



# Direct Air Cooling Unit Product Manual DAC (Door Air Cooling) WAC (Wall Air Cooling)

## Installation & Operation Manual Wall Mounted Direct Air Cooling Unit

### **MODELS:**

WAC2000

DAC2000



WAC2000



DAC2000



### **IMPORTANT**

This manual may include information for options and features which may not be included on the unit being installed. Refer to the unit data label or Model Identification to determine which features and options this unit is equipped with.

**INSTALLER:** Affix the instructions on the inside of the building adjacent to the thermostat.  
**END USER:** Retain this manual for future reference.

*Manufactured By:*

### **Marvair, An AirX Climate Solutions Brand**

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The most current version of this manual can be found at [www.Marvair.com](http://www.Marvair.com).

## How To Use This Manual

This manual is intended to be a guide to the Marvair DAC/WAC direct air cooling unit. It contains installation, troubleshooting, maintenance, warranty, and application information. The information contained in this manual is to be used by the installer as a guide only. This manual does not supersede or circumvent any applicable national or local codes.

If you are installing the DAC/WAC unit, first read Chapter 1 and scan the entire manual before beginning the installation as described in Chapter 2. Chapter 1 contains general, descriptive information and provides an overview which can speed up the installation process and simplify troubleshooting.

If a malfunction occurs, follow this troubleshooting sequence:

1. Make sure you understand how the DAC/WAC unit works (Chapters 1 & 3).
2. Identify and correct installation errors (Chapter 2).
3. Refer to the troubleshooting information in Chapter 4.

If you are still unable to correct the problem, contact the Factory at 1-800-841-7854 for additional assistance.


**Please read the following “Important Safety Precautions” before beginning any work.**


## Important Safety Precautions


1. USE CARE when LIFTING or TRANSPORTING equipment.
2. TRANSPORT the UNIT UPRIGHT. Laying it down on its side may cause breakage or damage to internal components.
3. TURN ELECTRICAL POWER OFF AT THE breaker or fuse box BEFORE installing or working on the equipment. LINE VOLTAGES ARE HAZARDOUS or LETHAL.
4. OBSERVE and COMPLY with ALL applicable PLUMBING, ELECTRICAL, and BUILDING CODES and ordinances.
5. SERVICE may be performed ONLY by QUALIFIED and EXPERIENCED PERSONS.


**\* Beware of sharp edges on sheet metal components**

6. Use COMMON SENSE - BE SAFETY-CONSCIOUS

This is the safety alert symbol . When you see this symbol on the DAC/WAC unit and in the instruction manuals be alert to the potential for personal injury. Understand the signal word DANGER, WARNING, CAUTION and IMPORTANT. These words are used to identify levels of the seriousness of the hazard.

 **DANGER** Failure to comply will result in death or severe personal injury and/or property damage.

 **WARNING** Failure to comply could result in death or severe personal injury and/or property damage.

 **CAUTION** Failure to comply could result in minor personal injury and/or property damage.

**IMPORTANT** Used to point out helpful suggestions that will result in improved installation, reliability or operation.

AS PART OF THE MARVAIR CONTINUOUS IMPROVEMENT PROGRAM, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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**⚠ WARNING**

- If the information in these instructions are not followed exactly, a fire may result causing property damage, personal injury or loss of life.
- Read all instructions carefully prior to beginning the installation. Do not begin installation if you do not understand any of the instructions.
- Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life.
- Installation and service must be performed by a qualified installer or service agency in accordance with these instructions and in compliance with all codes and requirements of authorities having jurisdiction.

**INSTALLER:** Affix the instructions on the inside of the building adjacent to the thermostat.

**END USER:** Retain these instructions for future reference.

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# Chapter 1 Description & Specifications

## 1.1 General Description

The Marvair DAC (Door Air Cooling) and WAC (Wall Air Cooling) units are direct air cooling units designed to provide free cooling for telecom shelters and cabinets. The DAC is designed for installation on a door and the WAC is designed to be mounted on a wall in place of a wallmount air conditioner unit and includes a door-mounted exhaust damper.

The units consist of a 48 VDC backward curved, single inlet electronically commutated centrifugal fan, an outside (intake) air assembly with a motorized damper, a 4” (102 mm) disposable MERV 13 filter, and the CoolLinks control board housed in a steel cabinet. Pressure relief is provided by a powered exhaust damper on the opposite side of the shelter or cabinet. An exhaust damper on the opposing wall ensures optimal air circulation throughout the building. An anti-corrosion protective coating on the cabinet and the internal components is available as an option.

