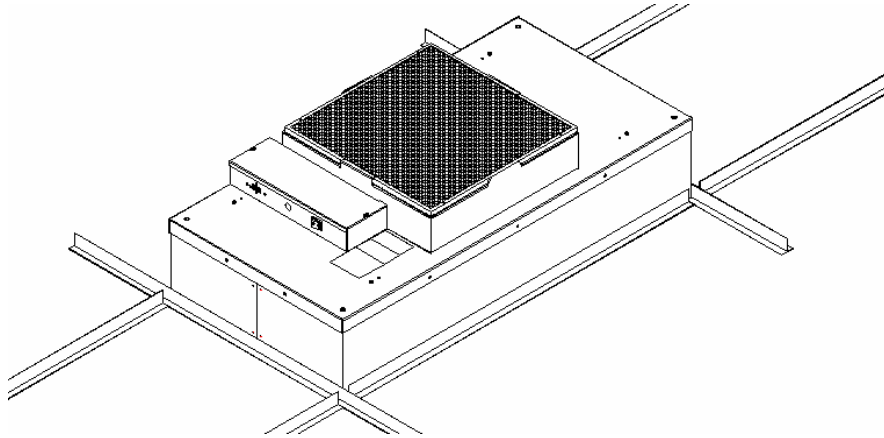


\*\*\* READ AND SAVE THESE INSTRUCTIONS \*\*\*

# MAC 10<sup>®</sup> *LE-DC* FAN FILTER MODULE INSTALLATION AND SERVICE MANUAL

STANDARD, RSR, RSRE MODELS



Mac 10<sup>®</sup> and VE5<sup>®</sup> are registered Trademarks of the  
Envirco, U.S.A.

US Patents 4,560,395 and 5,470,363 Other patents issued and pending in foreign countries

Version 1.1  
Updated 4-19-11

## **Critical operation conditions of the MAC 10**

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 or back to protect from damage.
2. Prior to powering the unit, verify that the unit has been plugged into the correct voltage. The serial number label on the top of the Mac 10 unit has the required voltage.
3. For reorder prepossess the Mac 10 part number and serial number should be recorded. This information is located on the serial number label, located adjacent to the electrical box. If you can't located the Sales Order Number please contact Enviroco for this information.

## **Part Numbers Covered by this Manual**

11202-XXX	Mac 10 LE-DC 2x4 (600x1210mm) Standard Filter
11203-XXX	Mac 10 LE-DC 2x3 ½ (600x1057mm) Standard Filter
11204-XXX	Mac 10 LE-DC 2x3 (600x905 mm) Standard Filter
11205-XXX	Mac 10 LE-DC 2x2 (600 x 600 mm) Standard Filter
11206-XXX	Mac 10 LE-DC 2x4 (600x1210mm) RSR/E Filter
11207-XXX	Mac 10 LE-DC 2x3 ½ (600x1057mm) RSR/E Filter
11208-XXX	Mac 10 LE-DC 2x3 (600x905 mm) RSR/E Filter
11209-XXX	Mac 10 LE-DC 2x2 (600 x 600 mm) RSR/E Filter

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

## **CAUTION**

**TO REDUCE THE RISK OF INJURY TO PERSONS, INSTALL FAN AT  
LEAST 2.1M (7 FEET) ABOVE THE FLOOR**

## **READ AND SAVE THESE INSTRUCTIONS**

### **WARNING!**

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

- A. Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
- B. When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.
- C. If this unit is to be installed over a tub or shower, it must be marked as appropriate for the application.
- D. Use this unit only in the manner intended by the manufacturer. If you have any questions, contact the manufacturer:

#### **ENVIRCO**

101 McNeill Road  
Sanford, NC 27330  
Tel: (919) 775-2201  
Tel: (800) 884-0002  
Fax: (800) 458-2379  
Email: info@envirco.com

#### **ASIAN SALES**

Building #1  
200 Middle Suhong Road  
Suzhou, Jiangsu  
PRC 215021  
Tel: (86) 512 6258 0031  
Fax: (86) 512 6258 7180

#### **Europe, Middle East & Africa (EMEA)**

TRION Div of Ruskin Air Management Ltd  
*European Operations*  
The Cavendish Center Winnall Close  
Winchester Hampshire  
SO23 OLB, UK  
Tel: +44 (0) 1962 840465  
Fax: +44 (0) 1962 828619

- E. Before servicing or cleaning unit, switch power off at service panel and lock service panel to prevent power from being switched on accidentally.

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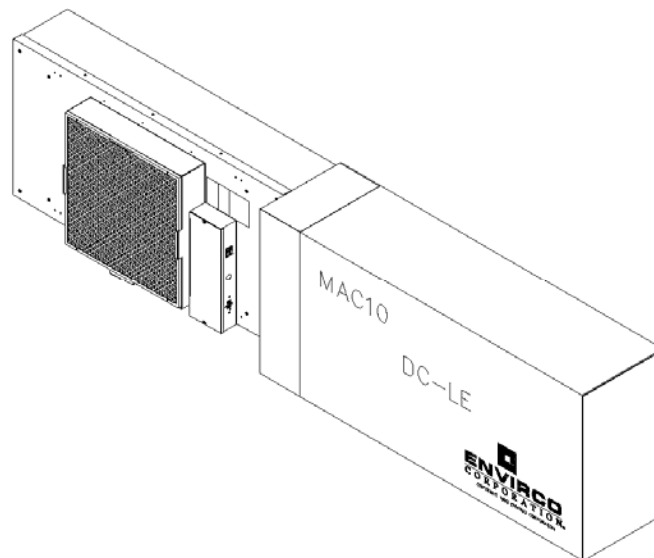
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## 1 INSTALLATION

Note: The MAC 10 DC-LE Fan Filter Unit is completely assembled at the factory with the exception of the optional ¼" (0.64 cm)-20 eyebolts, which can be used when hanging the unit from an overhead structure.

