

PAC SERIES AIR CLEANERS

PAC MAX

Installation, Operation, and
Maintenance Manual



PAC MAX AIR CLEANER

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

TABLE OF CONTENTS

SECTION ONE - INTRODUCTION.....	3
Features.....	3
Options	3
Applications.....	3
SECTION TWO - INSTALLATION.....	4
SECTION THREE - OPERATION	5
Initial Start-Up.....	5
Airflow Adjustment.....	5
Filter Status Indicator	5
Recirculation Mode	5
Total Exhaust Mode (Negative Pressure)	5
SECTION FOUR - MAINTENANCE & SERVICE.....	6
Parts Identification.....	6
Daily Maintenance.....	6
Cleaning the Unit.....	6
Removal of Front Panel.....	6
Prefilter Replacement.....	6
Primary Filter Replacement.....	7
Removal of the UV Light Assembly	8
Removal of the UV Light Bulb.....	8
Motor/Blower Assembly Removal.....	8
Relocated a Contaminated Unit.....	9
Unit Decontamination	9
SECTION FIVE - TROUBLESHOOTING	10
Inoperative Airflow	10
Low Airflow.....	10
High Airflow	10
SECTION SIX - MISCELLANEOUS	11
Wiring Diagram.....	11
Replacement Parts	12
Specifications	12
Air Change Rates	12
SECTION SEVEN - LIMITED WARRANTY.....	13

SECTION ONE - INTRODUCTION

The PAC MAX is a portable, self-contained high efficiency particulate air (HEPA) filtration system with an optional ultraviolet lamp that helps to disinfect the filter face. The PAC MAX is designed to easily and economically create a negative pressure isolation room or be used as a positive pressure clean air recirculating system for a large variety of applications. The PAC MAX's powerful motor/blower can deliver up to 1,700 CFM (2,888 m³/hr) to provide a large number of room air changes per hour to minimize the spread of airborne diseases. The unit works by pulling air through a MERV 8 antimicrobial prefilter and then through an efficient HEPA filter before being exhausted out of the top of the unit or through an optional 14" duct collar and ducted to the exterior through a window or wall.

FEATURES

- **Low Cost Isolation Room:** The PAC MAX is an easy and economical solution for creating a negative pressure isolation room. Simply roll the PAC MAX into a standard room, connect flexible ducting to an optional 14" (355 mm) collar on the top of the unit and vent the purified air to the exterior through a window or wall.
- **Flexible Applications:** The versatile PAC MAX can be used as a clean air recirculating unit with a variable speed fan to accommodate spaces of all sizes.
- **Small and Portable:** The PAC MAX can be rolled from one room to another and easily fits into areas with limited floor space.
- **Simple Maintenance:** Both the HEPA filter and prefilter are easily accessible for replacement by authorized personnel.
- **Adjustable Airflow:** The PAC MAX provides effective air filtration for a wide variety of room sizes. The PAC MAX utilizes a variable speed control with airflows ranging from 400 to 1,700 CFM (679 to 2,888 m³/hr).
- **Quiet Operation:** 48 dBA on low and 65 dBA on high speed measured 30" (762mm) from face of the unit.

OPTIONS

- UV-C Sanitizing Light
- Carbon Prefilter (Sold Separately)
- 100% Exhaust Duct Collar (Sold Separately)
- Directional Discharge Kit (Sold Separately)



Figure 1

APPLICATIONS

- Negative Pressure Rooms
- Office Buildings
- Waiting Rooms
- Health Clubs & Fitness Centers
- Dental & Medical Offices
- Classrooms & Dormitories
- Auditoriums
- Clinics
- Physician Offices
- Correctional Facilities
- Nursing Homes
- Homeless Shelters
- Addiction Recovery Centers
- Temporary Medical Facilities

SECTION TWO - INSTALLATION

SAFETY WARNING & PROCEDURES



WARNING: To reduce the risk of fire, electric shock, or injury to persons, observe the following.

