that the primary air balancing of the duct system be done before installing the fan filter unit. When the duct is at optimal static, install the unit per these instructions and adjust the airflow to the design setting. Verify the airflow with an airflow hood.

It is recommended that all fan filter units in the system be energized before any upstream devices to prevent the FFU blower wheel from spinning backwards. While the motor can generally overcome this, if the airflow needed to overcome high static is too great, it may not. This will cause the motor to shut down. Continual running of the motor backward may result in reduced reliability of the ECM.

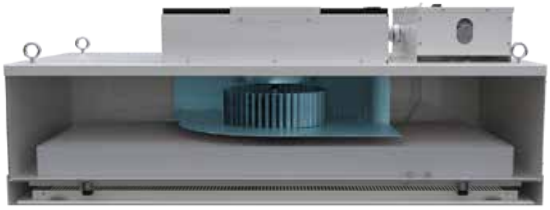
FAN FILTER UNIT ECM PROGRAMS

The Nailor 92FFU is available in 2 different motor programs, Constant Torque (CT) and Constant Flow (CF). These programs each have their advantages at different conditions depending on a series of factors such as if the system is ducted or non-ducted, the blower wheel is Forward Curved (FC) or Backwards Curved (BC), and if the system is pressure depended or independent. The following section will detail the best conditions for each program.

CONSTANT TORQUE (CT) PROGRAMING

This programming will maintain a specified torque for the motor based on the voltage provided. This is beneficial for applications in which a VAV box is present upstream from the unit so as to not throttle the airflow, which is often the case in ducted applications.

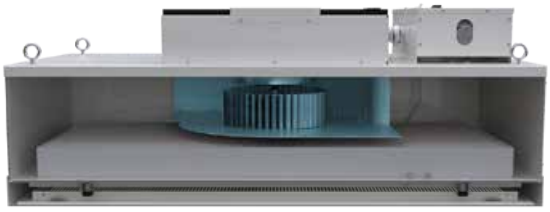
This program can be paired with both a forward curved and a backward curved motor/blower combination, with the latter being the most energy efficient option.



CONSTANT FLOW (CF) PROGRAMING

This programming will maintain a specified airflow the voltage provided. This is ideal for open plenum applications where the unit can maintain the desired CFM independently of other equipment, it is also capable of adjusting for increased static pressure due to the filter getting full.

This program can only be paired with both a forward curved motor/blower combination.



CONTROLS

The fan filter unit can be controlled through different methods, the following sections will go over the different types of controls available for the unit, as well as how to program them in the field.

Local Potentiometer

- Adjust flow from back of unit.
- Program unit for different control methods.

Individual Unit Wall Mounted Controls (must be determined before ordering)

- 0 - 10V / 0 - 5V DC Control.
- 0 - 20mA / 4 - 20mA Control.

Full range of network controls including connection to BAS / BMS

- BAC Net IP, BACNet MS / TP, & LON Works available with additional hardware.
- Additionally, monitoring and controls of the fan filter unit can be done through closed loop control from sensors such as pressure transducers, thermostats, partical counters, etc.

FFU Universal Control Card

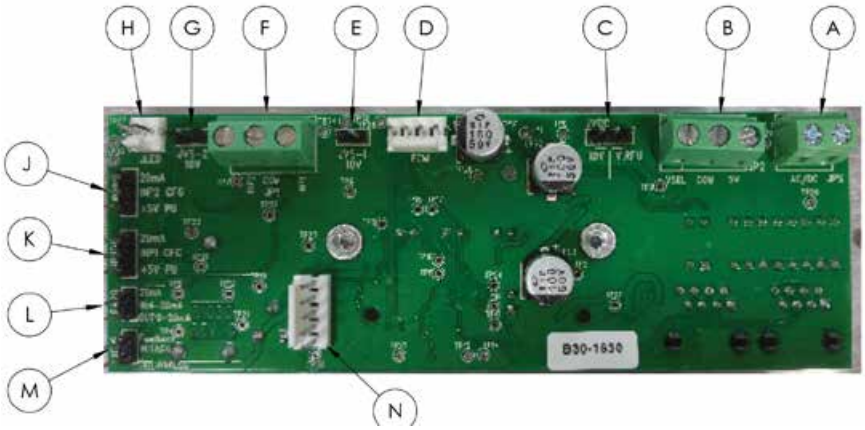
The control card for the unit provides useful information through it's LED indicators and it is the first point of communication to adjust the output of airflow. Any other form of controls will need to be configured here, the following section will identify all the components of the card and how to configure them.

EC MOTOR CONTROL CARD FRONT

1. RJ45 Dual Jacks
2. MODBUS Address DIP Switches
3. S1-1 and S1-2 Configuration DIP Switches
4. STATUS LED
5. NET LED (network activity)
6. FAULT LED
7. Multimeter Common
8. Multimeter Setpoint as m VDC
9. Multimeter CFM as m VDC
10. Onboard Setpoint Potentiometer

EC MOTOR CONTROL CARD FRONT

- **A.** JPS: Bias input power, isolated
- **B.** JP2: Accessory output voltages
- **C.** JVDC: Selector for 10 V regulated or unregulated rectified and filtered bus voltage
- **D.** J1: EC Motor Port
- **E.** JVS1: INP1 10 V signal range selector
- **F.** JP1: INP1 and INP2 analog / digital inputs
- **G.** JVS2: INP2 10 V signal range selector
- **H.** JLED: External FAULT output
- **J.** JPUD2: INP2 digital input pull-up or 20 mA signal format selector
- **K.** JPUD1: INP1 digital input pull-up or 20 mA signal format selector
- **L.** JP420: 0 – 20 mA or 4 – 20 mA signal format selector
- **M.** JFBS: TACH or Analog 2 feedback signal selector
- **N.** Auxiliary Board Port



NETWORKING

DIP SWITCH SETTINGS

Each Fan Filter unit in a network must be set to a unique address between 1 and 247. Addresses 248 – 255 are declared reserved per MODBUS protocol. A DIP switch block of eight switches are used for addressing. The control board supports MODBUS Broadcast Address Zero for single and multiple register write commands (MODBUS Function Codes 6 and 16).

Address settings are checked by the board controller only at power-up, so power must be cycled before any changes take effect.

Analog input setpoint modes preserve the ability to monitor and modify register values using a suitable controller console or PLC. Therefore, addressing may be relevant for configuration, monitoring and / or troubleshooting even when units are intended to be used with analog setpoint input.

ADDRESS SELECTION

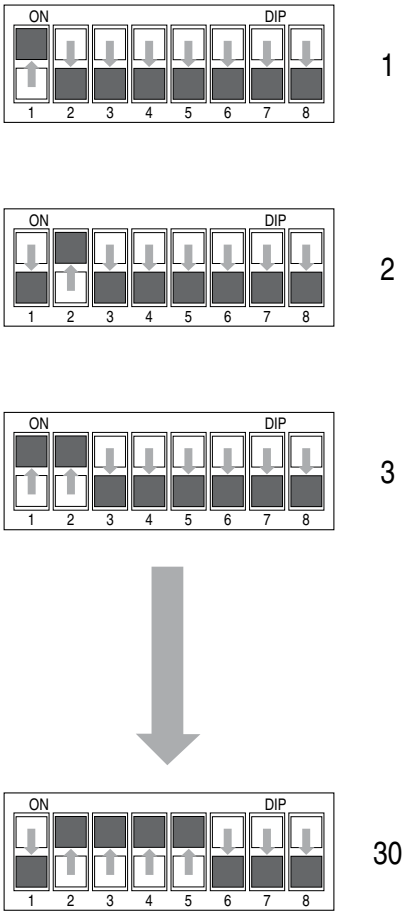
When adjusted to the ON position, each DIP switch pole represents a value as follows:

Calculate the address value of existing switch settings by adding the values of each DIP switch pole in the ON position, per the table below.
Construct switch settings for a desired address value by successively subtracting the largest pole value that is less than the desired address value, repeating with each remainder until the remainder is zero. An example is provided below.

Example: Desired address is 114

114 – 64 = 50 SW1-7 ON
50 – 32 = 18 SW1-6 ON
18 – 16 = 2 SW1-5 ON
2 – 2 = 0 SW1-2 ON

DIP Switch Pole	Value
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128



CONFIGURATION DIP SWITCHES S1-1 & S1-2

Switch	S1-1	S1-2
	Control Loop Mode	Setpoint Source
OFF	Open-Loop Control	Analog Setpoint
ON	Closed-Loop Control	Network Setpoint

Open-Loop – Fan filter unit is controlled by a controller, i.e. on-board potentiometer or network controller.
Closed-Loop – A sensor is used to maintain airflow, i.e. room pressure, room temperature or a particle counter.
Analog Setpoint – Unit is controlled with an analog controller, i.e. on-board potentiometer or individual wall mounted controller (must be determined before ordering).
Network Setpoint – Unit is controlled with a networked controller, i.e. ACC1 or ACM7052 touchscreen controller.

SENSOR SHUNT TABLES

Shunt	JP420	JFBS	JVS-1*	JVS-2*
OUT	0 – 20 mA	Analog	0 – 5 VDC	0 – 5 VDC
IN	4 – 20 mA	n/a	0 – 10 VDC	0 – 10 VDC

* Leave shunt out if using a 0 – 20 mA or 4 – 20 mA sensor.