- Step 1.** Carefully remove the unit from the shipping carton and inspect for any damage that may have occurred during transportation. (See Figure 1)
- Step 2.** Wipe down plastic bag and move unit into clean room. (Double bagging is available upon request.)
- Step 3.** If using rigidly supported grid (usually 2" (50 mm) or wider), raise unit through ceiling and lower onto the gasketed grid. If using a flexible grid (typically supported with wires) the unit must be secured to an overhead structure with eyebolts, s-hooks and chain or ¼-20 all thread. A roll of high-density gasket has been provided for use with ungasketed grids. Note: special size units are available to fit specific clean room grid systems.
- Step 4.** Have an electrician wire the unit to the appropriate voltage (115V, 220V, 277V AC), according to the wiring diagram in section IX and local electric codes. If optional power cord was purchased, plug unit into a grounded receptacle. The optional power cord is not acceptable for plenum installations.



**Figure 1 – Unit Uncrating**

## 2 SERVICE: Cleaning the MAC 10 DC-LE Prefilter (foam)

### WARNING!

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

**Tools Required:** None

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

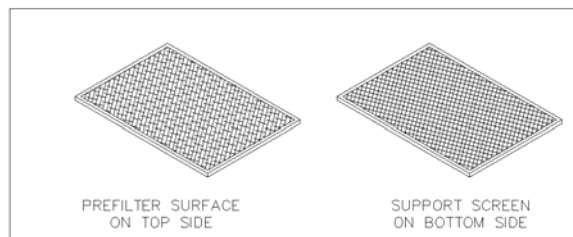
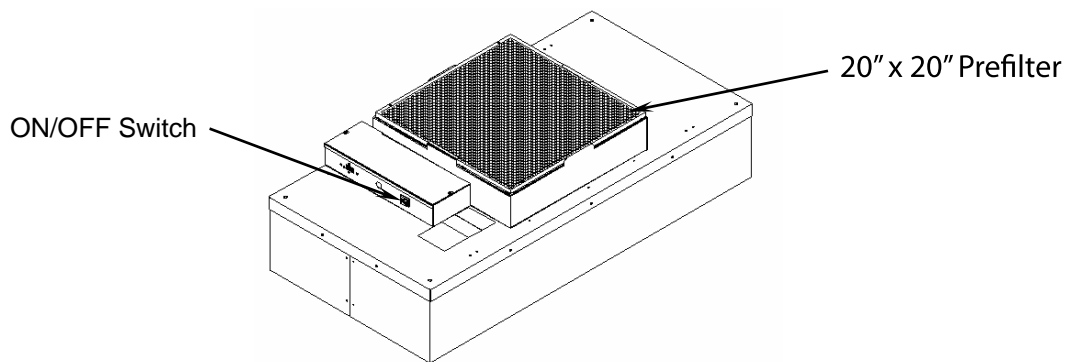
**Step 1.** To gain access to the prefilter, remove the ceiling panel next to the unit, if applicable.

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

**Step 3.** Remove the 20"x20" prefilter from the snap-in frame. (See Figure 2)

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

**Step 5.** Reassemble by reversing the above steps.



**Figure 2 – Foam Prefilter Cleaning**

### **3 SERVICE: Cleaning the MAC 10 DC-LE Prefilter (G4 Pleated Prefilter)**

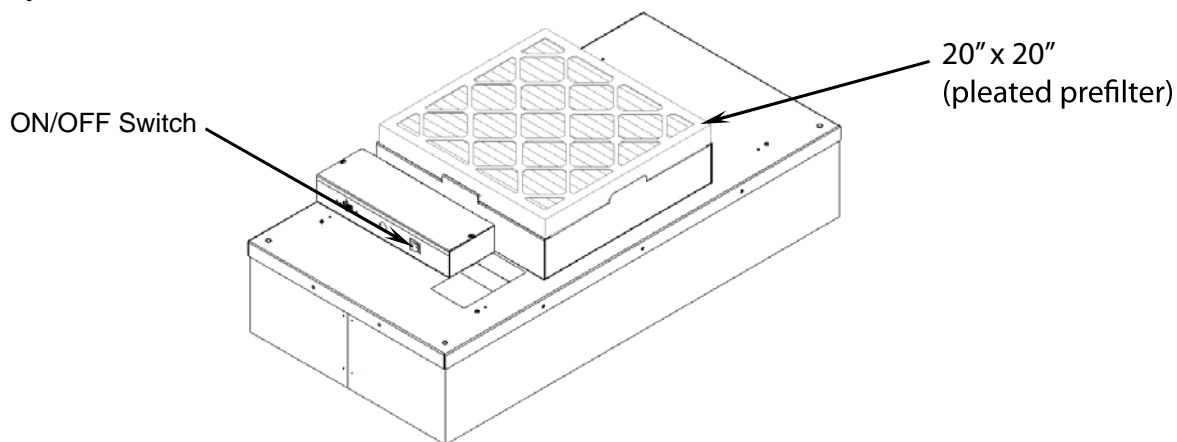
**WARNING!**

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

**Tools Required:      None**

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

- Step 1.** To gain access to the prefilter, remove the ceiling panel next to the unit, if applicable.
- Step 2.** Switch the ON-OFF switch to the off position.
- Step 3.** Remove the prefilter from the snap-in frame. The beverage frame has slots that have to be depressed to release the filter from the prefilter housing (See Figure 3)
- Step 4.** After removing the new G4 pleated prefilter from the box, remove the die cut slots from the beverage board frame and install on prefilter bracket.
- Step 5.** Reassemble by reversing the above steps.