1. Installation work and electrical wiring must be done by a qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
2. Service to this equipment should be performed by an authorized technician trained and experienced in performance evaluation and maintenance of clean air equipment.
3. Before servicing or cleaning unit, unplug the unit power cord from outlet to prevent power from being switched on accidentally.
4. This unit may have UV lamps. Eye damage may result from direct exposure to the light. Take UV radiation protective measures for personnel during service.
5. Use this unit only in the manner intended by the manufacturer.

UNPACKING INSTRUCTIONS

1. The PAC MAX will arrive in a cardboard carton that's wrapped and on top of shipping pallet. Inspect for any noticeable damage to the unit before unpacking. If any damage is observed, a claims report should be completed and promptly filed with the responsible carrier.
2. Cut the wrapping and remove the cardboard. Again, inspect for any noticeable damage to the unit. The shipping components list and actual material received should be compared and any shortages reported to Krueger immediately.
3. Lift the PAC MAX off the shipping pallet. Move the unit to the desired location.
4. Remove the tie wrap around power cord.
5. Unit is ready to be plugged in for use.

SECTION THREE - OPERATION

INITIAL START-UP

1. Connect the power cord to a standard 115 v, 1-phase, 60 Hz, grounded power source. Verify that the circuit is sized to provide sufficient amperage as noted on the data label on the back.
2. Locate the "ON/OFF" switch on the left side of the unit. The switch is a maintain contact rocker type.
3. Turn the PAC MAX unit on by pressing downward on the raised portion of the rocker switch.

AIRFLOW ADJUSTMENT

1. To adjust airflow, locate the speed control on the left side (viewing the unit from the front).
2. Turn the fan adjust knob using a small flathead screw driver to select the fan setpoint. Turn clockwise direction to speed up the unit or counterclockwise to slow the unit down.
3. The LED readout alternates between selected setpoint and motor RPM. The RPM may not scale linearly with the selected setpoint.

FILTER STATUS INDICATOR

1. Locate the filter status indicator on the left side of the unit adjacent to the "ON/OFF" switch. The indicator light will be green during normal operation. The light will illuminate red should the pressure threshold be met. It is recommended to replace the prefilter. If the light continues to be red after a prefilter change, it is recommended to replace the HEPA filter. The indicator light should not be used as the only guide for when a filter change is necessary. The unit should be checked often to insure recommended room air changes per hour are being met.

RECIRCULATION MODE

1. The PAC MAX unit arrives from the factory to provide air recirculation.
2. The room air change rate of the unit will depend on both the speed control setpoint and the size of the room. See Air Change Rates on page 11 for representative room air changes per hour (ACH).

TOTAL EXHAUST MODE (NEGATIVE PRESSURE)

CAUTION: To reduce risk of fire and to properly exhaust air, be sure to duct air outside. Do not vent exhaust air into spaces within walls or ceilings or into attics, crawl spaces, or garages.

CAUTION: For general ventilating use only. Do not use to exhaust hazardous or explosive materials and vapors.

An optional 14" (355mm) exhaust collar kit (272040-001) is available to convert the PAC MAX unit to the 100% exhaust mode.

1. Remove the 8 screws from on top of the unit. These 8 screws will be utilized to connect the 14" exhaust collar.
2. Apply gasket (if not already applied) to the flat plate of the duct collar to help seal the exhaust collar to the PAC MAX.
3. Line up the 8 holes on the exhaust collar to the holes on top of the PAC MAX. Use the 8 previously removed screws to secure the exhaust collar to the unit.
4. Attach flexible exhaust duct (not included) over the 14" collar and fasten tightly with a round hose clamp (not included).
5. The HEPA filtered exhaust air can now be vented to the outside or returned to the main HVAC system. If the unit is ducted to an exhaust duct rather than directly to the outside, it must be verified that the exhaust duct is capable of handling the exhaust air expelled by the unit.