SHUNT TABLE FOR JP1 WIRING BLOCK

Center Pin to...	JPUD1:INP1	JPUD2:INP2
No Connection	Analog 5 V or 10 V	Analog 5 V or 10 V
20 mA	Analog 20 mA	Analog 20 mA
+ 5 PU	Digital 10 kΩ pull-up TO 5 V	Digital 10 kΩ pull-up TO 5 V

SHUNT TABLE FOR JP2 WIRING BLOCK

Center Pin to...	JVDC
No Connection	VSEL = no connection; open
10 V	VSEL = 10 V regulated
V.RFU	VSEL = DC filtered, unregulated, ~33 VDC

NOTES:

- JP1 is for signal input
- JP2 is for output power
  - connect COM / 5 V –> 5 V power supplied
  - connect COM / VSEL with 10 V shunt –> 10 V power supplied
  - connect COM / VSEL with V.RFU shunt –> Full wave rectified power supplied (~ 33 VDC)

- INP1 on JP1 wiring block is for monitoring only
  - 0 – 10 VDC
  - 0 – 5 VDC
  - 0 – 20 mA
  - 4 – 20 mA

- INP2 on JP1 wiring block is for closed-loop feedback monitoring
  - Controller airflow by room pressure or particle counter

DIP SWITCH SETTINGS FOR UP TO 30 FAN FILTER UNITS

(For more units; see below)

Calculate the address value of existing switch settings by adding the values of each DIP switch pole in the ON position, per the table below.
Construct switch settings for a desired address value by successively subtracting the largest pole value that is less than the desired address value, repeating with each remainder until the remainder is zero. An example is provided below.

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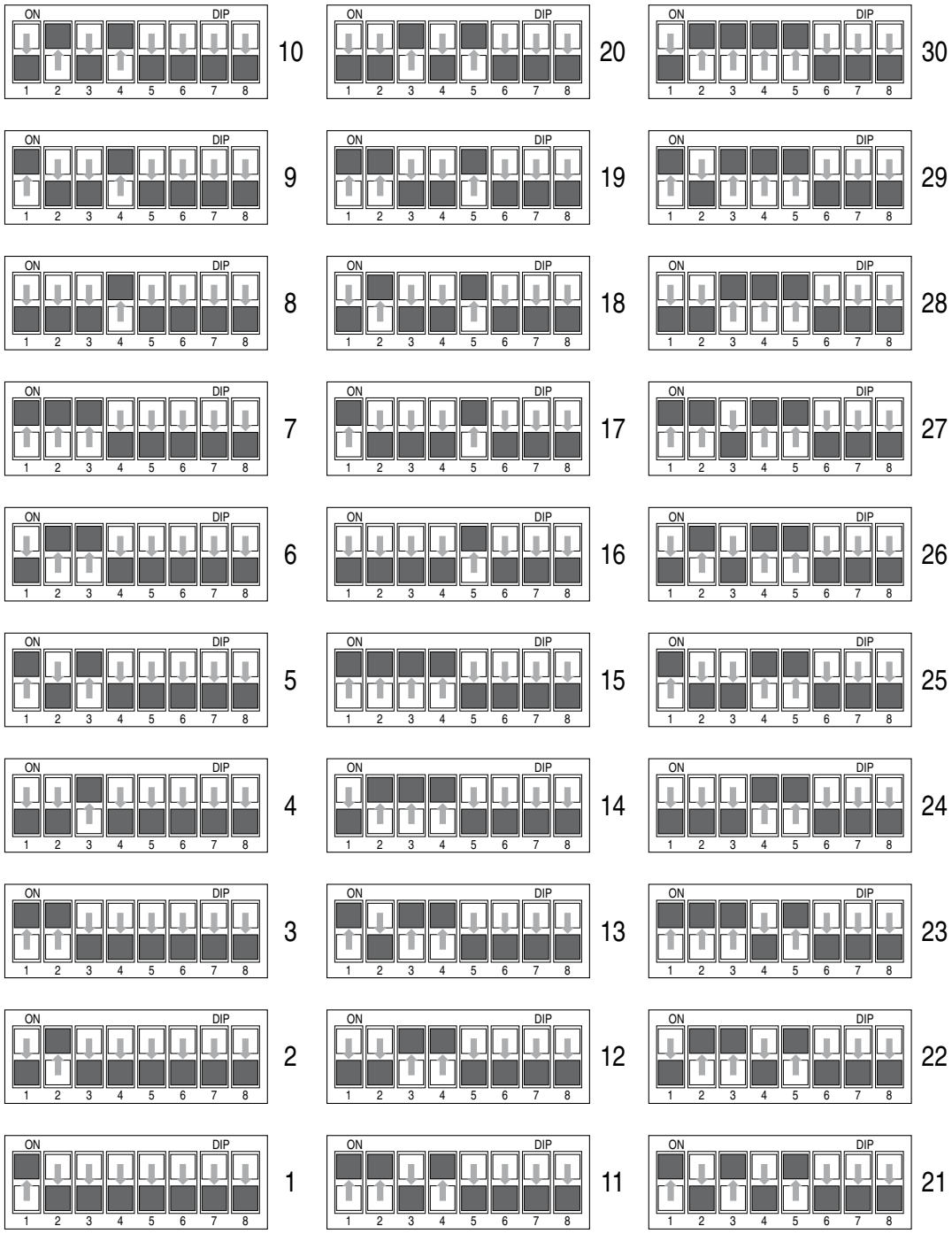


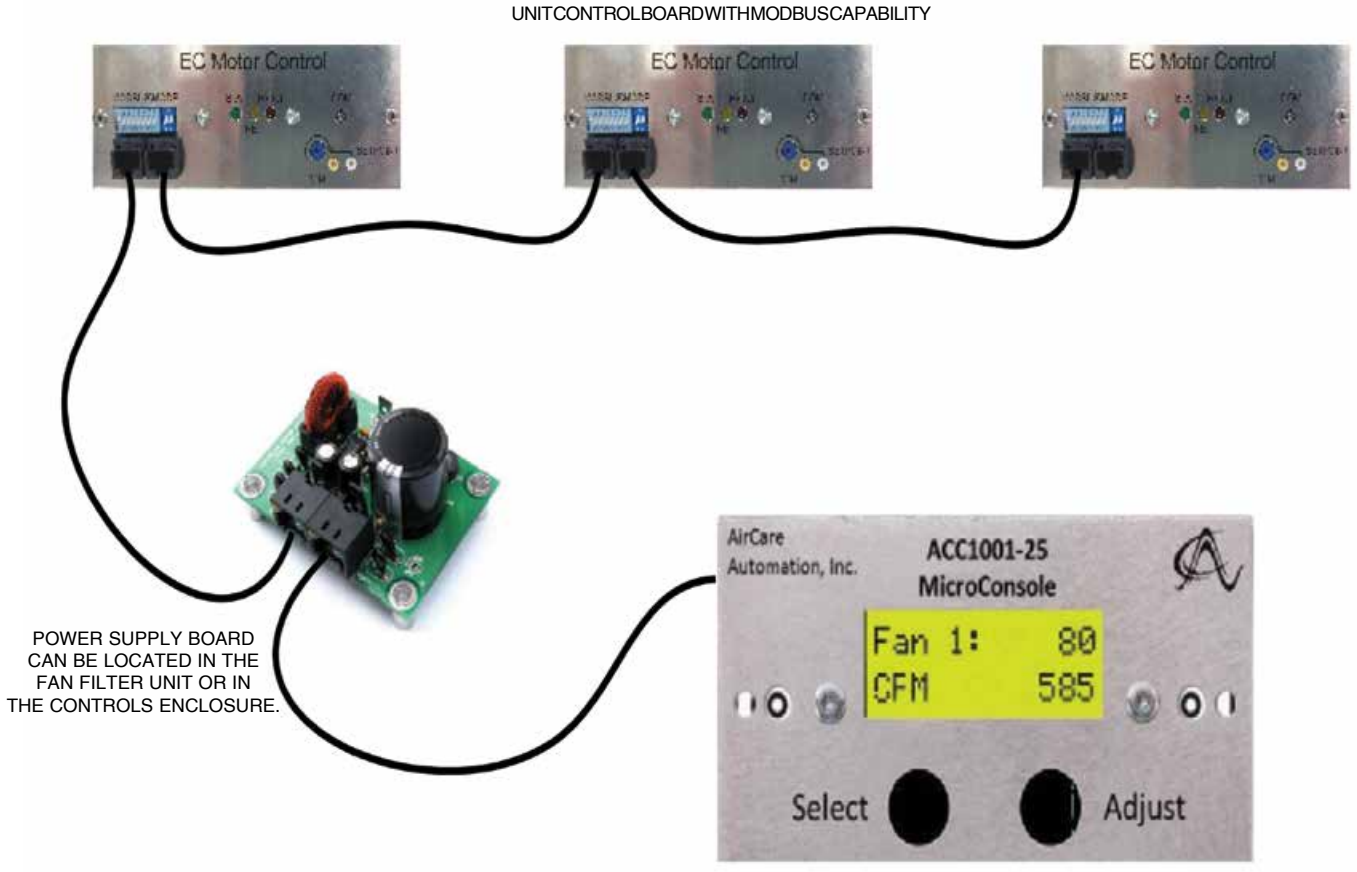
NETWORKING

When networking the fan filter units whether in a local area network (LAN) or connecting to a BAS / BMS system, each unit is connected in a straight-through daisy-chain using Cat5e or Cat6 network cables and the on-board RJ45 connectors.

If field cutting network cables, it is important for each end of the cable to be wired identically. However, assembled network cable are available; field assembled cables are the leading cause of problems in new systems.

WHAT TO EXPECT:

One unit will be clearly labelled MASTER UNIT. This unit will contain the ACC1001-25 and power supply. The power supply can be left in the master unit control box and control board can be mounted anywhere in the space, including at the master unit.



ACC1001 CONTROL USED AS AN EXAMPLE.
OTHER CONTROLLER OPTIONS ARE AVAILABLE.