**Figure 3 – G4 Prefilter Replacement**



## 4 SERVICE: Removal and Replacement of the HEPA/ULPA Filter (Standard Unit)

### 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.

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

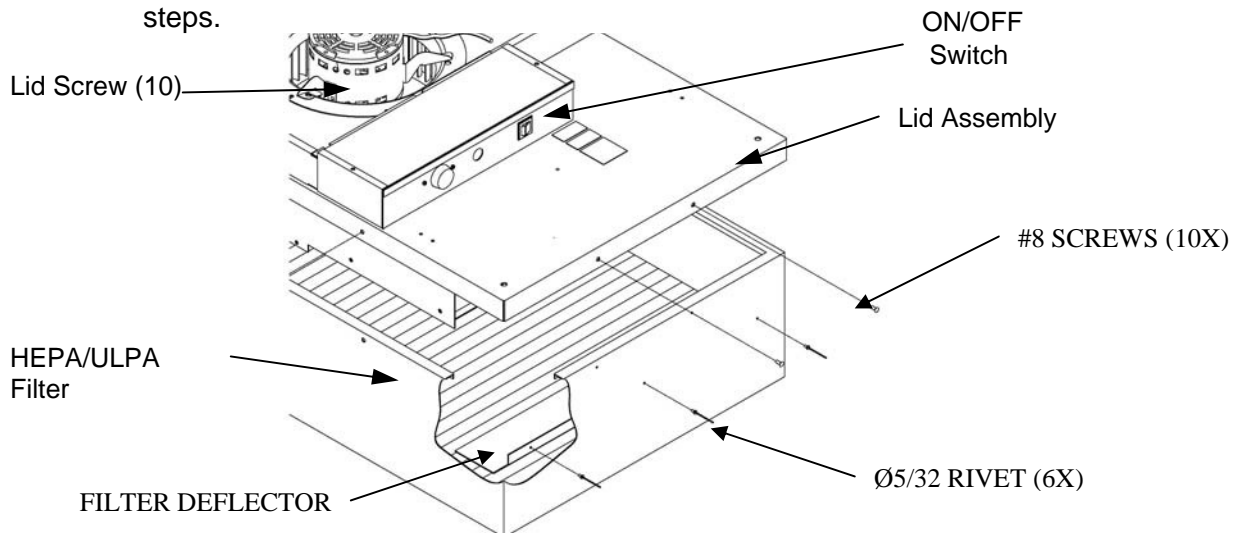
**Step 1.** Remove unit from ceiling.

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

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

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

**Step 4.** Replace with the new HEPA/ULPA filter and assemble by reversing the above steps.



**Figure 4 – Standard Filter Replacement**

## **5 SERVICE: Removal and Installation of the Room Side Replaceable Gel Seal Filter (RSR/RSRE)**

### **WARNING!**

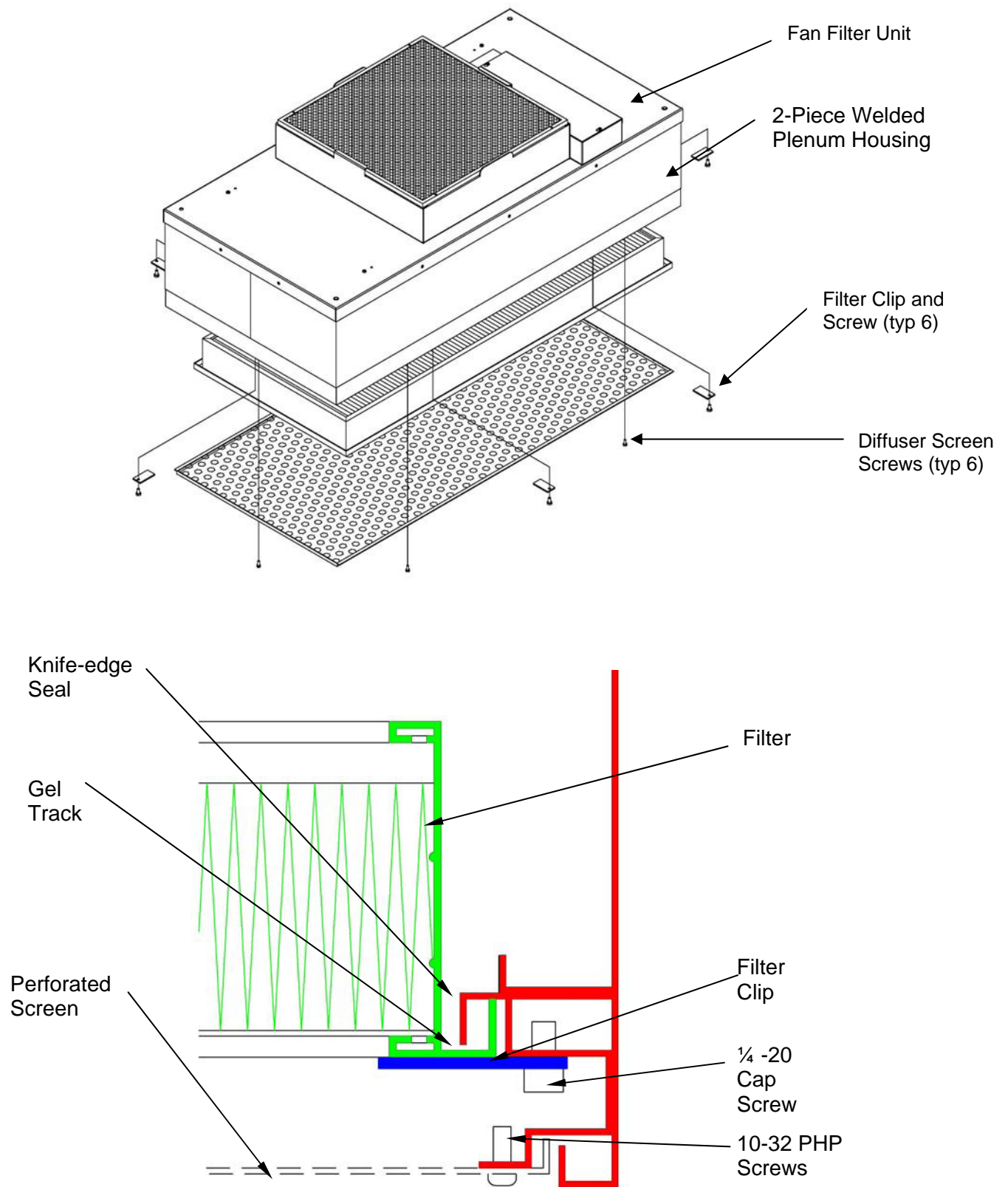
**Disconnect the unit from the electrical power source before attempting any service.**

### **WARNING!**

**The RSR 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.**

**Tools Required:** Phillips Head Driver  
3/16" hex head wrench  
**Manpower Required:** 2

- Step 1.** Remove the diffuser screen by removing the 6 each 10-32x1/2 screws.
- Step 2.** Loosen the six 1/4x20 socket head screws far enough to rotate the filter clip 90°. The filter will not drop during this operation. Slowly pull the filter away from the knife-edge seal, taking care not to touch the filter face during this operation. It is important to pull the filter slowly away from the seal, so that the gel remains in the filter gel track.
- Step 3.** Inspect filter for visible damage, if damaged set aside for replacement or repair.
- Step 4.** Inspect the gel seal, if reinstalling the removed filter. Determine if the gel has lost its ability to seal, if so repair the gel.
- Step 5.** Place the filter against the filter-sealing surface of the RSR unit. Install filter clips and screws. The clips can be rotated and angled into place. Using the clips as a lever the filter can be seated. It is recommended to work either clockwise or counter clock wise around the filter, raise the filter into the gel.
- Step 6.** Reinstall screen.