- **Door Mounted Direct Air Cooling Unit**

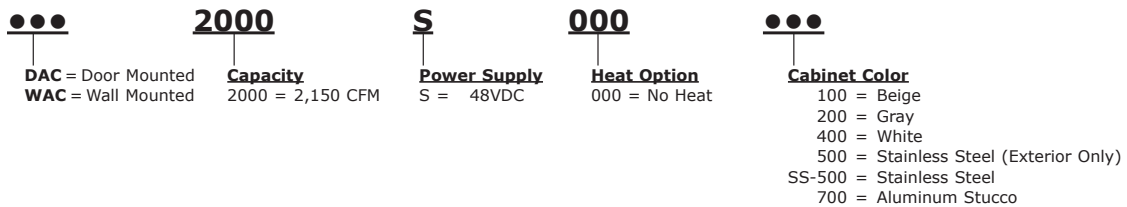
**DAC:** The Marvair Door Mounted Direct Air Cooling Unit (DAC) is designed to install in a standard shelter door. The DAC operates on 48 VDC and is installed in an opening in the door. The WAC unit provides free air cooling and the installation kit includes all necessary hardware and a wall-mounted exhaust air damper to relieve pressure within the building.

- **Wall Mounted Direct Air Cooling Unit**

**WAC:** The Marvair Wall Mounted Direct Air Cooling Unit (WAC) is designed as a direct replacement for a standard sized wall mounted air conditioner unit. The WAC operates on 48 VDC and is installed using the existing supply air wall openings. When replacing an A/C unit, the WAC back panel covers/seals the existing return air opening. The WAC unit provides free air cooling and includes a door-mounted exhaust air damper to relieve pressure within the building.

## 1.2 Model Identification

The model identification number is found on the data sticker rating plate located on side panel.



## 1.3 Serial Number Date Code

20 = 2020	01 = January	05 = May	09 = September
21 = 2021	02 = February	06 = June	10 = October
22 = 2022	03 = March	07 = July	11 = November
23 = 2023	04 = April	08 = August	12 = December

## 1.4 Air Flow, Weights and Filter Sizes

MODEL	INCHES	MILLIMETERS	PART NUMBER	FILTERS PER UNIT	MERV RATING
DAC/WAC2000	36 1/2 x 22 x 4	927 x 559 x 102	93205	1	13

Table 1. Return Air Filter Sizes

MODEL	LBS	KG
DAC2000	75	34
WAC2000	275	125

Table 2. WAC/DAC Shipping Weights

## 1.5 General Operation

On a call for cooling from a temperature sensor located in the building, the centrifugal fan in the DAC/DAC/WAC unit turns on and both the outside air damper in the unit and the external exhaust damper open. The fan speed varies based on the difference between the current building temperature and the first stage cooling set point temperature of 90°F (32.2°C). As the temperature approaches the set point, the fan speed increases to a maximum of 100% of rated air flow and, as the temperature recedes from the set point, the fan speed decreases to the minimum of 5% of rated air flow.

If the DAC/WAC is operating and the temperature rises above the first stage cooling set point of 90°F (32.2°C), the DAC/WAC will continue to operate and the evaporator blower in the ComPac air conditioner will turn on. If the temperature rises above the second set point temperature of 104°F (40°C), the DAC/WAC is turned off, the motorized damper and exhaust damper are both closed and the ComPac air conditioner turns on in mechanical cooling. The air conditioner runs until the temperature drops below the mechanical cooling disable set point of 79°F (26.1°C). At this point, the DAC/WAC is turned on and both the motorized damper and exhaust damper are opened. The ComPac air conditioner can also be turned on to provide a comfortable working temperature when technicians are in the shelter. Any time the ComPac air conditioner is providing mechanical cooling, the DAC/WAC is turned off and all louvers are closed.

## 1.6 CoolLinks™ 2.0 Controller

Operation of the DAC/WAC and the air conditioner in the shelter or cabinet is managed by the CoolLinks 2.0 controller. See Appendix A for CoolLinks 2.0 installation details.

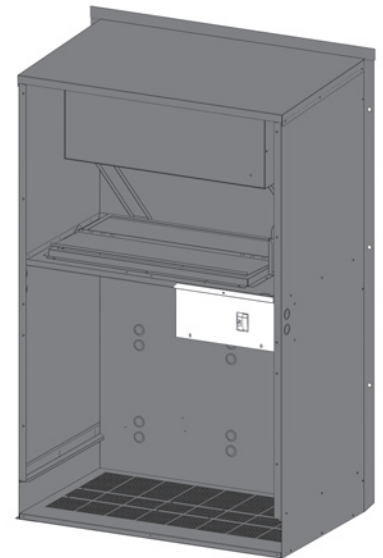
## 1.7 Options

### Protective Coating Packages

The WAC is available with corrosion protection, which includes a protective coating on the entire cabinet inside and out (except for the control box and control box cover).