INSTALLATION

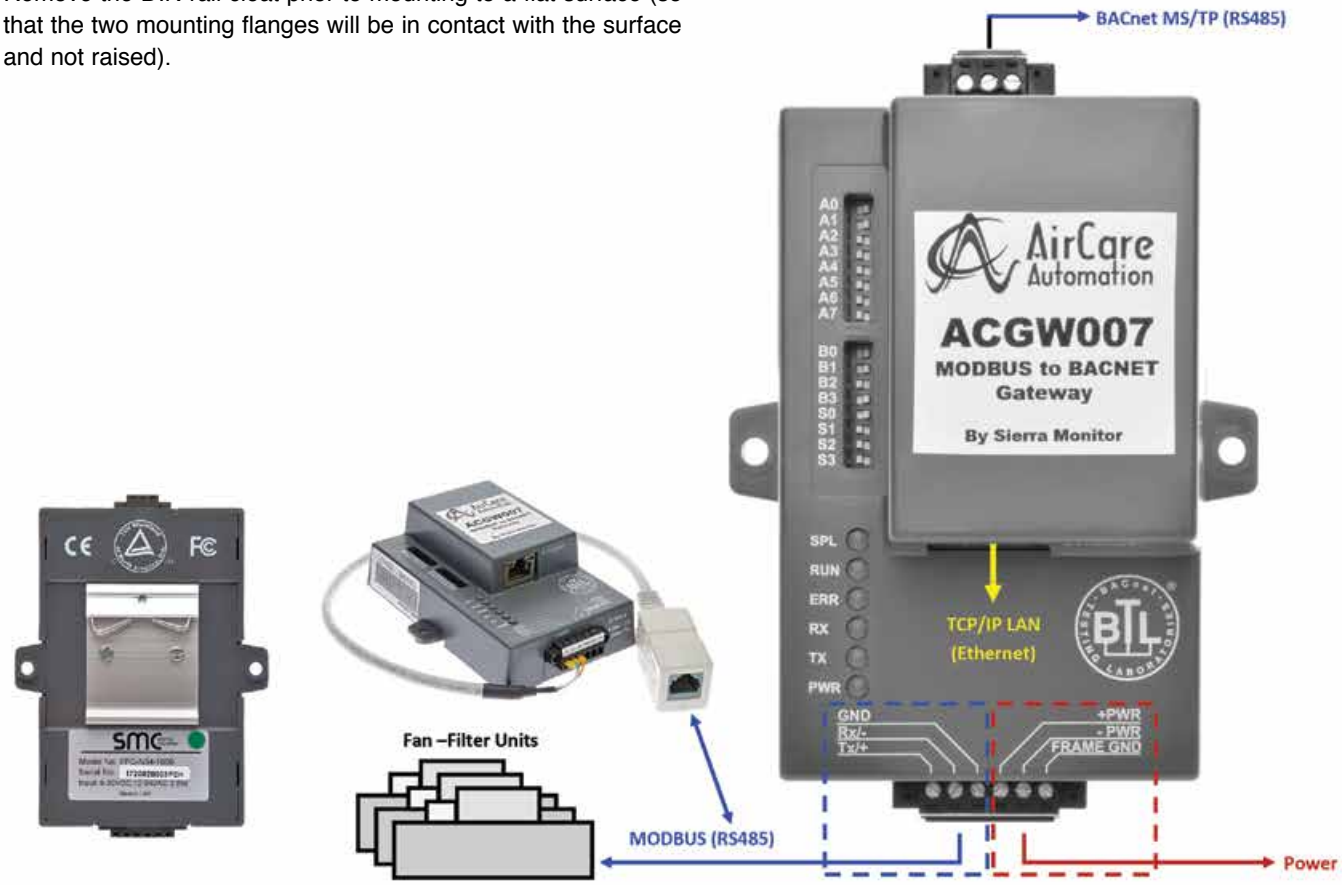
ACGW007 – MODBUS RTU TO BACnet / IP & MS / TP Gateway

INSTALLATION OUTLINE

1. Mount unit.
2. Connect to fan filter network using the RJ45 inline coupler and serial cable, which are provided with each ACGW007.
3. Connect 3-pin screw terminals to BACnet MS/TP or BACnet IP network.
4. Verify switch settings (next page).
5. Connect to power (9 – 30 VDC, 12 – 24 VAC, 2.5 W).
6. Verify operation (see ACGW007 User Guide).

MOUNTING

The ACGW007 can be mounted to a flat surface or to a DIN rail. Remove the DIN rail cleat prior to mounting to a flat surface (so that the two mounting flanges will be in contact with the surface and not raised).

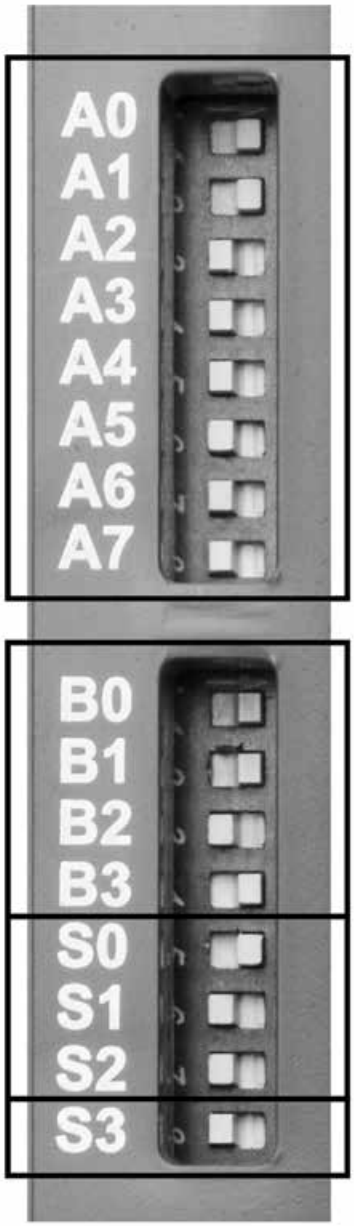


INSTALLATION

ACGW007 – MODBUS RTU to BACnet / IP & MS / TP Gateway

VERIFY SWITCH SETTINGS

Power OFF before changing switch settings. New settings will take effect on power-up.



1) A0 – A7: BACnet MS / TP MAC Address

Switches A0 - A7 select the BACnet MS / TP MAC address.

The BACnet MS / TP MAC address is used by a BMS upstream system to find the ACGW007 via BACnet Auto-Discovery.

The default BACnet address is a value of 3, corresponding to switches A0 and A1 in the ON position as shown.

2) B0 – B3: BMS BACnet MS / TP Baud Rate

Switches B0 - B3 select the BACnet MS / TP Baud Rate.

The Baud Rate should be set to match upstream BMS BACnet MS / TP Baud Rate..

3) S0 – S2: BACnet MS / IP or BACnet MS / TP

Switches S0 - S2 select upstream BACnet protocol. Verify switches S0 – S2 are set in agreement with your system.

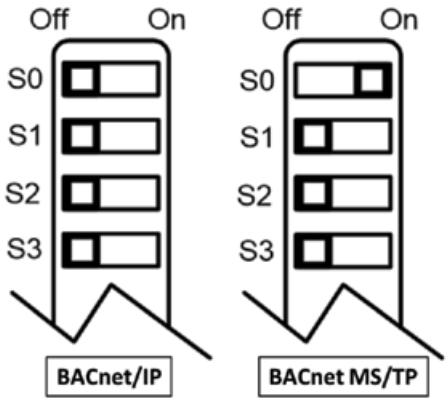
4) S3: AutoDiscovery Switch OFF

Switches S3 enables AutoDiscovery. S3 should be in the OFF position to allow for control of AutoDiscovery using the web browser interface.

Baud	B0	B1	B2	B3
9600	On	On	On	Off
19200	Off	Off	Off	On
38400*	**On**	**On**	**Off**	**On**
57600	Off	Off	On	On
76800	On	Off	On	On

Figure 9: BMS Baud Rate

* Factory default setting = 38400



LOW VOLTAGE SYSTEM GROUNDING & GROUND LOOPS

This section provides basic guidance on grounding ACM102x low-voltage systems and avoiding ground loops.
Grounding a low-voltage system at more than one location may create ground-loop conditions as a result of differing electrical potentials (voltages). Ground-loop conditions can interfere with signals and communications. In extreme cases ground loop electrical currents and/or voltages can result in damage to electronic components. In order to avoid ground loops, ACM102x low-voltage systems are typically ungrounded or are grounded at only one point.

ACM102x low voltage system components fall into four categories:
1. ACM102x onboard bias power and circuits
2. Powered accessory devices (sensors)
3. Modbus network interconnections (cabling)
4. Modbus devices (Modbus Masters, gateways and RS-485 signal repeaters)

ACM102x Electrical Isolation: ACM102x products should be powered by fully-isolated external power sources, such as low-voltage transformers or regulated DC power supplies. ACM102x products do not provide their own electrical isolation.

Accessories: Typical accessory devices are sensors, such as tachometers, air pressure, air flow, temperature, etc. Accessory devices have or receive bias power by varying means; factory and field options for grounding the low-voltage bias and signal circuitry in accessory devices can vary. Accessory devices may introduce ground connections by construction or optional connection.

Modbus Network Interconnections: ACM102x units in a Modbus network are connected to each other and to a Modbus master, gateway and/or RS-485 signal repeater by daisy-chained Cat5e cabling, supporting RS-485 electrical signals. ACM102x units do not connect the RS-485 network-signal system to equipment or earth ground.