**Figure 5 – RSR Sheet Metal Filter Replacement**

## **6 SERVICE: Removal and Installation of the Motor (Standard and RSR models)**

### **WARNING!**

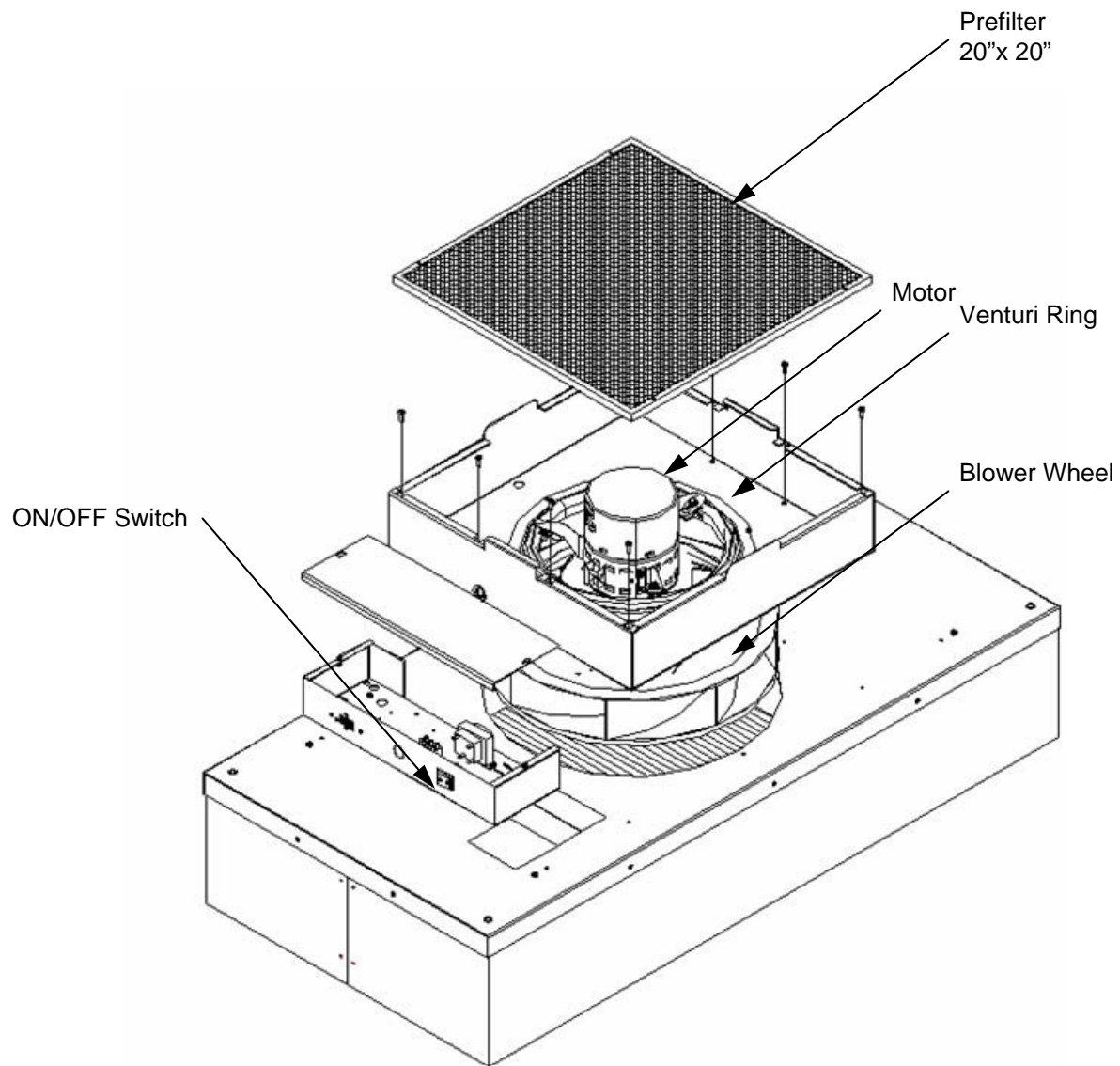
**Disconnect the unit from the electrical power source before attempting any service.**

### **WARNING!**

**Electrical service should be performed by licensed electricians or authorized ENVIRCO service technicians.**

**Tools Required:**     **Phillips Head Driver**  
                              **3/8" (10mm) Hex Head Wrench**  
                              **Pliers**  
                              **5/32"(0.40 cm) Allen wrench**

- Step 1.** To gain access to the motor, remove the ceiling panel next to the unit, if applicable.
- Step 2.** Switch the ON-OFF switch to the off position.
- Step 3.** Remove the prefilter off the prefilter frame. (See Section II)
- Step 4.** Loosen the electrical box cover screws (2), and slide/lift off cover. (Figure 6)
- Step 5.** Make note of all wire locations for reinstallation later.
- Step 6.** Disconnect 5-pin and 16-pin wire harnesses from the electrical box housing.
- Step 7.** Remove the eight screws to free the motor/blower assembly from the lid assembly. If using power drivers, set the unit to a low torque setting to avoid stripping the sheet metal screws. (See Figure 6)
- Step 8.** Using an adjustable wrench loosen the two set screws that attach the blower wheel to the motor shaft.
- Step 9.** Mark the location of the motor support bracket (belly band), then loosen the bolt just enough to allow the motor support bracket to slid off the motor.
- Step 10.** Using the removed motor, mark the new motor with the location of the motor support bracket.
- Step 11.** Replace with the new motor and reassemble by reversing the above steps 1-8. Set the spacing at 0.25" (6.35 mm) clearance between the blower and the upper motor plate/prefilter frame. This will give a 0.11" overlap between the venturi ring and the blower



