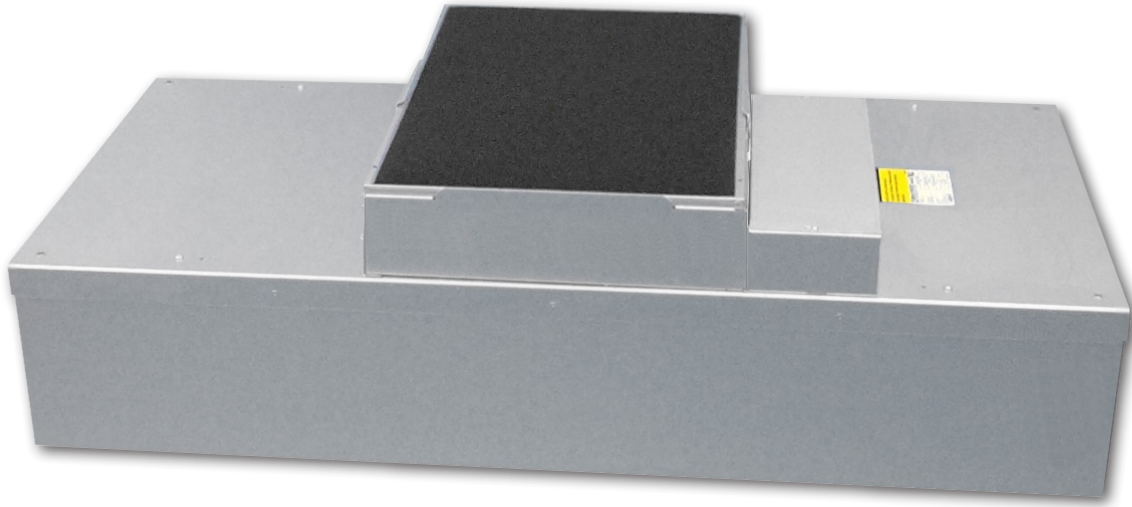*****READ AND SAVE THESE INSTRUCTIONS*****

MAC 10® Original
Fan Filter Unit
Standard, RSR, & RSRE Models
INSTALLATION, OPERATION & MAINTENANCE MANUAL

ENVIRCO®
Innovators in clean air technology

Table of Contents

■ Critical Operation Conditions of the MAC 10 Original

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 MAC 10 unit has the required voltage.
3. To insure you order the proper replacement parts or complete MAC 10 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 ENVIRCO for this information. Once obtained, record the information for reference.

■ Part Numbers Covered by this Manual

MAC 10 Original Standard	P/N
2x4	11111-XXX
2x3.5	11112-XXX
2x3	11113-XXX
2x2	11114-XXX
MAC 10 Original RSR Sheet Metal Housing	P/N
2x4	11115-XXX
2x3.5	11116-XXX
2x3	11117-XXX
2x2	11118-XXX
MAC 10 Original RSR Extrusion Housing	P/N
2x4	11157-XXX
2x3.5	11171-XXX
2x3	11169-XXX
2x2	11170-XXX

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.

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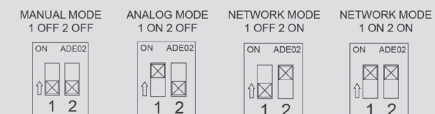
Units come set in manual mode from the factory. Please review installation requirements and set up with your end user (See page 8 for complete set up instructions.)

■ Warning

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

A.   Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
B.   When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.
C.   If this unit is to be installed over an area using liquid, such as water or chemical cleaning solutions, it must be marked as appropriate for the application.
D.   Use this unit only in the manner intended by the manufacturer. If you have any questions, contact the manufacturer.
E.   Before servicing or cleaning the unit, switch power off at unit service panel and lock service panel to prevent power from being switched on accidentally.
F.   NOTE – The Mac 10 has not been investigated for use in fire resistance rated construction.
G.   To fulfill our obligations towards Article 33, in accordance to European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list: Cadmium/ 1,3,5-triglycidyl-s-triazinetrione

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Email: info@envirco.com

■ Installation

Note: The MAC 10 Original 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.