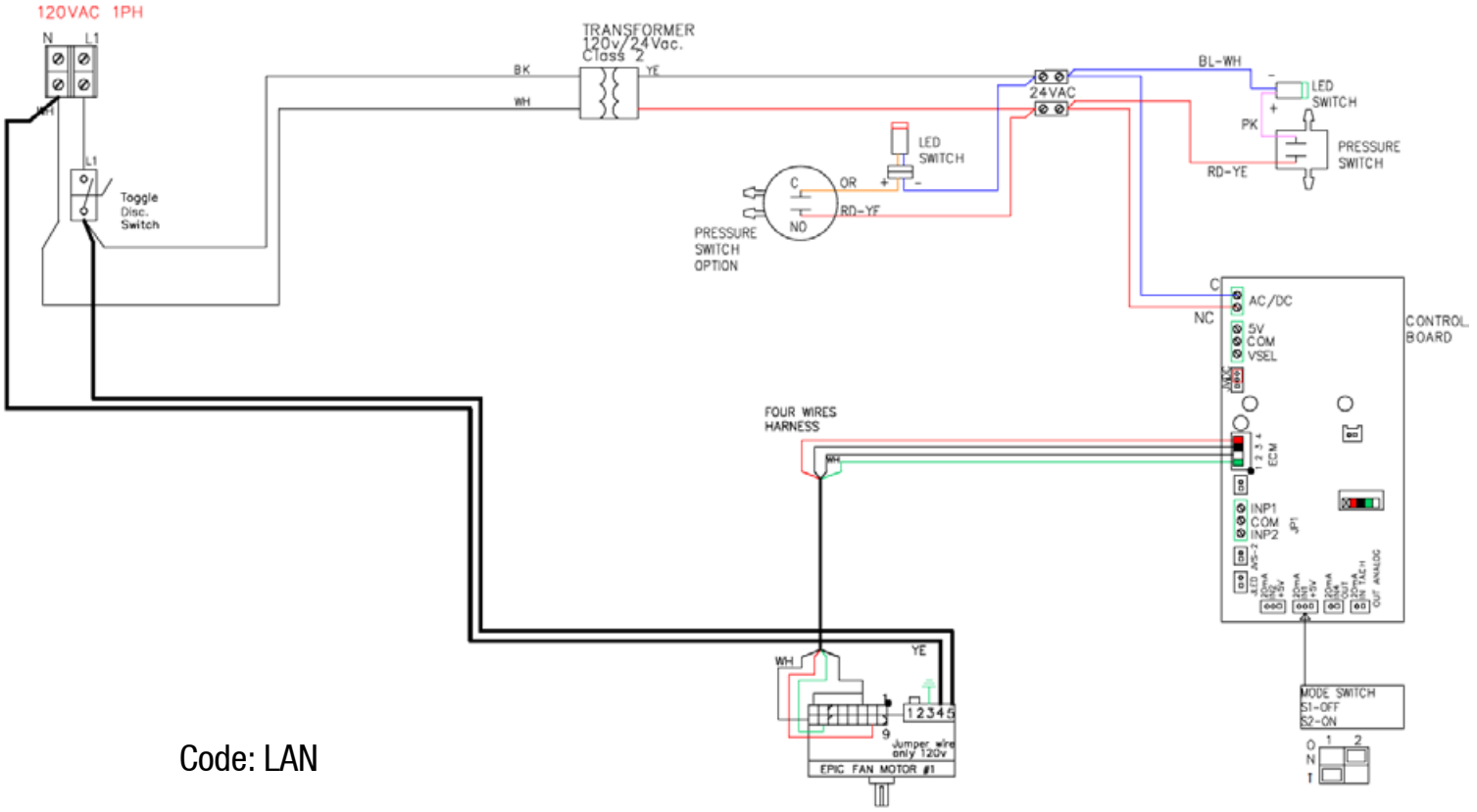
Modbus Masters & Gateways: Modbus networks include a Master device, such as an AirCare ACCx console, or third party Modbus PLC, HMI, or building automation system (BAS). A Modbus Master may connect to an ACM102x networked population by means of a gateway, such as in Modbus TCP/RTU network systems. Bias power sources, factory and field options for grounding master devices and gateways may vary, and may introduce ground connections to the RS-485 network-signal system.

To avoid ground loops:
• Provide a means of electrical isolation between multiple points of connection to ground that may exist or be necessary in a given system (such as an isolated RS-485 signal repeater).
• Ground the entire low-voltage system, or an isolated segment of a system, at only one location, or at no locations, as necessary to ensure satisfaction of all applicable electrical codes per a given equipment-system-facility type and regulatory code environment.
• Check grounding information and configuration for all accessory devices and network appliances used in an ACM102x system, such as sensors, Modbus controllers and network gateways. Within the satisfaction of all applicable electrical codes, resolve any/all detected multiple points of low-voltage system grounding.

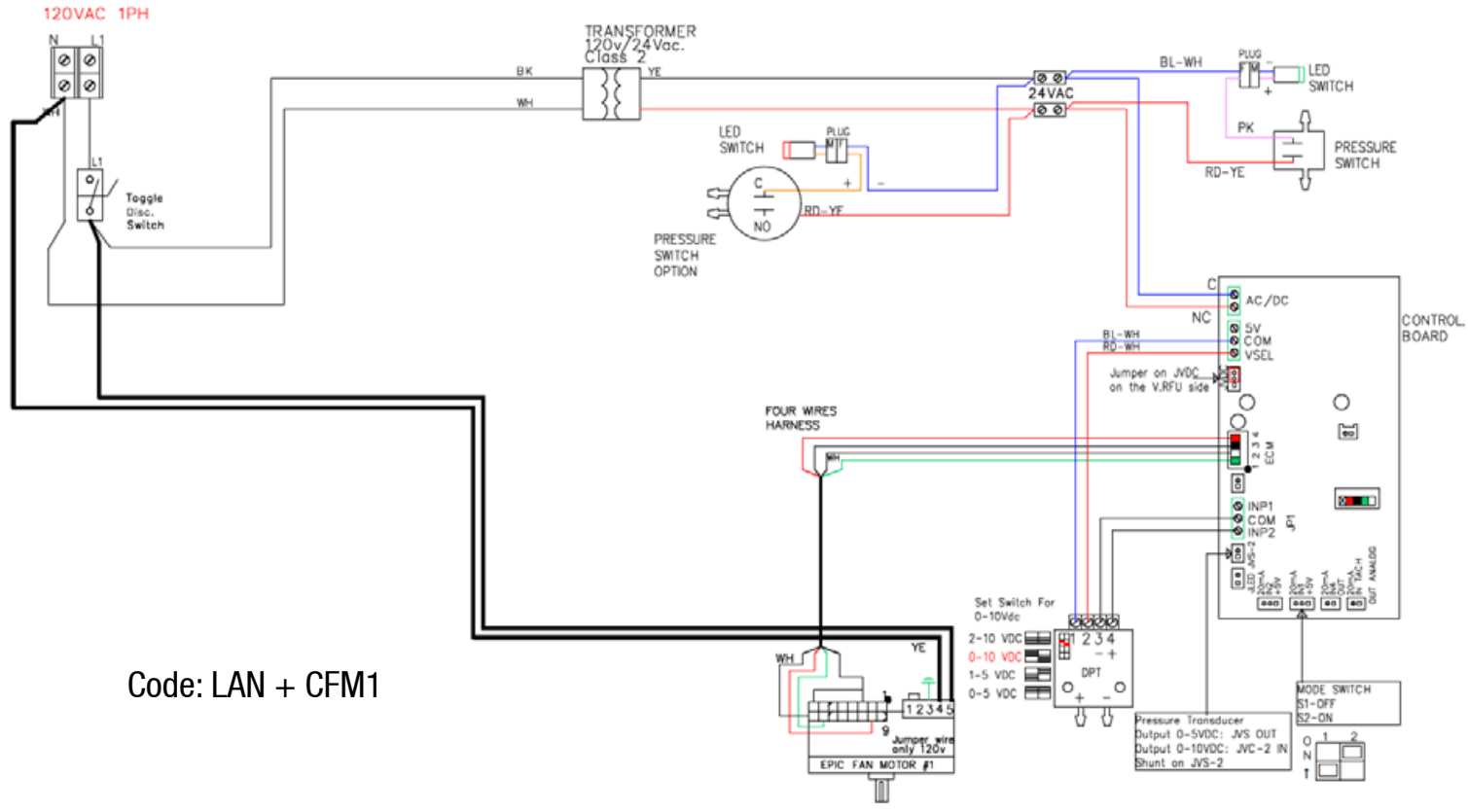
Note: Nailor may ground the secondary side on the 120/24V transformer. This is done as standard on all controls in order to exceed NEC requirements (150V+), but also to meet all local electrical codes, where some require grounding for all primary voltages. The Aircare FFU control board if daisy chained for a network will not communicate due to a ground loop issue. To resolve this possible problem, the secondary ground wire needs to be disconnected. This can be done in a few seconds when setting up the unit.

Optoelectronic, galvanic or other means of electrical isolation may be indicated to resolve grounding and ground loop issues for a given system. Please consult the factory for further information or assistance regarding grounding and ground loop avoidance.