**Figure 6 – Motor Replacement**

## 7 SERVICE: Removal and Installation of the RSRE Motor

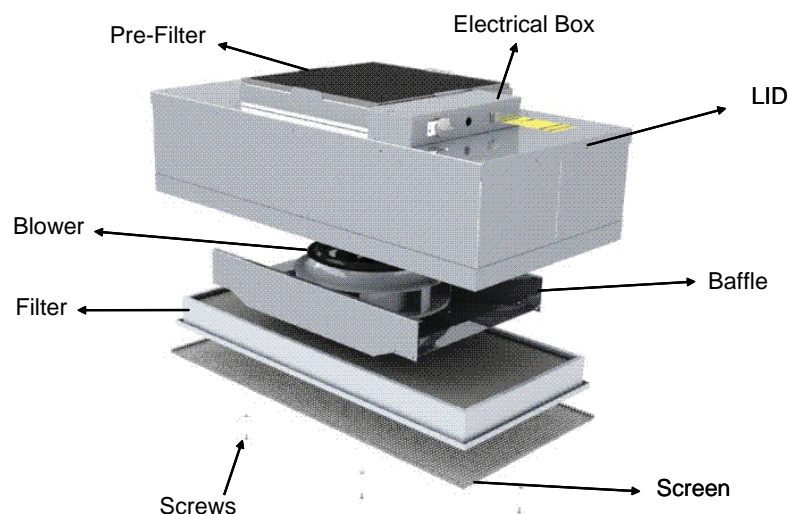
### WARNING!

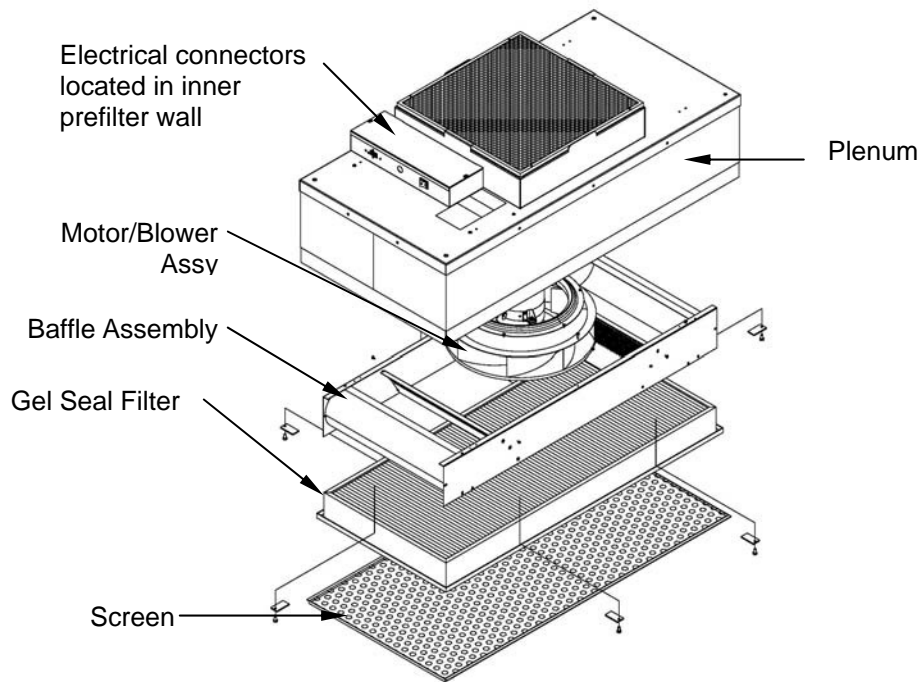
Disconnect the unit from the electrical power source before attempting any service.

### WARNING!

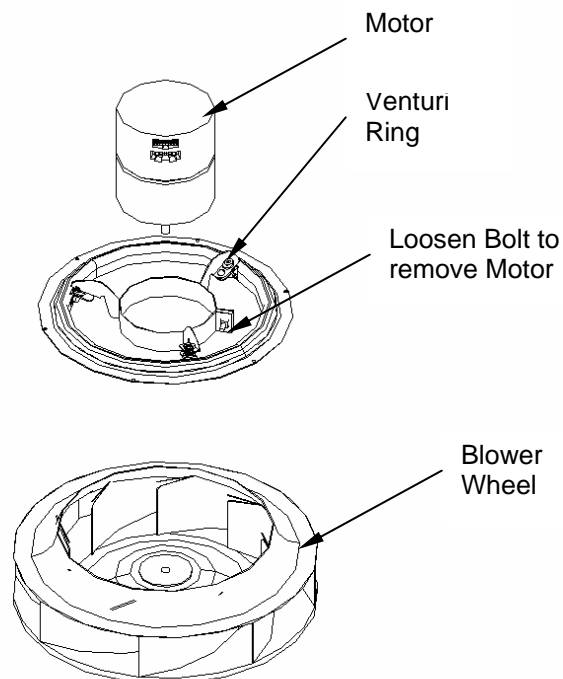
Electrical service should be performed by licensed electricians or authorized ENVIRCO service technicians.

- Step 1.** To gain access to the motor, remove the gel seal filter (see Section III).
- Step 2.** Prior to removing motor/blower assembly, remove blower wheel to expose motor connectors on motor. Using an adjustable wrench loosen the two set screws that attach the blower wheel to the motor shaft. Disconnect the five and sixteen pin connectors from the motor.
- Step 3.** While supporting the motor blower assembly from below, remove the six screws on the underside of the venturi ring and lower the assembly. (See Figure 7). Note the baffle does not have to be removed to remove the motor/blower assembly.
- Step 4.** Before removal of the motor mount bracket, measure the precise location of the bracket on the motor. Remove the bracket.
- Step 5.** Replace with the new motor and reassemble by reversing the above steps. Set the location of the motor mount bracket as measured (see above Step 6). Set the spacing at 0.25" (6.35 mm) clearance between the blower and the upper motor plate/prefilter frame creating a 0.11" (2.80 mm) overlap between the wheel and the venturi ring. When reinstalling the assembly, align the plate to insure that the leads will reach the electrical box.





**Figure 7 – RSRE Motor Replacement**



**Figure 8 –Motor Blower Components**

## 8 ON/OFF Switch - Speed/Airflow Adjustment

All MAC 10 LE-DC units are equipped with a two-position rocker switch (ON/OFF), which is located on the side of the electrical box, on top of the unit. All units are furnished with the Visual Speed Control to enable adjustment of airflow at any setting within the recommended performance range. The visual control speed is mounted on the electric control box and can be adjusted without opening the electrical box (see figure 8).