SECTION FOUR - MAINTENANCE & SERVICE

PARTS IDENTIFICATION

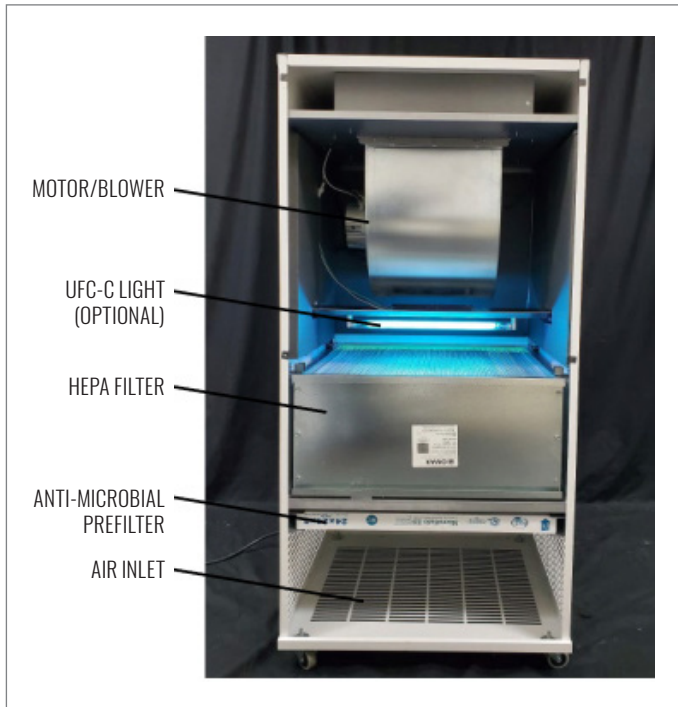


Figure 2

DAILY MAINTENANCE

The PAC MAX does not require daily maintenance for optimized operation. It is recommended to visually inspect the unit on occasion for any integrity issues with the unit, controls, power cord, casters, or ductwork (if attached). Remember to monitor the filter status indicator light over time to assist in setting a filter change schedule for the HEPA filter.

CLEANING THE UNIT

Periodic cleaning of the unit may be done with a mild disinfecting soap and water solution. A 1% or 1/100 dilution of bleach is an optional disinfectant. Wipe the exterior of the unit with a damp sponge or cloth. Do not use an excessive amount of liquid or cleaning agent when wiping the unit down.

REMOVAL OF FRONT PANEL

To access the prefilter, HEPA filter, UV light, or motor/blower assembly, the front panel will need to be removed. To remove the front panel perform the following.

1. Turn off the unit by placing the power switch to the "OFF" position.
2. Unplug the unit from the power source.
3. Remove the 4 screws holding the front panel to the body of the unit. Two of these screws are located in the top left and top right of the front face. The other two screws are located approximately halfway down the unit on the left and right of the front face. It is recommended to wear protective gloves when performing maintenance on the PAC MAX.

PREFILTER REPLACEMENT

The prefilter should be replaced every 60 to 90 days. Regularly replacing the prefilter will maximize the life of the HEPA filter. The PAC MAX comes standard with an anti-microbial pleated prefilter. Please see directions for removing the front panel before removing the prefilter. The prefilter can be removed and replaced by grabbing prefilter and sliding in and out. Reference facility protocols for handling and disposing of the prefilter.



Figure 3

SECTION FOUR - MAINTENANCE & SERVICE (CONTINUED)

PRIMARY FILTER REPLACEMENT

Reference the CDC for appropriate precautions required for handling HEPA filters. A regular maintenance program should include procedures for installation, removal, and disposal of filter elements and a program to monitor the HEPA filter for possible leakage and for filter loading. The filter status indicator light can help assist in determining an appropriate time to replace the HEPA filter. The indicator light should not be used as the only guide for when a filter change is necessary. The unit should be checked often to ensure recommended room air changes per hour are being met.