ECM CONTROL BOARD WIRING DIAGRAM - LAN

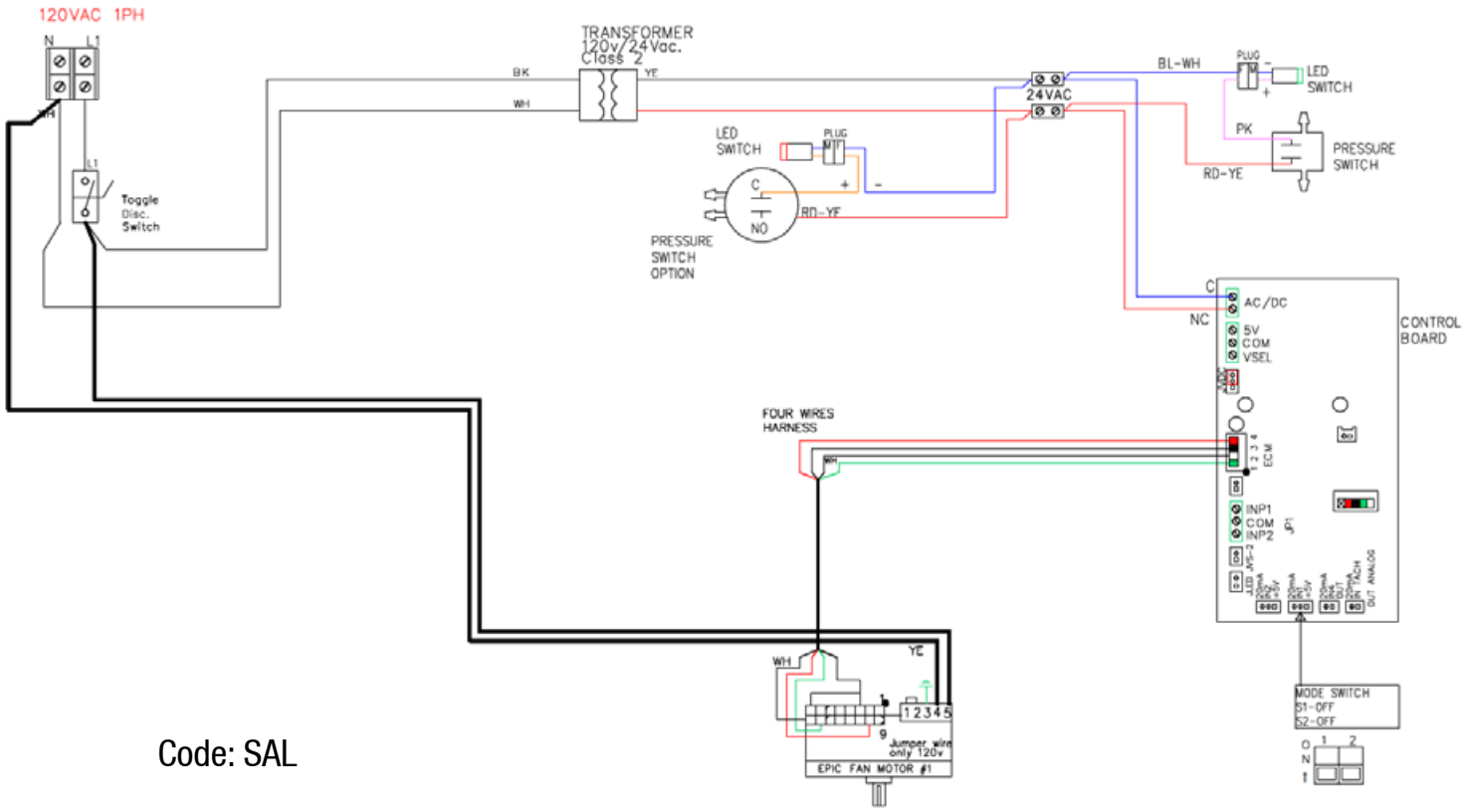


Code: LAN

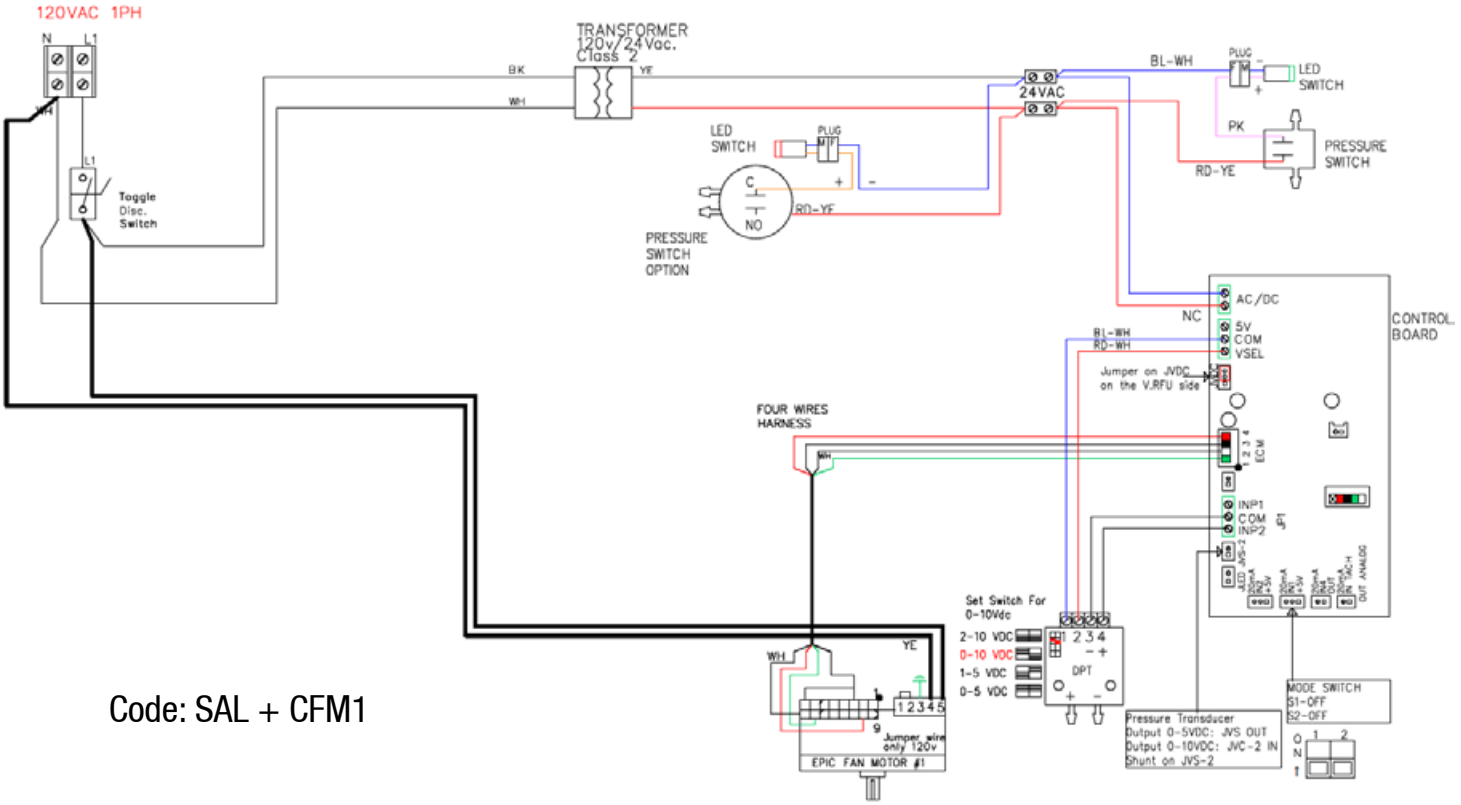


Code: LAN + CFM1

ECM CONTROL BOARD WIRING DIAGRAM - STANDALONE

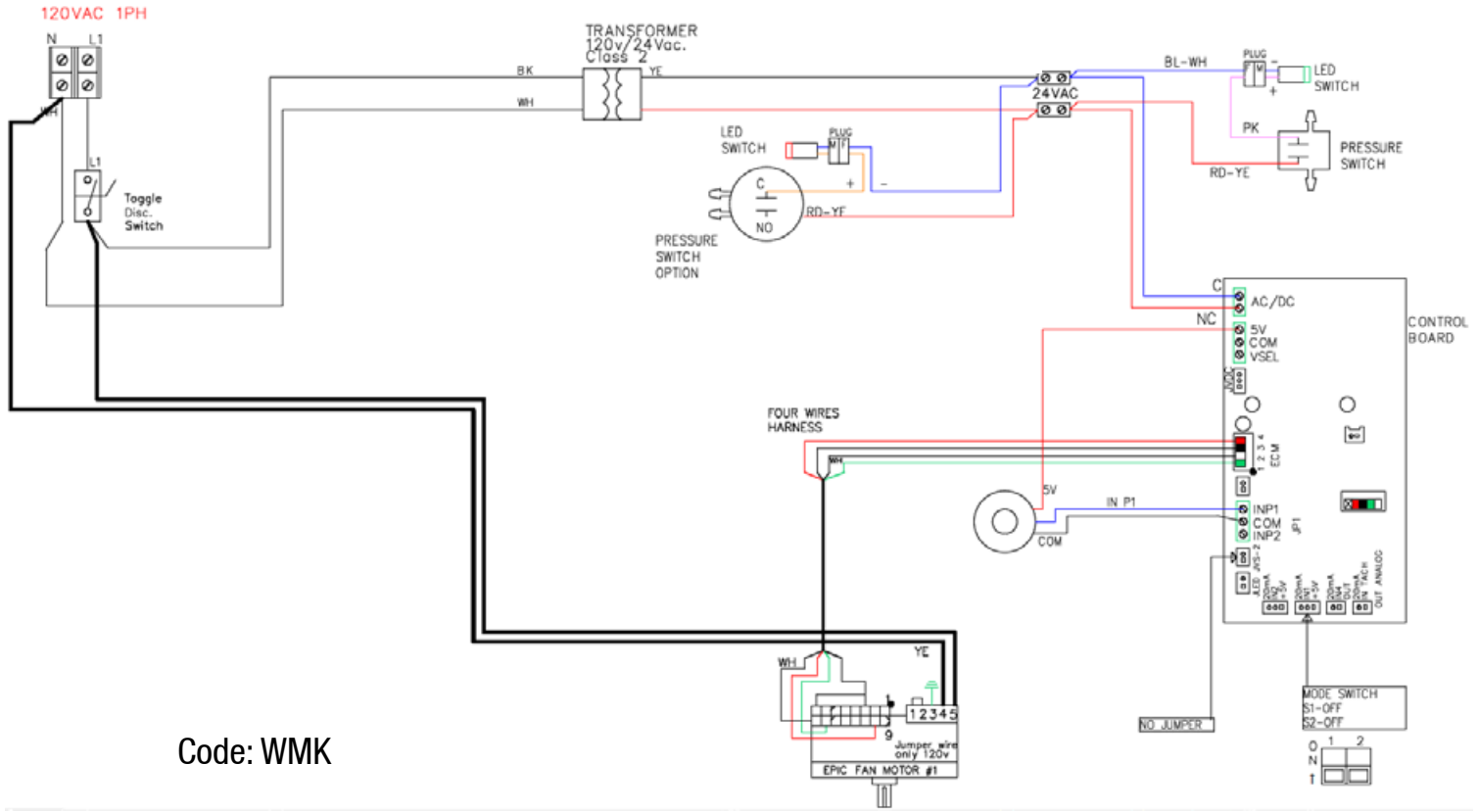


Code: SAL

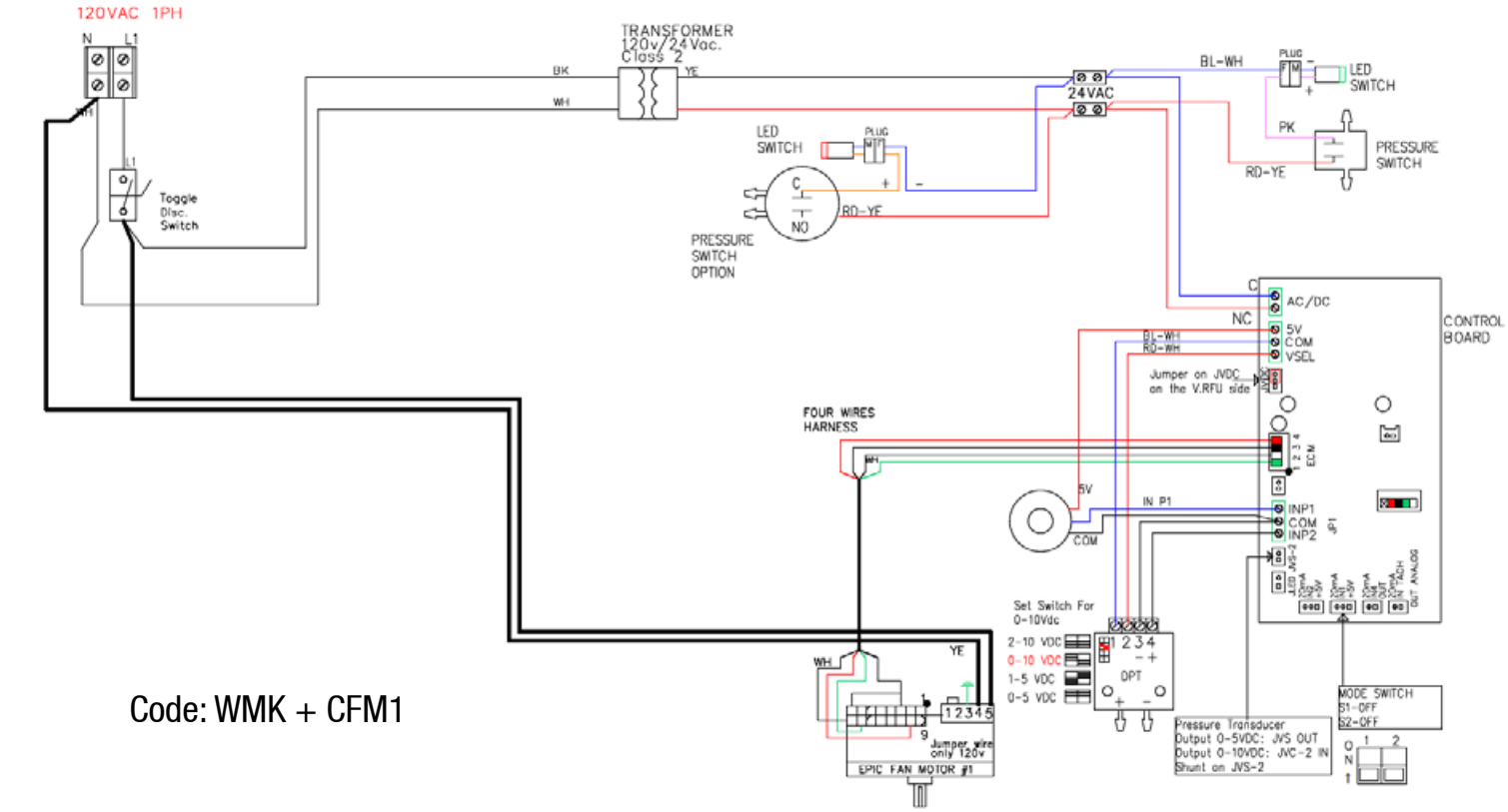


Code: SAL + CFM1

ECM CONTROL BOARD WIRING DIAGRAM - WALL MOUNTED KIT



Code: WMK

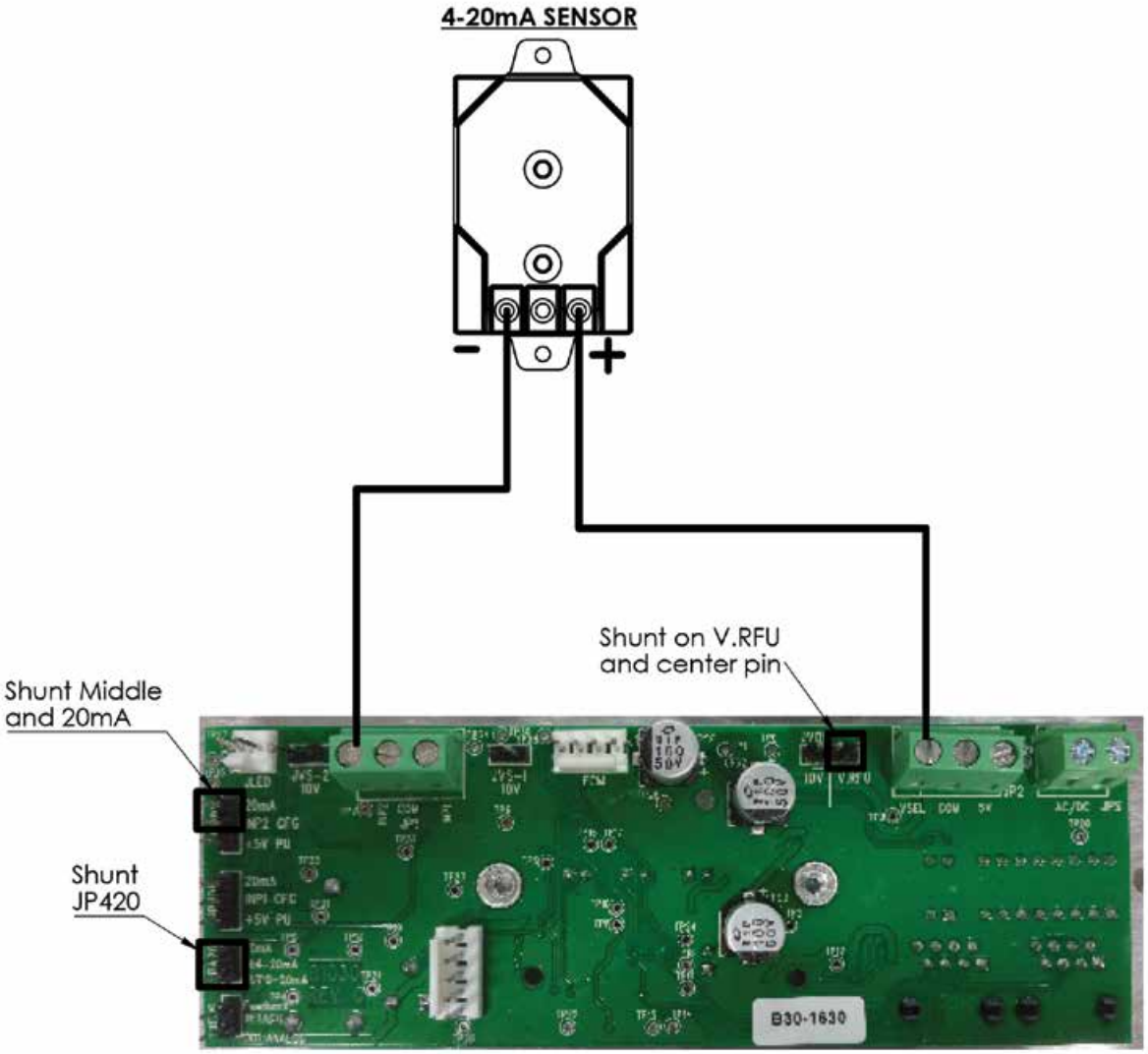


Code: WMK + CFM1

EXAMPLE OF WIRING A SENSOR TO CONTROL BOARD FOR FEEDBACK OR MONITORING THROUGH CONTROLLER