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

Recommendation:
Review mode settings
at this time as specified
for installation
(see page 7 for controls).
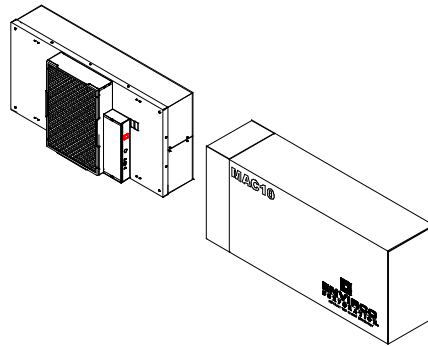
Note: When ordering RSR and RSRE units, the HEPA filters may be shipped separately to be installed into units after the fan box has been installed.

Figure 1: Unboxing

Step 2. 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. **Note:** Special size units are available to fit specific cleanroom grid systems.

Step 3. Have an electrician wire the unit to the appropriate voltage (115V, 220V, 277VAC), according to the wiring diagram in section IX and local electric codes. If optional power cord was purchased, plug unit into a grounded receptacle.

3 SPEED SWITCH   ON/OFF SWITCH

ELECTRICAL ENTRANCE
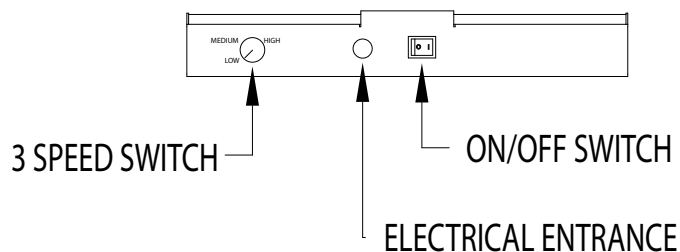
■ Unit Control Box

ON/OFF Switch - Speed/Airflow Adjustment
All MAC 10 units are equipped with a three-position rotary switch, which is located on the side of the electrical box. (See Figure 2.)

Recommended fan speed during initial start-up and operation is the "LOW" speed. As airflow eventually decreases due to filter loading, fan speed may be increased by moving the rocker switch to the top or "MEDIUM" position, and finally to the "HIGH" position. Periodic airflow velocity readings (Per I.E.S. Specifications) should be conducted to determine the filter condition and appropriate fan speed setting.
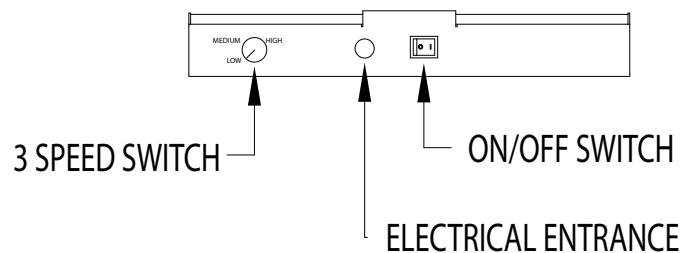
Figure 2: 3 Speed Switch Adjustment

Optional Speed Control
Units furnished with the optional speed control (standard with 2x2 and 2x3 units) enable adjustment of airflow at any setting within the recommended performance range. The speed control knob is located on the side of the electrical box, adjacent to the on/off switch.
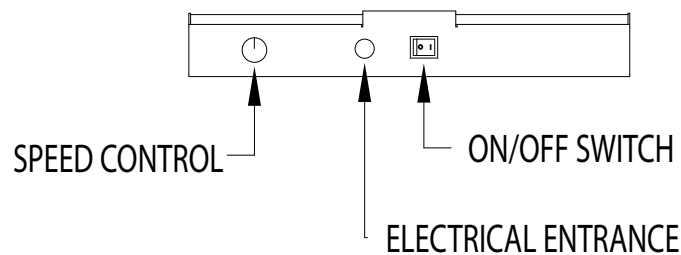
Figure 3: Speed Control Adjustment

- Airflow/speed is adjusted by rotating the knob (see Figure 3):
- Clockwise lowers the speed
- Counter-Clockwise increases the speed
- Fully rotating the speed control knob to the left or counter-clockwise will turn the unit off.
Note: When turning the unit "ON" from the "OFF" position of the speed control, the fan is at the highest speed. Turning the speed control knob clockwise will lower the airflow.

■ Cleaning the MAC 10 Prefilter

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 prefilter from the snap-in frame. (See Figure 4.)
Step 4. Clean the prefilter by hand washing in water with a mild detergent or by using a vacuum cleaner. Allow prefilter to dry completely before replacing.
Step 5. Reassemble by reversing the above steps.