The expected HEPA filter life should range from eighteen (18) months to two (2) years depending on the environment and prefilter maintenance schedule. The filter indicator light will give a warning of filter loading by illuminating red. To replace the HEPA filter, please reference the directions for removing the front panel before removing the HEPA filter.

1. Once the power is off and the front panel is off, it is recommended to remove the UV bulb from the UV light assembly before removing the HEPA filter. If the unit does not have a UV bulb this can be skipped. It is recommended to wear protective gloves before removing the UV bulb. The UV bulb is removed from the UV light assembly by twisting the bulb out of the supporting lamp sockets (you should feel tension on the tube release). Please reference the UV bulb replacement section for all steps.
2. The HEPA filter is compressed and held in place using 4 rotating thumb latches located in the 4 corners of the HEPA filter. Rotate the thumb latches 90° to allow the filter to be removed.
3. Pull the filter towards you using the filter frame to remove the filter. The filter will slide out the channel. Once the filter is pulled out far enough, the filter can be handled by using opposing sides of the filter frame. Reference facility protocols for handling and disposing of the HEPA filter. Note: Filter weighs approximately 30 lbs.
4. Remove the new HEPA filter from its packaging and install it in the reverse order of removal. Care must be taken when handling the filter. Do not bump or squeeze the filter as this may damage the filter and render it non-effective.



Figure 4



Figure 5



Figure 6

SECTION FOUR - MAINTENANCE & SERVICE (CONTINUED)

REMOVAL OF THE UV LIGHT ASSEMBLY



WARNING: Skin or eye damage may result from directly viewing the light produced by the lamp in this apparatus. Always disconnect power before relamping or servicing. Replace lamp with lamp TUV 15W SLV, manufactured by Philips.

1. Once the power is off and the front panel is off (reference removal of front panel), the UV light assembly can be removed and is located above the HEPA filter.
2. Disconnect the 3-pin connector.
3. Remove the two screws on the left hand of the UV assembly and then the two screws on the right of the UV assembly.
4. The entire assembly can now be removed. For replacement, perform these steps in reverse order.



Figure 7

REMOVAL OF THE UV LIGHT BULB

The expected life of the UV light bulb is 9,000 hours of operation. To remove the bulb, follow the steps below.

1. Twist the bulb to enable removal (you should feel tension on the tube release). To remove the light tube, carefully pull away from the supporting UV lamp sockets towards the HEPA filter (take care not to contact the filter). Dispose of the light bulb (or recycle) following local guidelines.
2. Use clean latex gloves to ensure that the new light tube remains clean. Clean the new light tube using a cloth dampened with a 10% alcohol (or ammonia) and water solution. To replace, reverse the order of removal.



Figure 8

MOTOR/BLOWER ASSEMBLY REMOVAL

To replace the motor/blower assembly, please reference the directions for removing the front panel before removing the motor/blower assembly.

1. Once the power is off, the front panel is off, and the motor/blower is no longer spinning, the motor/blower assembly can be removed.
2. Disconnect the power and control wire harnesses from the motor.
3. Remove the two vertical screws fastening the assembly into the housing.
4. Grip the motor/blower assembly on both sides and pull towards you. The motor/blower assembly will slide on the channel rails. Take care when at the edge of the channel to support the weight of the motor/blower assembly. Note: The motor/blower weighs approximately 35 lbs. To replace, reverse the order of removal.



Figure 9

SECTION FOUR - MAINTENANCE & SERVICE (CONTINUED)

RELOCATING A CONTAMINATED UNIT

NOTE: Use proper protocol, gowning, and protective measures.

1. If an existing unit is to be placed into storage for an extended period of time, remove and replace the prefilter.
2. Turn the unit off and disconnect from power source.
3. Clean the exterior surfaces of the unit.
4. Unlock caster wheel locks and move unit to its new location.