### 8.1 Visual Speed Control

The Mac 10 LE -DCis provided with the standard Visual Speed Control board a single screw driver is required to adjust the unit airflow. Just to the left of the LED readout is a recessed blue slotted stem which when turned clockwise will increase the airflow and if turned counter clockwise will decrease the airflow. The LED readout alternates between outputting the selected flow index (%) and the actual motor RPM.

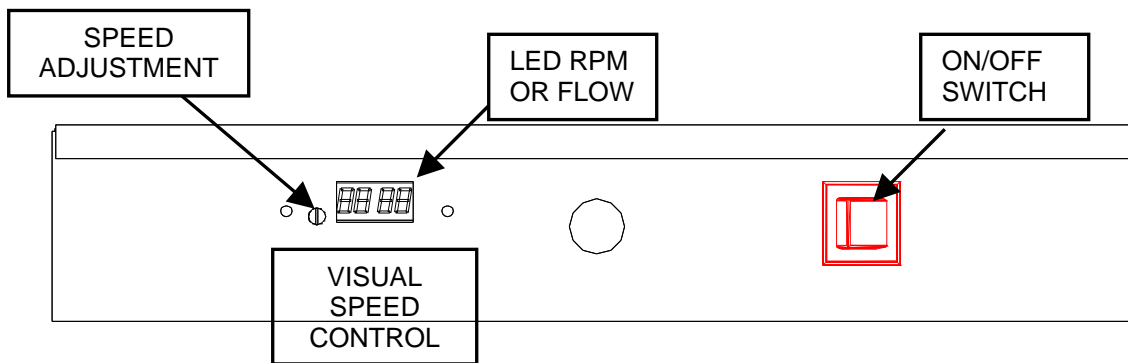


Figure 9 – Electrical Box Face

### 8.2 Infrared Speed Control (Optional)

The Flow-Set is a handheld infrared remote control configured to adjust the Envirco Mac 10 LE-DC unit.

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

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

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














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

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

- A flow index of 24 flashes two longs, then 4 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 Flow-Set at the Flow-Set target on the equipment and press the **on/off** button. If you press **Enter** while the motor is off, the motor stays off, even through a power on/off cycle.

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

## Batteries

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

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



Figure 10 – Flow-Set Handheld Remote

### 8.3 Automation Control Unit (Optional)

The Automation Control Unit (ACU) is controlled by the customers Building Management System. An ACU control requires industry standard 0-10Vdc to adjust and monitor the Motor. 2-10Vdc controls the motor between 0% to 100% of the flow index and 0 or 1Vdc turns the unit off. RPM feed back is provides the Building Management System with a unit operation signal. 0 -10 Vdc give a linear response to 0-2000 RPM.

### 8.4 Modbus Control System (Optional)

This information is available in the Modbus Manual for the Console Control System.

## 9 Trouble Shooting:

### Unit is not adjustable

**Step 1.** Verify that rotation of the knob on the visual speed control does not change the RPM or Flow Index display on the unit. If rotating does nothing, remove the electrical box cover and remove the 4-pin connector from the Visual Speed control and install in 180 degrees rotated. Again adjust the knob. The 4 pin connector is on the 18" (31.8 mm) white conductor.

### Low Air Velocity

**Step 1.** Check prefilter media; replace or clean as necessary.

**Step 2.** Adjust visual speed control for higher blower output.

**Step 3.** Check power supply for proper voltage, amperage and distribution frequency.

**Step 4.** Check / Clean or replace prefilter

**Step 5.** Replace HEPA filter if the air velocity remains low.

### High Air Velocity

**Step 1.** Adjust visual speed control for lower blower output.

### Non-Laminar Flow and/or Excessive Contamination

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

**Step 2.** Determine that no other air-moving devices are operating in or around clean room which disrupt room's airflow pattern.

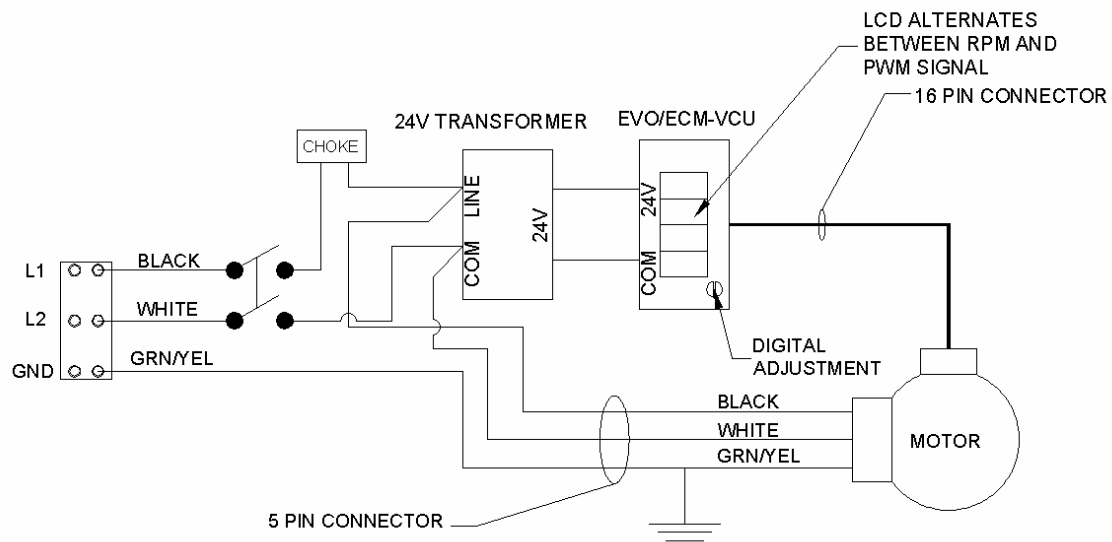
**Step 3.** Check air velocity and if low, conduct the "Low Air Velocity" procedure outlined above.