WARNING
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE
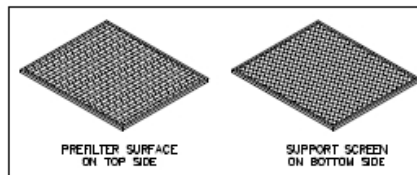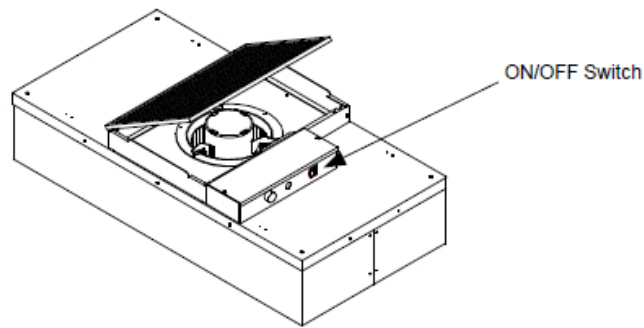
Figure 4: Prefilter Cleaning

■   Service: Removal and Replacement of Standard HEPA/ULPA Filters

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. It is necessary to use two workers when removing the filter and for installation to avoid twisting or separation of the media seals. Handle the filter only by the frame and never place anything on the upstream filter side of the filter. Additionally, it is important to keep the filter level to prevent any shearing force on the media itself.

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

Step 1. Remove unit from ceiling.
Step 2. Remove the 10 screws holding the HEPA/ULPA filter to the lid assembly.
Step 3. Lift the lid assembly off the HEPA/ULPA filter (see Figure). Remove Filter deflectors using 5/32 drill bit. Keep filter deflectors to install in new filter. Discard the used filter as per requirements of the applicable regulations. Carefully install the filter deflectors into the new filter using the 5/32 rivets. Do not touch or place the filter deflectors on the HEPA/ULPA media pack. This could cause tears in the filter pack.
Step 4. Before replacing with the new filter, carefully inspect the new filter for any visible damage. Also inspect the gasket and the T-Bar to insure a tight seal. Replace if necessary.
Step 5. To replace 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.

On/Off Switch

Lid Assembly

#8 Screws (10x)

Ø5/32 Rivet (6x)

Filter Deflector

HEPA/ULPA Filter
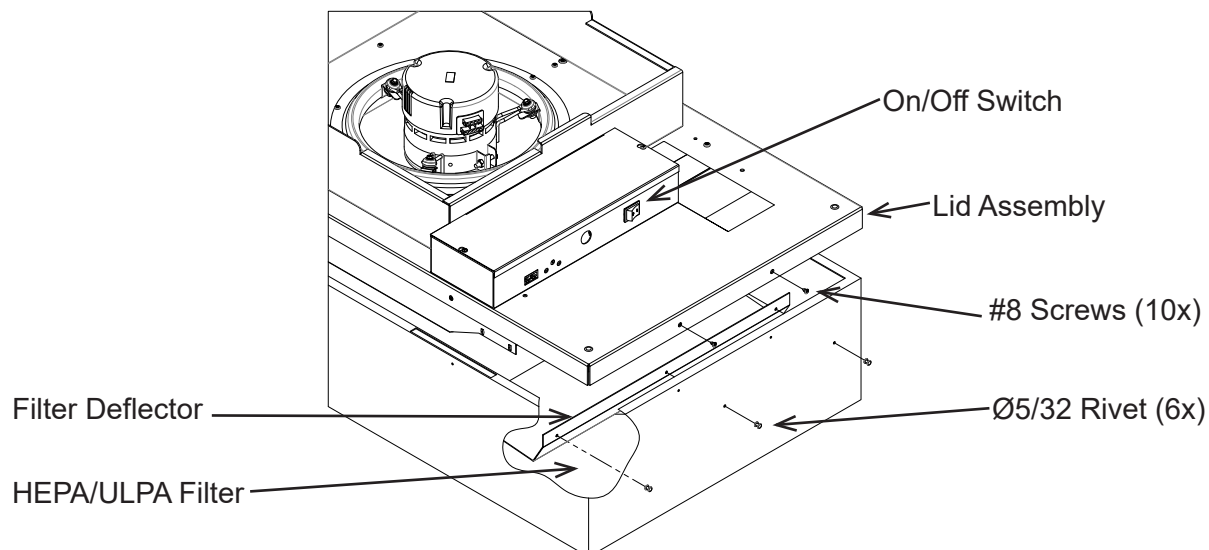
Figure 5: Standard Filter Change