UNIT DECONTAMINATION

NOTE: Use proper protocol, gowning, and protective measures during unit decontamination.

Should decontamination of the unit be required, the following is an adaptation by Annex G. of the Recommended Microbiological Decontamination Procedure from NSF 49, June 2008. Confirm with appropriate Biosafety and Industrial Safety Professionals that the procedures meet your facility's guidelines.

Paraformaldehyde Decontamination

1. As described previously, relocate the unit to a controlled access, non-public area with a non-porous floor, good ventilation, and a dedicated exhaust directly outside the building. A new prefilter is not required. Attach and seal a flexible hose to the dedicated exhaust. Place the other end of the exhaust hose near the unit.
2. Calculate the total volume of the unit by multiplying the height, width, and depth. The total unit volume is 13 cubic feet (61" x 24" x 15.5") or (1.55m x 0.61m x 0.39m).
3. Multiply the total volume of the unit by 0.3g/ft³ to determine the gram weight of Paraformaldehyde required. Decontamination of the unit requires 3.9 grams (12 ft³ x 0.3g/ft³) of Paraformaldehyde.
4. Remove the intake grille and wipe it down with an appropriate surface decontaminant.
5. Place an unplugged heating device, such as a commercially available electric frying pan with the thermostat set at 232.2° to 246.1°C (450° to 475°F) inside the unit through the removed prefilter access panel. Spread the Paraformaldehyde evenly over the heating surface of the electric frying pan. **Caution:** The auto-ignition temperature of paraformaldehyde is 300°C (572°F). Place a hot plate, beaker of water, and temperature and humidity indicators in the unit next to the pan that will contain the paraformaldehyde.
6. Enclose all sides of the unit with heavy gauge plastic film and tape in place while leaving the film that will close the space formerly occupied by the intake grille free. The power cord should be coiled and taped to the unit and sealed under the plastic film. Seal the film to the floor on which the unit stands.
7. Determine the temperature and humidity inside the unit.
8. The temperature should be 21.1°C (70°F) or higher with a humidity level between 60% to 85%. Use the hot plate to heat the beaker of water until the desired temperature and humidity are achieved. Disconnect the hot plate.
9. Seal the film over the remaining opening of the intake grille space. Carefully seal around the power cord extending from the electric frying pan so that formaldehyde gas will not leak out.
10. Plug the cord of the electric frying pan into an outlet.
11. After the Paraformaldehyde has depolymerized, disconnect the frying pan from the electrical outlet.
12. Allow the unit to stand for a minimum of two hours or overnight.
13. Attach the flexible hose to the unit and allow it to draw from inside the unit.
14. After 15 minutes of visible exhaust activity, small openings may be made in the film over the unit's air supply grille to improve ventilation.
15. Allow the unit to ventilate overnight.
16. Remove the unit from exhaust ventilation when the formaldehyde gas has been exhausted. **Caution:** During unit decontamination, respiratory protection for service personnel is highly recommended. Only national institute for occupational safety and health (NIOSH) approved respirators should be used.
17. Remove the HEPA filter as described previously. The filter can now be disposed of as general waste.

Phenolic Decontamination

In facilities where Paraformaldehyde gas decontamination is prohibited or not feasible, the unit can be disinfected by the following procedure.

1. Remove the prefilter.
2. After the intake grille and prefilter are removed, turn the unit on, and with the unit running, spray a mist of phenolic disinfectant such as Amphyl or Lysol into the air intake opening. Approximately two (2) to five (5) ounces is adequate.
3. Remove the HEPA filter as described previously. Since the filter has not been decontaminated by the formaldehyde procedure, it must be placed in a red medical waste bag and disposed of properly.

SECTION FIVE - TROUBLESHOOTING

If the unit requires service to repair the unit, use proper facility protocol. It is recommended to wear protective equipment, clean the unit, and verify power has been turned off at the unit and the unit is disconnected from the power source for initial inspection.