NOTES:

– Pressure transducer provides 4 – 20 mA output signal
– Powered by ~ 33 VDC supply



REPLACEMENT/CLEANING OF THE PRE-FILTER

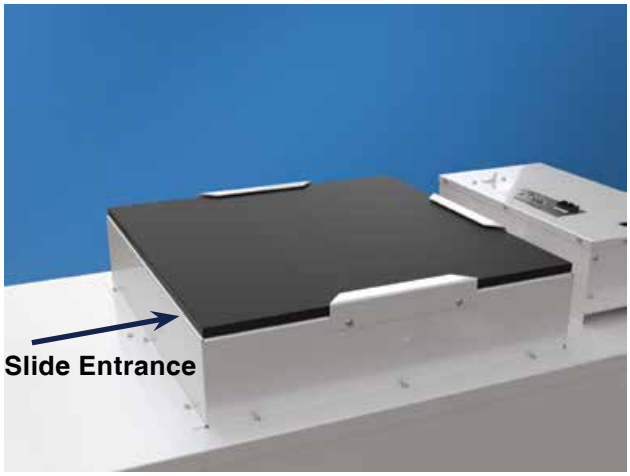
WARNING!
Disconnect the unit from the electrical power source before attempting to service the unit

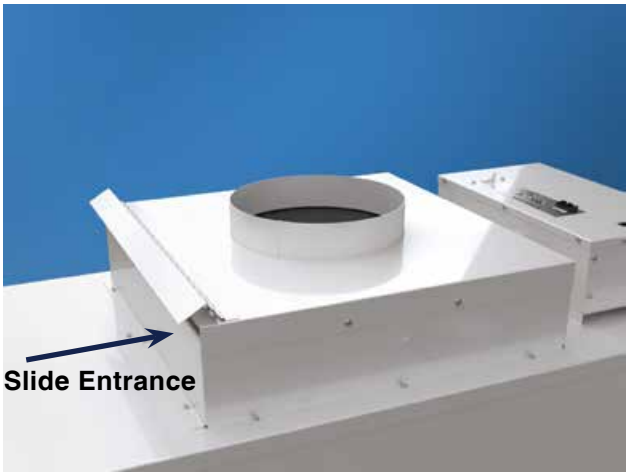
Tools required: Flat screwdriver, 7/16" hex wrench

Note: For maximum performance, wash the aluminum washable pre-filter every three to six months at minimum.