■ Service: Removal and Replacement of RSR/E Filters (Extrusion Housing)

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. 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 RSR/E Filters:
Tools Required: 5/32" hex head wrench

Step 1. Remove the diffuser screen by removing the four M5x35 socket head screws securing the screen to the filter. (See Figure 6.)
Step 2. Loosen the six M5x16 socket head screws far enough to rotate the filter clip 180°. The filter will not drop during this operation. Using the clips as handles, slowly pull the filter away from the knife-edge seal. 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 6: RSR Extrusion Filter Replacement

■   **Service: Removal and Replacement of RSR/E Filters (Sheet Metal Housing)**

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 ACCIDENTIAL TOUCH OF THE FILTER. ONLY HANDLE FILTER BY THE FRAME.

Step 1. Remove the diffuser screen by shifting it to one side and lowering it out of the housing.
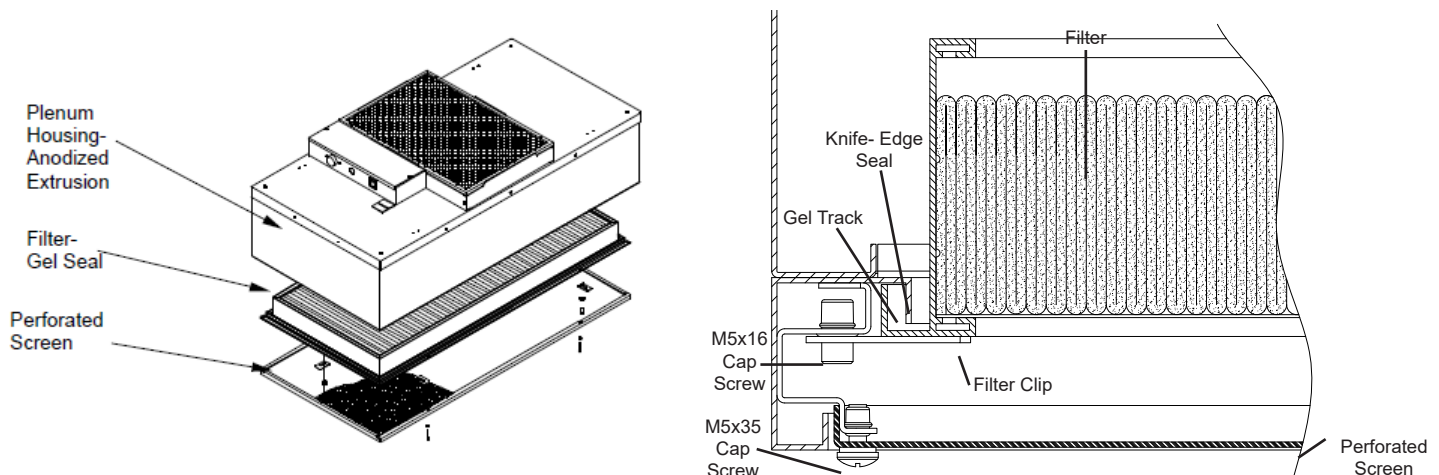
Step 2. Loosen the six M5x16 socket head screws far enough to rotate the filter clip 180°. The filter will not drop during this operation. Using the clips as handles, slowly pull the filter away from the knife-edge seal. It is important to pull the filter slowly away from the seal, so that the gel remains 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.
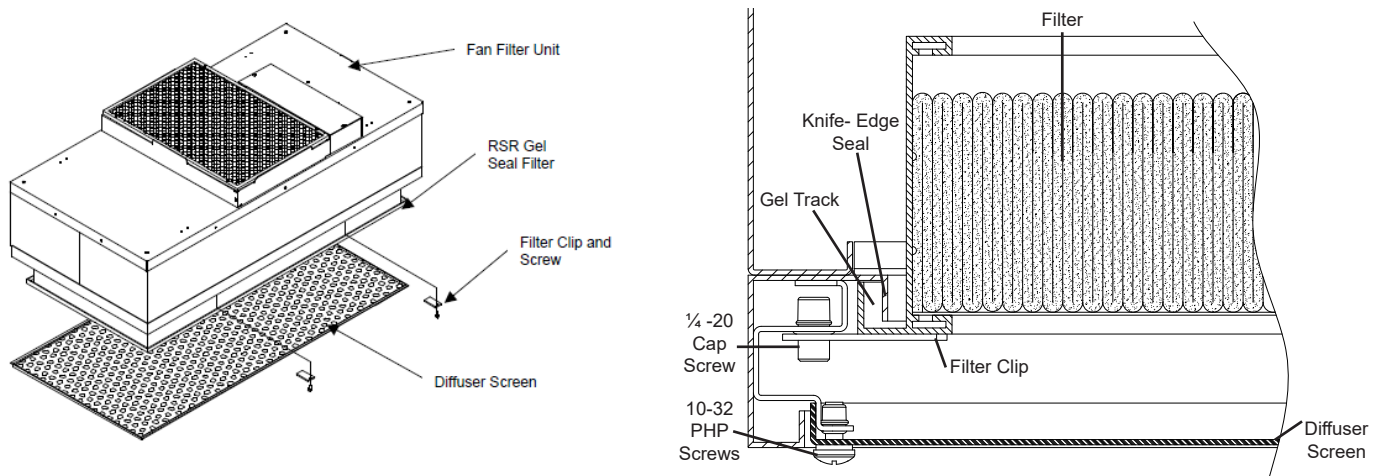
Step 6. Reinstall screen.