**Step 4.** Conduct smoke and photometer test on HEPA filter. Seal or replace HEPA filter as necessary.

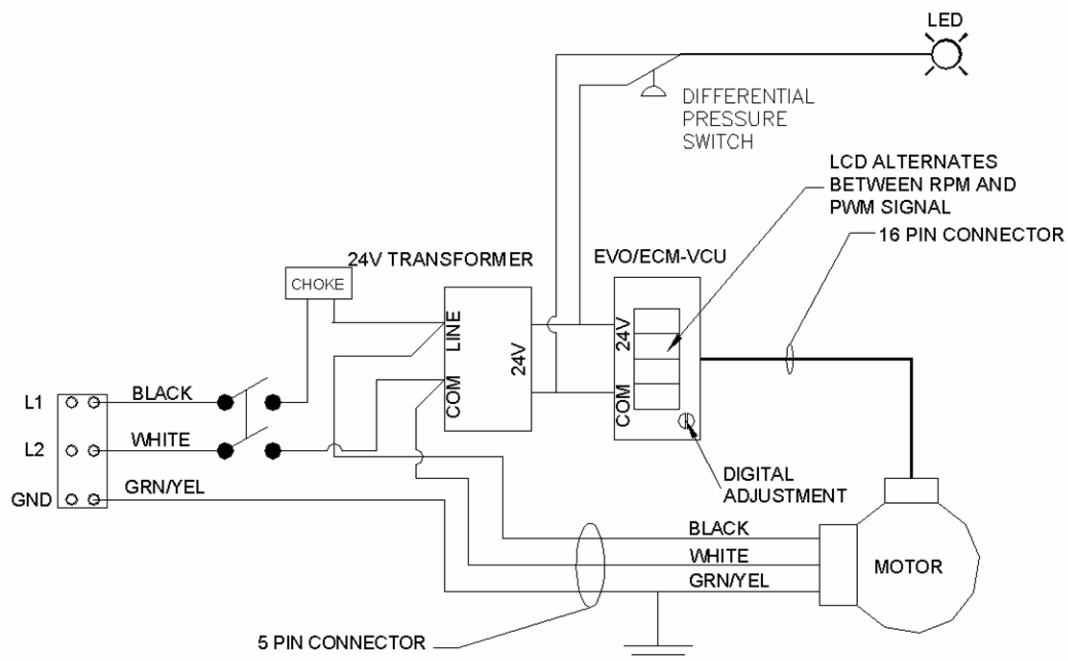
### **Contact Technical support at: ENVIRCO**