Step 1 Disconnect the unit at the power source or at the service panel.

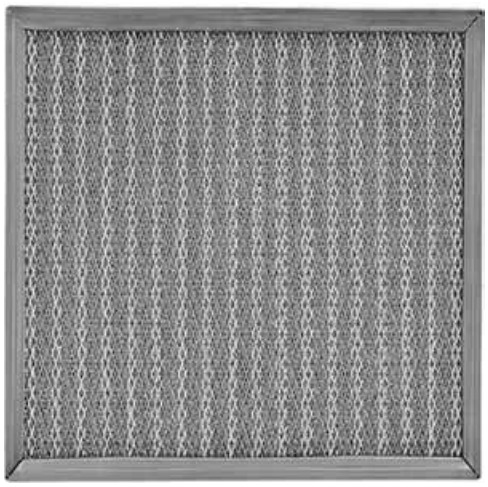
Step 2 For Non-Ducted: Remove filter by pushing filter to one side and sliding it out from under the brackets.
For Ducted: Using a driver, remove the screw holding the hinged door to access the pre-filter.





Step 3 Slide the pre-filter out of the motor enclosure.

Step 4 Wash the filter with hot water and a mild detergent and rinse thoroughly. Do not use a caustic solution to clean the filter. Blow dry or let air dry and slide the filter back into the motor enclosure.
Note: Filter should be completely dry before reinstalling into unit.



Step 5 Reassemble by reversing the above steps.

REPLACEMENT OF THE HEPA/ULPA FILTER WITH GEL SEAL

WARNING!
Disconnect the unit from the electrical power source before attempting to service the unit

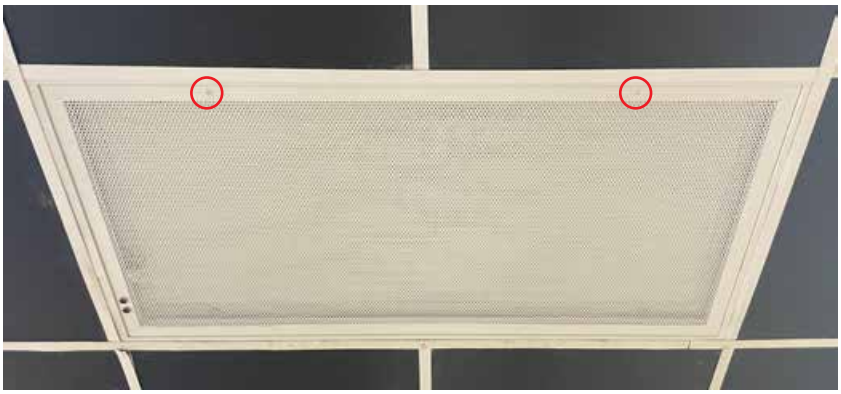
WARNING!
The HEPA filter may be protected by an expanded metal screen. This is to prevent accidental touching of the filter media. It is not meant to allow handling of the filter in these areas. Handle the filter ONLY by the frame.

Tools required: Flat screwdriver, 7/16" hex wrench, 2 ladders.

Note: The manufacturer recommends two people to remove and install the HEPA filter in the unit.

Step 1 Disconnect the unit at the power source or at the service panel.

Step 2 Using a flat screwdriver, release the face frame by rotating the two (2) fasteners a quarter-turn counter clock-wise.



Step 3 Open the hinged frame to access the filter section.
Note: if installing for the first time, skip to step 8.

Step 4 Evenly loosen the four bolts with a 7/16" wrench holding the filter retaining clips by working your way around the unit loosening the bolts a little at a time.

WARNING!
Disconnect the unit from the electrical power source before attempting to service the unit

WARNING!
The HEPA filter may be protected by an expanded metal screen. This is to prevent accidental touching of the filter media. It is not meant to allow handling of the filter in these areas. Handle the filter ONLY by the frame.

Step 5 USE TWO PEOPLE TO SUPPORT THE FILTER and rotate the filter clips toward the offset hole until clip is clear of the filter.

Step 6 Allow gravity to pull the filter away from the unit. If installing a new filter; discard the filter in an appropriate manner.

Step 7 Clean the knife edges of the unit to remove any gel residue from the filter

Step 8 Unpack the new filter and inspect for shipping damage (Refer to the inspection section for details). If damage is found, do not install in unit; call the manufacturer for replacement arrangements.

Step 9 Using two people, raise the filter into place assuring the seal edge is approximately in the center of the gel channel.

Step 10 While supporting the filter by its frame, rotate the filter clips so that the clips are supporting the frame and are at 90° to the frame. Tighten the clips with 7/16" wrench.
Note: Wait at least 30 minutes before performing any challenge testing to allow the gel to fully adhere to the unit.

Step 11 Close the hinged face frame back into place, and secure quarter-turn fasteners.

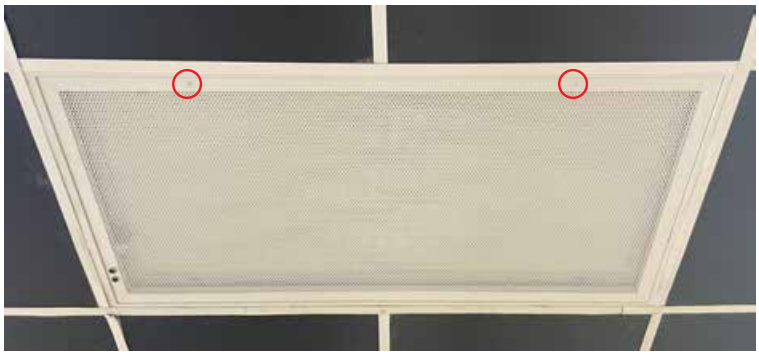
Step 12 Inspect all gaskets and seals for integrity. Reconnect power and turn unit power on.

REPLACEMENT OF THE EC MOTOR FROM ROOM SIDE

WARNING!
Disconnect the unit from the electrical power source before attempting to service the unit

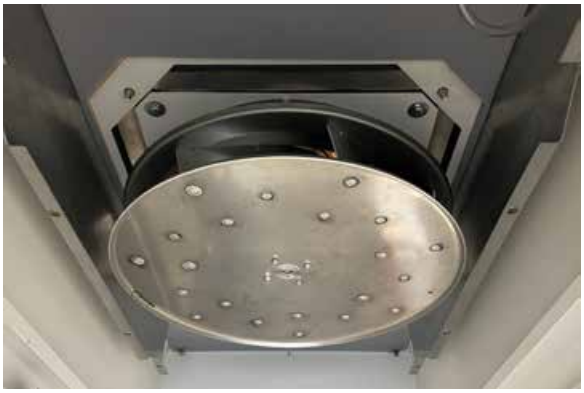
Tools required: Flat screwdriver, 7/16" hex wrench, 3/4" (6) hex wrench, 2 ladders.
Note: The manufacturer recommends two people to remove and install the HEPA filter in the unit.

Step 1 Disconnect the unit at the power source or at the service panel.
Step 2 Using a flat screwdriver, release the face frame by rotating the two (2) fasteners a quarter-turn counter clock-wise.




Step 3 Remove the HEPA filter and set aside. See Section "Removal and Replacement of the Gel Seal HEPA Filter" for instructions.
Step 4 Remove the 3/4" nuts holding up the baffle. Allow panel to swing down to vertical and remove from unit. Set aside.

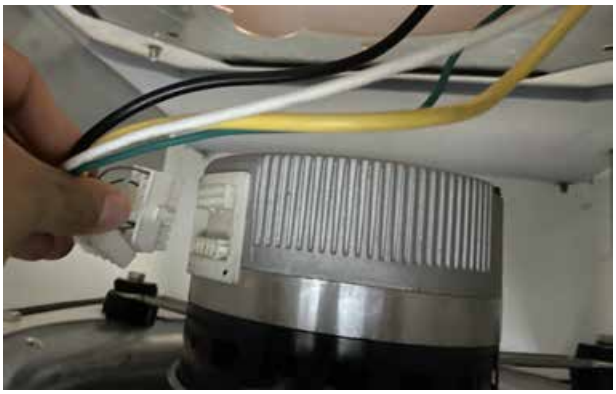

Step 5 Using a 7/16 wrench to detach the square plate holding the motor-blower assembly to the unit.




WARNING!

Disconnect the unit from the electrical power source before attempting to service the unit

Step 6 Disconnect the 5-pin power cable and the 16-pin data cable to the control board.



Step 7 Lower the motor/fan/ring assembly out of the unit.

Step 8 Using a 5/16" (8) wrench to loosen blower set screw and slide blower off the motor shaft.

Step 9 Using a 7/16" (11) nut driver, remove the three nuts holding the motor.

Step 10 Reverse above steps to reassemble the motor/fan/ring assembly into the unit. Motor mount should be against control housing of motor and fan collar should be even with the end of the motor shaft. Either rivets or sheet metal screws can be used to secure the motor housing cover.

REPLACEMENT OF THE EC MOTOR FROM PLENUM SIDE

WARNING!
Disconnect the unit from the electrical power source before attempting to service the unit

Tools required: 3/4" (6) hex wrench.