Figure 7: RSR Sheet Metal Filter Replacement

■   **Service: Standard and RSR Motor Removal and Installation**

WARNING	**WARNING**
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE	ELECTRICAL SERVICE SHOULD ONLY BE PERFORMED BY A LICENSED OR QUALIFIED ELECTRICIAN.

Tools Required: Phillips head screwdriver, 3/8 (10 mm) 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.
Step 4. Loosen the electrical box cover screws (2), and slide/lift off cover.
Step 5. Make note of all wire locations for reinstallation later.
Step 6. Disconnect the two brown wires from the capacitor, using a pair of pliers.
Step 7. Disconnect the motor wiring from the rotary switch and rocker switch or speed control and rocker switch and remove the grommet from the motor leads. Save this grommet for reinstallation.
Step 8. Remove the six screws to free the venturi ring and remove 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 8.)
Step 9. Using a 5/32"(0.40 cm) Allen wrench remove the blower wheel from the motor shaft. Remove motor from the venturi ring using a hex wrench.
Step 10. Replace with the new motor and reassemble by reversing the above steps. Set the spacing between the venturi ring and the blower wheel at 0.06"(0.15 cm) clearance.
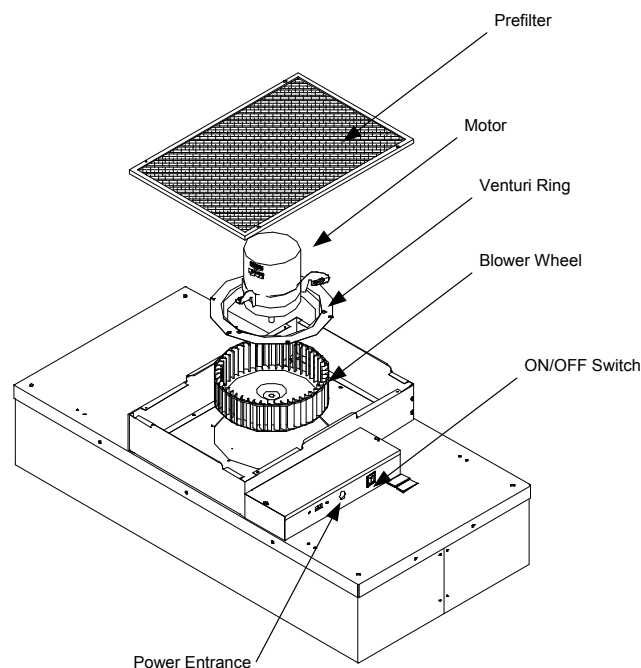
Figure 8: Standard/RSR Motor Replacement

■ Service: RSRE Motor Removal and Installation

WARNING	**WARNING**
DISCONNECT THE UNIT FROM THE ELECTRICAL POWER SOURCE BEFORE ATTEMPTING ANY SERVICE	ELECTRICAL SERVICE SHOULD ONLY BE PERFORMED BY A LICENSED OR QUALIFIED ELECTRICIAN.

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

Step 2. While supporting the baffle assembly from below, remove the four corner screws on the baffle assembly and lower the assembly. (See Figure 9.)