A few examples of issues that might occur:

INOPERATIVE AIRFLOW

1. Confirm that the power cord is plugged into the building receptacle and power is present.
2. Confirm that the unit power switch is turned "ON".
3. Confirm the setpoint is set to a value that will allow the motor/blower to run. Recommended to change the position for confirmation.
4. Authorized personnel can check power switch and transformer for appropriate power. Contact Krueger for more in-depth troubleshooting, if required. Replace or repair faulty component(s).

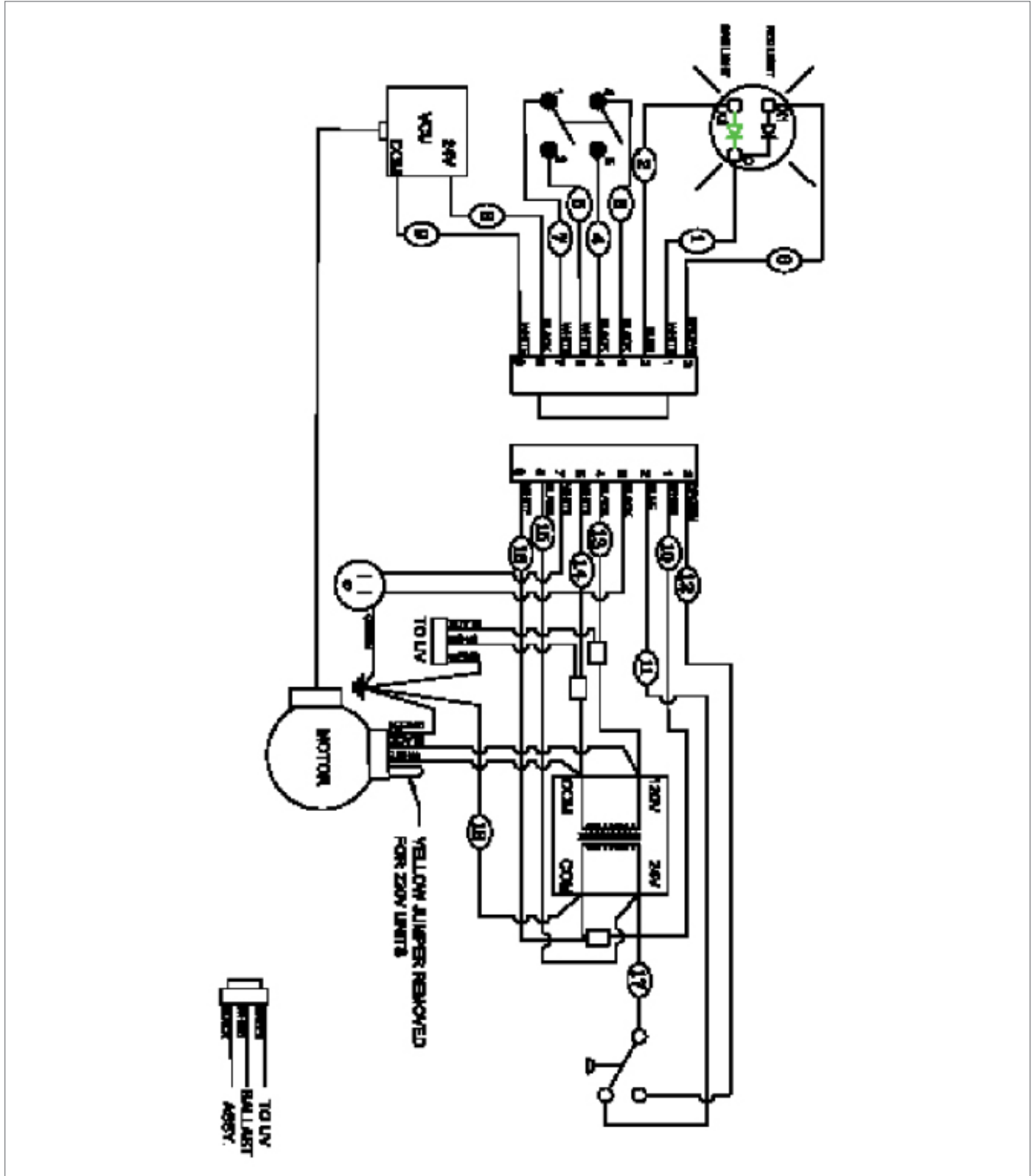
LOW AIRFLOW

1. Check prefilter for obstruction and remove obstruction as necessary.
2. Replace dirty prefilter media.
3. Increase the setpoint requirement of the speed control.
4. Check power supply for proper voltage, amperage, and distribution frequency.
5. Check for down-stream obstructions or erratic isolation room ventilation balance.
6. Replace HEPA filter if the air velocity remains low after checking all other causes of low airflow.

HIGH AIRFLOW

1. Decrease the setpoint requirement of the speed control.
2. Verify all filters are properly in place.

**SECTION SIX - MISCELLANEOUS
 WIRING DIAGRAM**



SECTION SIX - MISCELLANEOUS (CONTINUED)

REPLACEMENT PARTS

TABLE 1 - PAC MAX		
PART NO.	DESCRIPTION	QUANTITY
272000-001	PAC MAX 120V	1
272000-001UV	PAC MAX 120V UV	1
S272010-001	MOTOR/BLOWER ASSEMBLY, 120V	1