Step 1 Disconnect the unit at the power source or at the service panel.
Step 2 Using a 1/4" (6) wrench to detach the square plate holding the motor-blower assembly to the unit.
Step 3 Disconnect the 5-pin power cable and the 16-pin data cable to the control board.
Step 4 Lift the motor/fan/ring assembly out of the unit.

Step 5 Using a 5/16" (8) wrench to loosen blower set screw and slide blower off the motor shaft.
Step 6 Using a 7/16" (11) nut driver, remove the three nuts holding the motor.

Step 7 Reverse above steps to reassemble the motor/fan/ring assembly into the unit. Motor mount should be against control housing of motor and fan collar should be even with the end of the motor shaft. Either rivets or sheet metal screws can be used to secure the motor housing cover.

ACCESS TO ELECTRICAL COMPONENTS (PLENUM SIDE)

WARNING!

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

Tools required: 1/4" (6) hex driver.

Step 1 Turn off the unit with the toggle switch located on the electrical box.
Step 2 Use a 1/4" (6) hex driver to remove the top panel of the control box enclosure.
Step 3 Use the 1/4" (6) hex driver to remove the control box access panel.
Step 4 To remove transformer:
- **Step 4a** Disconnect all wires from terminals. See wiring diagram for replacing wires.
- **Step 4b** Use 1/4" (6) hex driver to unscrew the transformer. Clean debris.
- **Step 4c** Use new 1/4" (6) screws to install replacement transformer.

Step 5 To remove control board:
- **Step 5a** Use 1/4" (6) hex driver to remove nuts holding the control board to the electrical box. Clean debris.
- **Step 5b** Remove the two red plugs and use a small screwdriver to remove power wires.
- **Step 5c** Use new 1/4" (6) screws to install replacement board.

Step 6 Reverse above steps to replace electrical components and to replace panel.

AIRFLOW SET POINT

Step 1: Determine test point voltage (VDC) from the formula based on the desired airflow.

- Control Board Potentiometer: Rotate the potentiometer dial on the outside of the box with a screwdriver until the test point voltage is achieved.

$$VDC = \frac{CFM - 80}{953}$$

- Wall mount speed controller (2 - 10 VDC input signal): $VDC = \frac{CFM + 181}{121.75}$

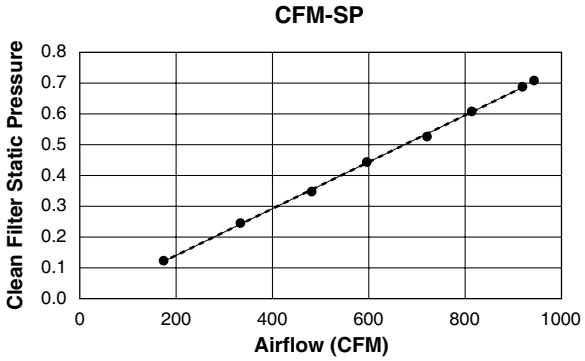
Note: When unit is operated from an external setpoint or network value 0 - 10% is reserved for local override of the EC Motor Control board POT so the unit can be adjusted from the main control board. 10% - 20% is reserved for the remote OFF Signal.

Step 2: Allow the ECM motor to adjust its speed for a few seconds. Use an airflow hood to measure and verify the airflow. Adjust the POT/DIA to reach desired airflow as required.

PRESSURE SWITCH ADJUSTMENT

Nailor fan filter unit (92FFU) is equipped with a loaded filter indicator (LFI) kit which includes a red panel mounted LED light and a pressure switch. The static pressure of the clean HEPA filter at 90 fpm is 0.35 in. w.g.. The pressure switch is factory set at 1.5 x clean filter and set at 0.525 in. w.g.. However, if different set points are desired, they can be adjusted as follows:

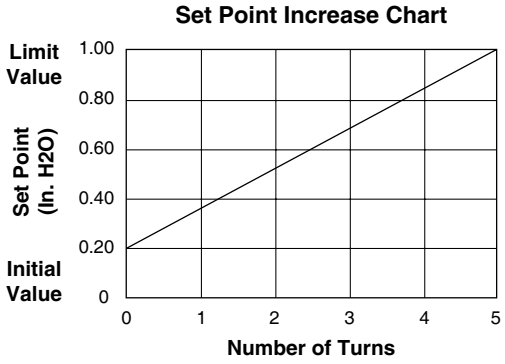
Step 1 Using the chart below, determine the clean filter static pressure at the desired airflow.



Step 2 Calculate the setpoint of the pressure switch using the equation below.

Setpoint Static Pressure = Clean Filter Static Pressure x 1.5.

Step 3 Calculate number of turns required based on the difference between factory set point and desired set point using the following chart. Each turn increases the static pressure by 0.16" w.g..



Step 4 Using a 2mm hex Allen wrench, turn the screw clockwise the number of turns calculated in step 3.

NOTE: Maximum available pressure setting is 1.0" w.g. Do not exceed 5 turns (total).

PAO CHALLENGE SYSTEM

These instructions are to assist a qualified technician in testing the leakage of the fan filter unit. Filter should be installed for a minimum of 30 minutes before test is performed.

An optional PAO Challenge Manifold System is available to provide a reliable,convenient method of performing a challenge test of the fan filter unit at the face.

Tools required: Flat screwdriver.

Step 1 Using a flat screwdriver, release the face frame by rotating the four (4) fasteners a 1/4 turn counter clock-wise. Unhook the safety cables from the filter clips.

Step 2 Remove cap from PAO concentration port (brass). Attach UPSTREAM hose (1/4" [6] ID) from photometer to PAO concentration port.

Step 3 Remove cap from PAO challenge supply port (brass). Attach DOWNSTREAM hose (3/8" [10] ID) from photometer to PAO concentration supply port.

Step 4 Conduct the challenge test per equipment specifications and IEST-RP-CC034.3.

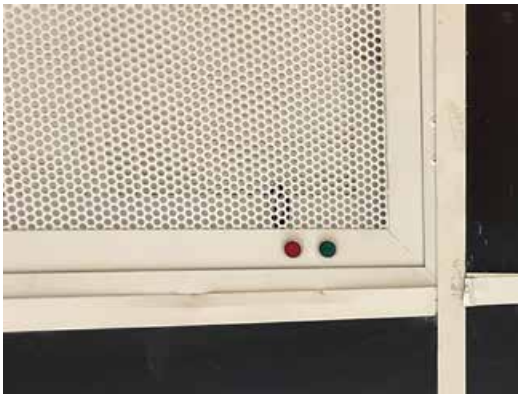
Step 5 Disconnect hoses from ports and securely replace caps.

Step 6 Reattach the safety chains and secure 1/4 turn fasteners.

LED INDICATORS

Two optional LED indicators, red and green, can be used to quickly monitor the status of the unit and identify if there is a need for correction. The following table will show the meaning of the LEDs.

Green/ON	Motor is running
Green/OFF	Motor is not running or unit is off
Red/ON	HEPA filter requires replacement
Red/OFF	HEPA filter is good



TESTING

Each Fan Filter Unit is thoroughly tested at the factory before shipment. However, many codes and standards require testing for by-pass leakage after installation. Nailor Industries Inc. encourages that the customer contact an independent, certified testing organization with technicians that are trained and experienced in performance evaluation and maintenance of clean air equipment. Nailor Industries Inc. recommends at least 30 minutes elapse after HEPA/ULPA filter installation before performing any type of challenge leak testing. The unit should be sealed to the ceiling and the room should have a positive pressure held during testing and normal operation.

TROUBLE SHOOTING

Low Airflow

- If optional HEPA red LED light is on, replace the HEPA filter.
- Inspect the pre-filter. Clean or replace as necessary.
- Adjust the digital speed control for higher blower output.
- Check the power supply for proper voltage, amperage and distribution frequency.
- Replace the HEPA filter if airflow remains low.

High Airflow

- Adjust the digital speed control for lower blower output.

Non-Laminar Airflow and/or Excessive Contamination

- Insure that upstream is clear of large obstructions.
- Ensure that no other air moving devices are operating in such a way to disrupt the room's airflow pattern.
- Check airflow and if not desired airflow see above.
- Conduct smoke or photometer test on HEPA filter and gel seal. If test fails seal or replace the HEPA filter as necessary.

WARRANTY

Limited Warranty

Unless otherwise expressly stated elsewhere in Nailor Industries Inc. (Nailor) published literature, Nailor warrants that the Fan Filter Units 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 twelve (12) months from the date of shipment from the Nailor facility. Provided the Buyer informs Nailor in writing of any breach or warranty prior to the expiration of the applicable warranty period, Nailor shall, as its sole obligation and the Buyer's sole and exclusive remedy for any breach of this warranty, repair or replace/reperform the unit which gave rise to the breach or, at Nailor's option, refund the amounts paid by the Buyer for the unit which gave rise to the breach. Any repair, replacement or reperformance by Nailor 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 Nailor in writing, the Buyer shall bear the costs of access, de-installation, re-installation and transportation of the unit to the Nailor facility and back to the Buyer's designated location. These warranties and remedies are conditioned upon (a) the proper storage, installation, operation and maintenance of the unit and conformance with the proper operation instruction manuals provided by Nailor or its suppliers and subcontractors, (b) the Buyer keeping proper records of operation and maintenance during the applicable Warranty Period and providing Nailor with access to these records and (c) modification of repair of the units only as authorized by Nailor. Nailor does not warrant the unit or any repaired or replacement parts against normal wear and tear or damage caused by misuse, accident or use against the instructions of Nailor. Any modification or repair of the unit not authorized by Nailor shall render the warranty null and void. EXCEPT AS EXPRESSLY SET FORTH HEREIN, NAILOR MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NO LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, NO-INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE WHICH ARE HEREBY DISCLAIMED TO THE EXTENT PERMITTED BY APPLICABLE LAW.