Step 3. Prior to removing motor/blower assembly, remove electrical box cover (located underneath the lid panel) to expose motor connectors. Disconnect the nine pin connector from it's mate in the prefilter bracket.

Step 4. While supporting the motor/blower assembly from below, remove the six machine screws that secure the venturi ring to the bottom face of the lid.

Step 5. Using a 5/32"(0.40 cm) Allen wrench, remove the blower wheel from the motor shaft. Remove motor from the venturi ring by removing the three # 10 bolts.

Step 6. Before removal of the motor mount bracket, measure the precise location of the bracket on the motor. Remove the bracket.

Step 7. 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 between the venturi ring and the blower wheel at 0.06"(0.15 cm) clearance. When reinstalling the motor plate, align the plate to insure that the leads will reach the electrical box.
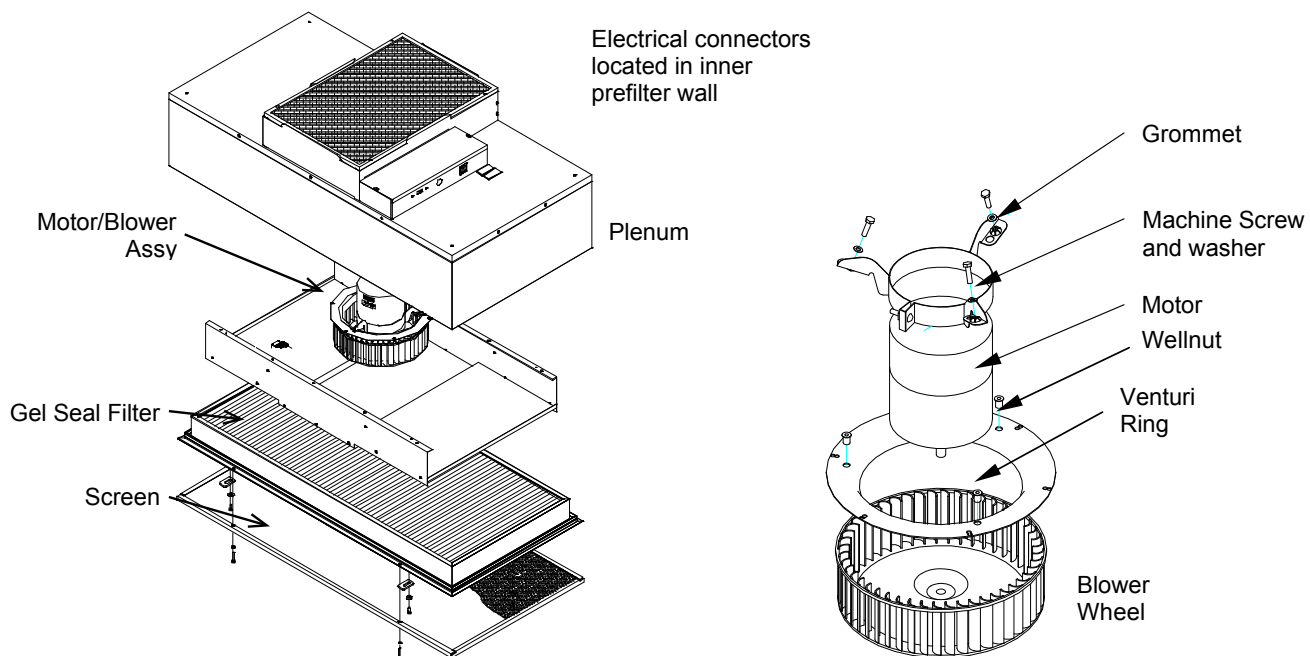
Figure 9: RSRE Motor Replacement

■ Troubleshooting

LOW AIR VELOCITY

Step 1. Check prefilter media; replace or clean as necessary.
Step 2. Flip switch from "Low" to "Medium" or "Medium" to "High" on units with 3-speed switch.
Step 3. Adjust variable speed control (only units with optional Speed Control) for higher blower output.
Step 4. Check power supply for proper voltage, amperage and distribution frequency.
Step 5. Replace HEPA/ULPA filter if the air velocity remains low.

HIGH AIR VELOCITY
Step 1. Flip switch from "HIGH" to "MEDUIM" to "LOW" on units with 3-speed switch.
Step 2. Adjust variable speed control (only units with optional Speed Control) for lower blower output.