272022-001	99.97% HEPA FILTER	1
63352-001	ANTI-MICROBIAL PREFILTER	1
63951-002	VCU SPEED CONTROL	1
62974	CASTER WITH LOCK	2
62973	CASTER	2
63667	TRANSFORMER 120/24VAC	1
63739-002	ON/OFF SWITCH	1
272019-001	FILTER INDICATOR LIGHT	1
63415-004	PRESSURE SWITCH	1
60265-002	UV LAMP	1
272014-001	UV LIGHT ASSEMBLY	1
272025-001	POWER CORD - 120V	1

PAC MAX SPECIFICATIONS

- **Dimensions:** 57.75" H x 26.18" W x 24.75" D, 1467 H x 665 W x 629 D (mm)
- **Weight:** 175 lbs. (79 kg) ship weight
- **Power Requirements:** 10.2 A at 120V, 60 Hz, 1-Phase, 10.3 A at 120V, 60 Hz, 1-Phase with UV Light
- **Airflow:** 400 CFM (679 m³/hr) at minimum ±10% and 1,700 CFM (2,888 m³/hr) at maximum ±10%
- **HEPA Filter Media:** 99.97% at 0.3 micron minimum efficiency
- **Prefilter:** 2" MERV8 multi-pleat anti-microbial pleated prefilter with frame
- **Motor:** 3/4 HP (0.56 kW), direct drive, continuous duty, variable speed, electronically commutated motor with sealed-for life bearings and overload protection

AIR CHANGE RATES

TABLE 2 - ROOM SIZE (ROOM AIR VOLUME) IN FEET								
PAC MODEL	FAN SPEED	15 x 20 x 8 (2400 ft ³)	20 x 20 x 8 (3200 ft ³)	24 x 24 x 8 (4608 ft ³)	24 x 30 x 8 (5760 ft ³)	30 x 30 x 8 (7200 ft ³)	30 x 40 x 8 (9600 ft ³)	40 x 40 x 8 (12800 ft ³)
MAX	Min 400 CFM	10 ACH	7 ACH	5 ACH	4 ACH	3 ACH	2 ACH	1 ACH
MAX	Max 1,700 CFM	42 ACH	31 ACH	22 ACH	17 ACH	14 ACH	10 ACH	7 ACH