101 McNeill Road  
Sanford, NC 27330, U.S.A.  
Tel: (919) 775-2201  
Tel: (800) 884-0002

## 10 MAC 10 DC-LE Wiring Diagrams

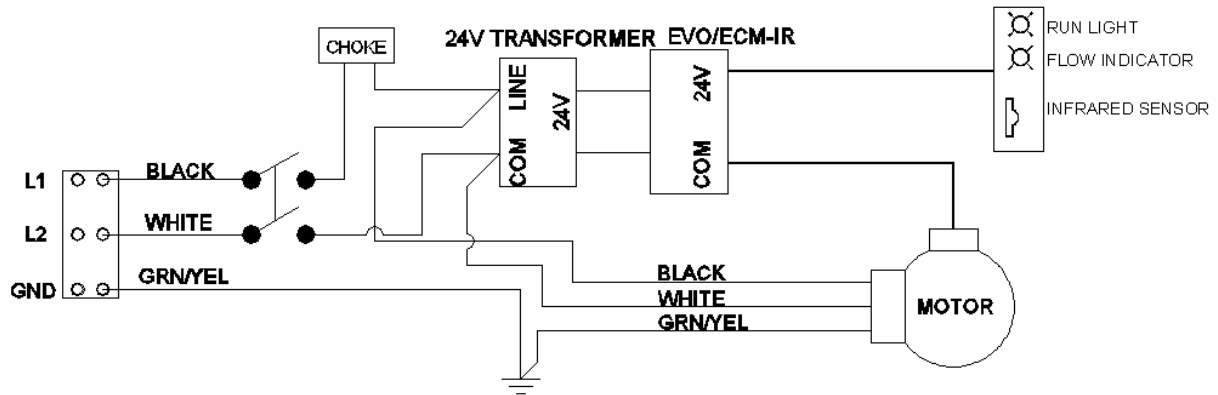


**Figure 11 – Visual Speed Control**

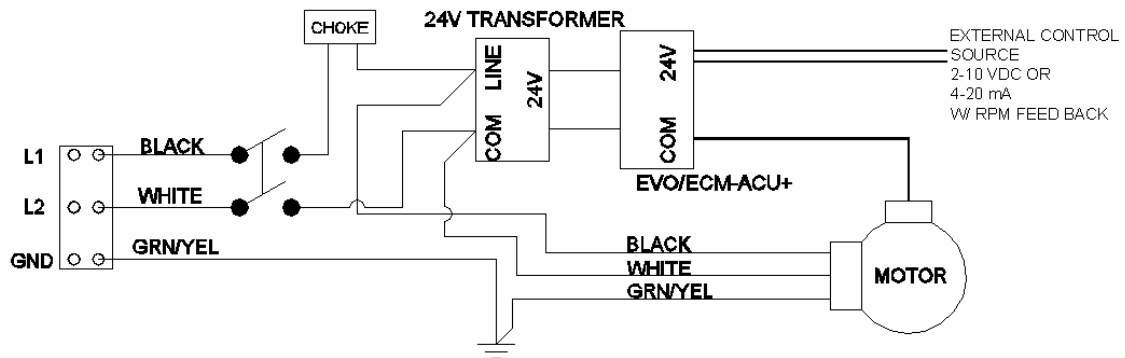


**Figure 12 – Visual Speed Control w/ Indicator Light**

## MAC 10 DC-LE Wiring Diagrams *(continued)*

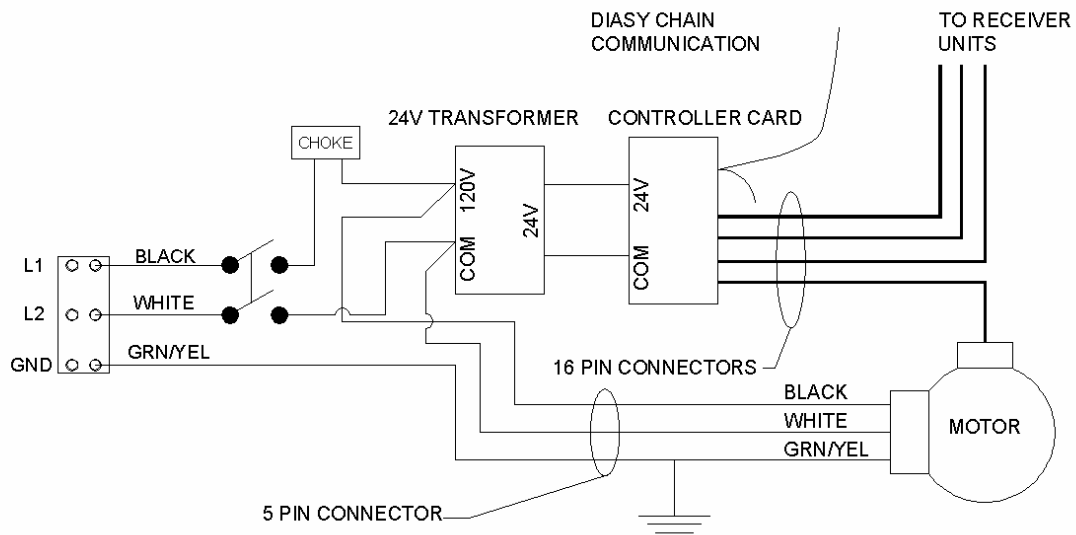


**Figure 13 - Infrared Control**

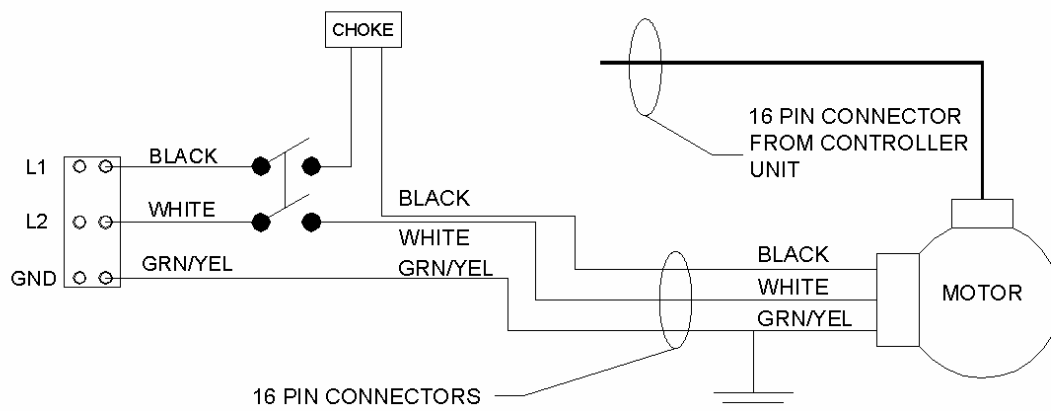


**Figure 14 - Automation Control Unit**

## MAC 10 DC-LE Wiring Diagrams *(continued)*



**Figure 15 - Modbus Control – Controller Mac 10**



**Figure 16 - Modbus Control - Receiver**

## 11 MAC 10 LE-DC Replacement Parts List:

	Part #
Grommet	63271
Motor/Blower Assy	
120V ( 63589)	24504-001
220 V ( 63589)	24504-001
220V -CE( 63589)	24504-001
277 volt ( 63655-001)	24504-002
Motor 2 x 4 120/240 volt (63589)	24397-012
Motor 2 x 4 277 volt (63655-001)	24397-013
Motor 2 x 2 120/240 volt ( 63589)	24397-003
Motor 2 x 2 277 volts (63655-001)	24397-004
Choke 3.0 amps ( 120 volts) (	63720
Transformer 120 volt	63667
Transformer 220 -CE volt	63666
Transformer 208-240 Volt	63666
Transformer 277 volt	63665
Motor Mount Clip	38511-001
Venturi Ring	64115
Blower Wheel 2 x 2 Poly	62270
Blower Wheel 2 x 2 Metal	62962
Blower Wheel 2 x 4 & 2 x 3 16" Metal	64015
IR Sensor Harness	63759-001
IR Sensor Harness/with out Sensor	63758
Visual Control Unit -EVO	63951-002
Foam Pre-filter (20" x 20")	62981-038
Pleated Pre filter (20" x 20")	64125-001
Modbus Card 1004/4	63970
Modbus card 1014. 1.32 Rev	63970-003
Pressure Switch	63415-003

All filter part numbers are based on the standard Mac 10 sizes (2x4 – 23.63x47.63, 2x3 – 23.63 x35.63, and 2x2 – 23.63x23.63). If the unit in question is not this size or the part number includes a "Z" contact the factory for replacement filter information.

### Optional Accessories:

Fluorescent lighting

Ionizing bar

12"(30.48 cm) diameter A/C intake collar

14"(35.56 cm) diameter A/C intake collar

ULPA Filter (Standard and RSR)

Replacement parts are available through your authorized Enviroco representative. If you cannot locate a representative in your area, contact Enviroco Parts Dept. at:

### **ENVIROCO**

101 McNeill Road  
Sanford, NC 27330, U.S.A.

Tel: (919) 775-2201

Tel: (800) 884-0002

Fax: (800) 458-2379

## 12 Warranty

**LIMITED WARRANTY:** Unless otherwise expressly stated in Enviroco's published specifications for the Goods, Enviroco warrants that 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 Enviroco'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 Enviroco in writing of any breach of warranty prior to the expiration of the applicable Warranty Period, Enviroco 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 Enviroco' option, refund the amounts paid by Buyer for the Goods which gave rise to the breach. Any repair, replacement or re-performance by Enviroco 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 Enviroco in writing, Buyer shall bear the costs of access, de-installation, re-installation and transportation of Goods to Enviroco 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 Enviroco or its suppliers or subcontractors, (b) Buyer keeping proper records of operation and maintenance during the applicable Warranty Period and providing Enviroco access to those records, and (c) modification or repair of the Goods only as authorized by Enviroco. Enviroco 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 Enviroco. Any modification or repair of any of the Goods not authorized by Enviroco shall render the warranty null and void. EXCEPT AS EXPRESSLY SET FORTH HEREIN, ENVIRCO 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.

## 13 TESTING

Each MAC 10 DC-LE filter unit is thoroughly tested at the factory before shipment. However, because of the "rigors" of shipping, ENVIRCO encourages its re-test after installation. Additional, for large installations it is recommended to bench test 5% of the units prior to installation.

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

Some of the testing procedures performed on the MAC 10 DC-LE include PSL challenge of HEPA/ULPA filters to assure specified performance, along with air velocity measurement and adjustment tests. No DOP is used on Mac 10 Filters, unless requested.