NON-LAMINAR FLOW AND/OR EXCESSIVE CONTAMINATION

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

Contact Technical Support at:
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Email: info@envirco.com

■ Wiring Diagrams

Figure 10: Wiring Diagram 3-Speed
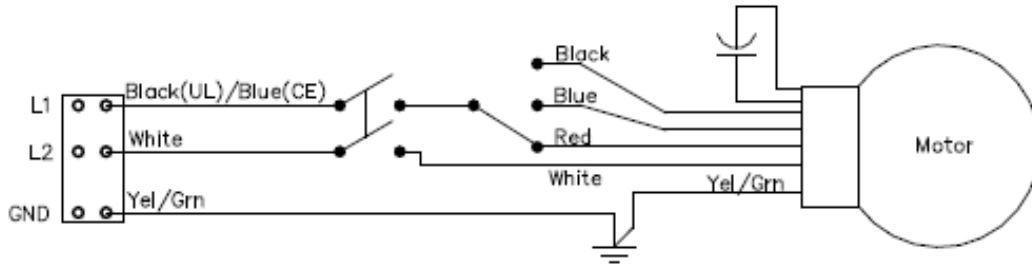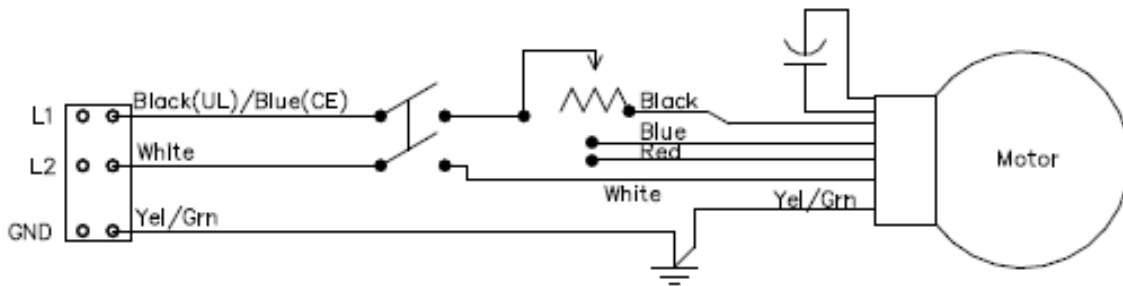

Figure 11: Wiring Diagram Speed Control

■ MAC 10 Original Replacement Parts List

		ENVIRCO Part Number		
Description	**Qty. per Unit**	**115V / 60 Hz**	**208-240V / 50-60 Hz**	**277V / 60 Hz**
Prefilter	1	62981-001	62981-001	62981-001
Motor	1	63764-001	63764-002	63764-003
ON/OFF Switch	1	61485	61485	61485
Speed Control (Optional)	1	63011	63015 63742 (CE Marked)	63016
Pressure Switch (Optional)	1	63415	63415	63415
Transformer (Optional)	1	63667	63666	63665
Current Sensor (Optional)	1	24235-001	24235-001	24235-001
Power Cord (Optional)	1	63042-001	63042-004	63042-013
Standard Filter[1]	**Qty. per Unit**	**HEPA**	**ULPA (Optional)**	**Actual Filter Dimensions**
2x2	1	69514-004	69514-018	23.63 x 23.63 x 9.125
2x3	1	69514-019	64514-012	23.63 x 35.63 x 9.125
2x3.5	1	64514-020	64514-021	23.63 x 41.63 x 9.125
2x4	1	69514-006	69514-007	23.63 x 47.63 x 9.125
RSR Filter - Extrusion Housing[1]	**Qty. per Unit**	**HEPA**	**ULPA (Optional)**	**Actual Filter Dimensions**
2x2	1	69563-005	69563-004	22.00 x 22.00 x 3.63
2x3	1	69563-006	69563-007	22.00 x 34.00 x 3.63
2x3.5	1	69563-008	69563-009	22.00 x 40.00 x 3.63
2x4	1	69563-001	69563-003	22.00 x 46.00 x 3.63
RSR Filter - Sheet Metal Housing[1]	**Qty. per Unit**	**HEPA**	**ULPA (Optional)**	**Actual Filter Dimensions**
2x2	1	93997-005	93997-004	21.00 x 21.00 x 3.55
2x3	1	93997-006	93997-007	21.00 x 33.00 x 3.55
2x3.5	1	93997-008	93997-009	21.00 x 39.00 x 3.55
2x4	1	93997-001	93997-003	21.00 x 45.00 x 4.55

[1] All filter part numbers are based on the standard MAC 10 sizes (**2x4** - 23.63 x 47.63; **2x3.5** - 23.63 x 35.63; **2x3** - 23.63 x 35.63; **2x2** - 23.63 x 23.63). If the unit in question is not this size or if the part number includes a "Z", contact the factory for replacement filter information.