SECTION SEVEN - LIMITED WARRANTY

a) Unless otherwise set forth in the Sales Confirmation, Seller warrants to Buyer, for a period of twelve (12) months following the date of shipment to the Delivery Location (the "Warranty Period"), that the Goods will be free from defects in material and workmanship. Notwithstanding the foregoing, the Warranty Period for consumable Goods shall in no event exceed recommended replacement intervals set forth in the Instructions (hereinafter defined). If, prior to the expiration of the Warranty Period, Buyer informs Seller in writing of any breach of this limited warranty, then Seller may repair or replace the Goods that gave rise to such breach or, in Seller's sole and exclusive discretion, refund the amounts that Buyer paid for such Goods.

The foregoing limited warranties do not apply to (i) any defect in Goods not manufactured by Seller; and (ii) any Goods manufactured according to Buyer's specifications.

(b) Buyer shall bear the costs of access, de-installation, re-installation and transportation of the Goods to Seller and back to Buyer. Any repair or replacement pursuant to this limited warranty shall not extend the Warranty Period. Seller does not warrant the Goods, or any repaired or replacement parts, against normal wear and tear. This limited warranty and remedy are expressly conditioned upon: (i) Buyer's payment of the purchase price in full, (ii) Buyer giving written notice of the defect, reasonably described, to Seller within ten (10) days of the time when Buyer discovers or ought to have discovered the defect, (iii) the storage, installation, operation, use, and maintenance of the Goods in compliance with the published specifications and instructions provided by Seller or its suppliers or subcontractors (the "Instructions"), (iv) the existence of proper records of Buyer's operation and maintenance of the Goods during the Warranty Period, (v) Buyer providing Seller with a reasonable opportunity to examine the Goods and the aforementioned records, and (vi) the absence of any unauthorized modification or repair of the Goods.

(c) Before any test may be used to evaluate the Goods, Buyer shall: (i) provide Seller with reasonable written notification of such test, (ii) allow Seller to be present during such test, and (iii) receive Seller's consent to the conditions of such test, which consent will not be unreasonably withheld. If a test is performed on the Goods, and Seller has not consented to the conditions of such test, then this limited warranty shall be void.

(d) THE REMEDIES SET FORTH IN THIS SECTION ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES FOR ANY FAILURE OF SELLER TO COMPLY WITH ITS OBLIGATIONS UNDER THIS AGREEMENT, INCLUDING ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN THIS SECTION. Correcting any defect in the manner set forth in this Section 8 shall constitute complete fulfillment of Seller's obligations and liabilities under the Agreement following the delivery of the Goods, regardless of whether a claim is based in contract law, tort law (including negligence, strict liability or otherwise), or other legal theory.

THE LIMITED WARRANTY SET FORTH IN THIS SECTION IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER STATUTORY, EXPRESS, OR IMPLIED. EXCEPT AS SET FORTH IN THIS SECTION, SELLER MAKES NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE. Any other oral or written statements, whether contained in general advertising or other printed material, do not constitute warranties, and Buyer agrees that it is not entering into the Agreement in reliance upon any such statements.

CONTACT KRUEGER

For warranties, replacement parts, technical support, or any other questions please contact us at the following.

tel: 972.680.9136
email: kruegerinfo@krueger-hvac.com
web: www.krueger-hvac.com

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CRITICAL ROOM SOLUTIONS

CHILLED BEAMS

DISPLACEMENT VENTILATION

UNDERFLOOR

Underfloor Diffusers
Underfloor Terminal Units

TERMINAL UNITS

Single Duct
Fan Powered
Dual Duct
Bypass & Retrofit

FAN COILS & BLOWER COILS

Horizontal
Vertical / Stack

DIFFUSERS

Plaque & Architectural
Louvered
Perforated
Modular Core
Linear Slot
Plenum Slot
Round
Air Nozzles

GRILLES & REGISTERS

Supply
Return
Linear Bar
Security
Industrial
Duct Mounted
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