Optional Accessories
• Fluorescent lighting
• Ionizing bar
• Solid-state speed control on 2x4 and 2x3.5 units (standard on all other sizes)
• 12" (30.48 cm) diameter A/C intake collar
• Gasket Seal Filter (RSR unit only)
• ULPA Filter (Standard and RSR)

■ Limited Warranty

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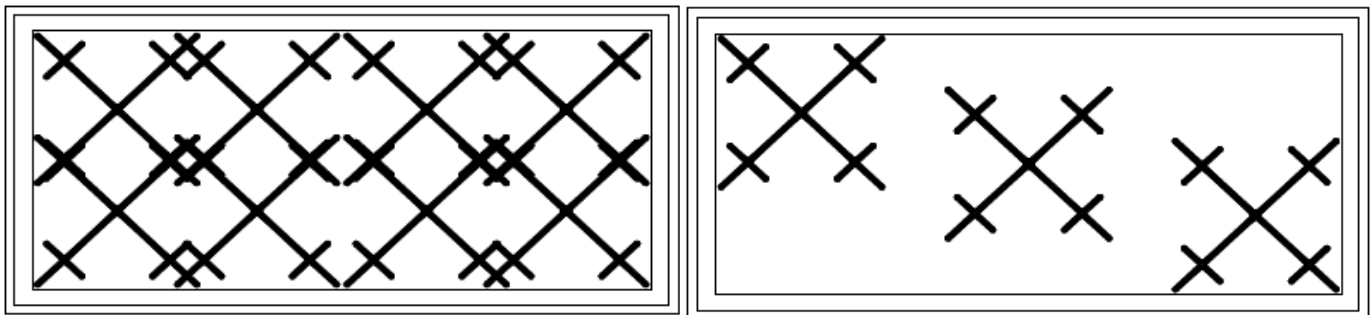
■ Testing

Each MAC 10 Original filter unit is thoroughly tested at the factory before shipment. However, because of the "rigors" of shipping, ENVIRCO encourages its re-test after 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 VE5 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.

Recommended Testing
All units that are airflow tested at Envirco are tested using a Shortridge Airdata Multimeter 800 series 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 for the other long side. This gives a total of eight reading to test the unit. All advertised data is based on using the Velgrid with eight readings (128 velocity points). Envirco recognized using eight reading during a cleanroom start-up may be time consuming and recommends using three Velgrid readings taken on a diagonal, as shown below.

Figure 12: Velgrid Testing
Recommended Testing, 8 Readings with a Velgrid (Left) and Factory Approved Testing, 3 Readings with a Velgrid (Right)

Clean air solutions built for you.

Industrial

Cleanroom Products

- » MAC 10® Original
- » MAC 10® IQ™
- » MAC 10® IQ™ LAF
- » MAC 10® LEAC™
- » MAC 10® LEAC2™
- » MAC 10® LEDC™
- » Ducted Ceiling Module: DCM & RSR
- » AC or DC Control Systems
- » MAC-T Ceiling Grid System

Hospital & Healthcare

Hospital & Healthcare

- » IsoClean® and IsoClean with Ultraviolet Light
- » AirCeil®
- » Hospi-Gard® Room Pressure Monitor

Enviramedic Products

- » HOR Horizontal Flow Enclosure
- » HCF Horizontal Flow Surgery Room
- » VOR Vertical Flow Surgery Isolator

Pharmaceutical

Pharmaceutical & Medical Device

- » Unimodule M2 Vertical Laminar Flow Workstation
- » METD 100% Exhausted Vertical Flow Workstation
- » Laminar Downflow Module

Laboratory & Research

Laboratory & Research

- » 100-Plus Horizontal or Vertical Flow Clean Bench
- » Unidirectional Flow Horizontal Flow Bench (LF)
- » TT Table Top Horizontal Flow Clean Bench
- » EnviraLab Sterility Module: ESM

ENVIRCO logo — Innovators in clean air technology