## 1.8 Control Circuit

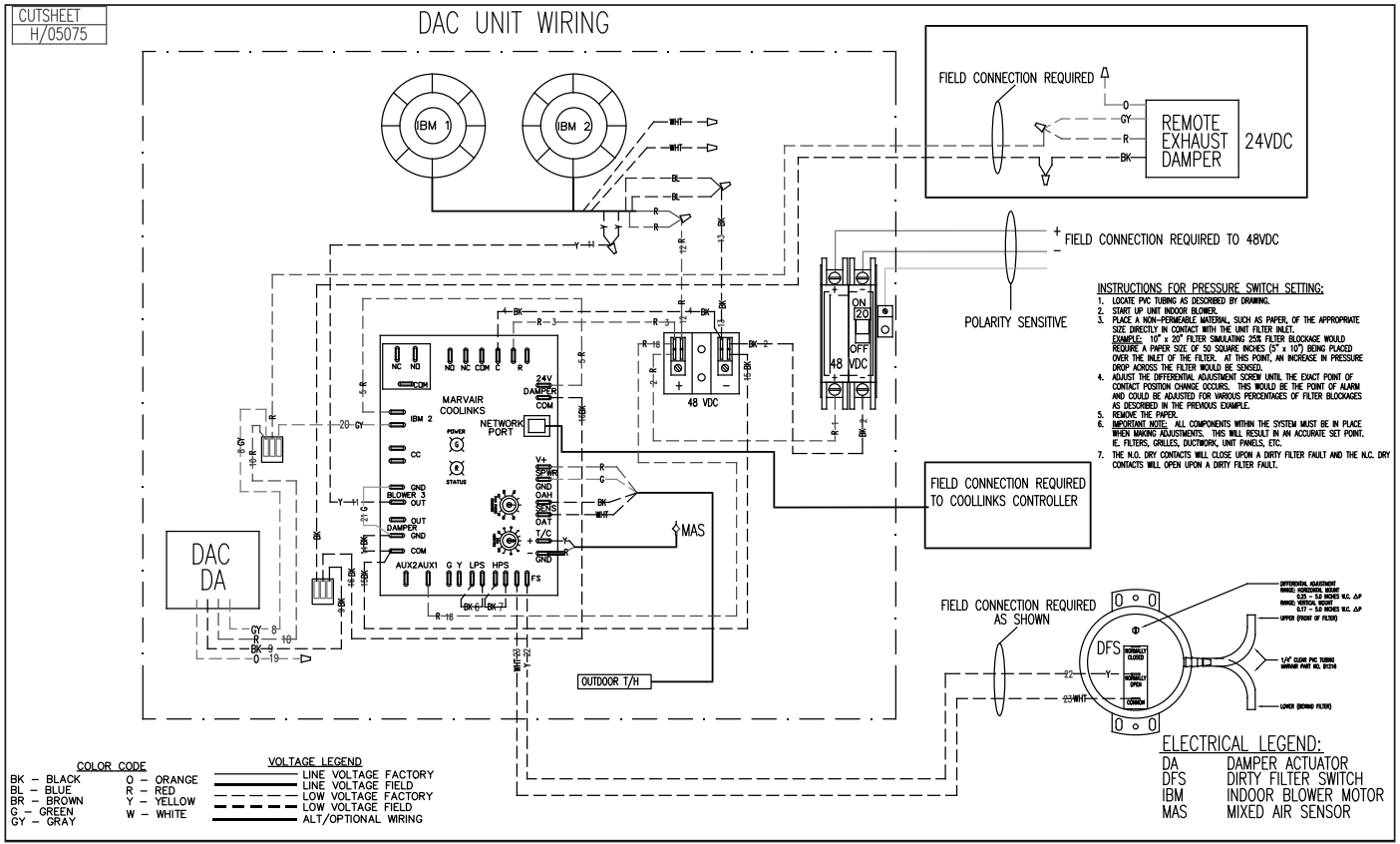
The DAC/WAC internal control circuit shall consist of a factory-installed electronic circuit board and is powered directly from an external 48 VDC source. This circuit board operates the indoor fan motor, the outside air damper and the outside air temperature and humidity sensor and uses LEDs to indicate power status and fault conditions to assist the service technician. Communication to the CoolLinks 2.0 controller is accomplished through an on-board RJ45 Ethernet port.



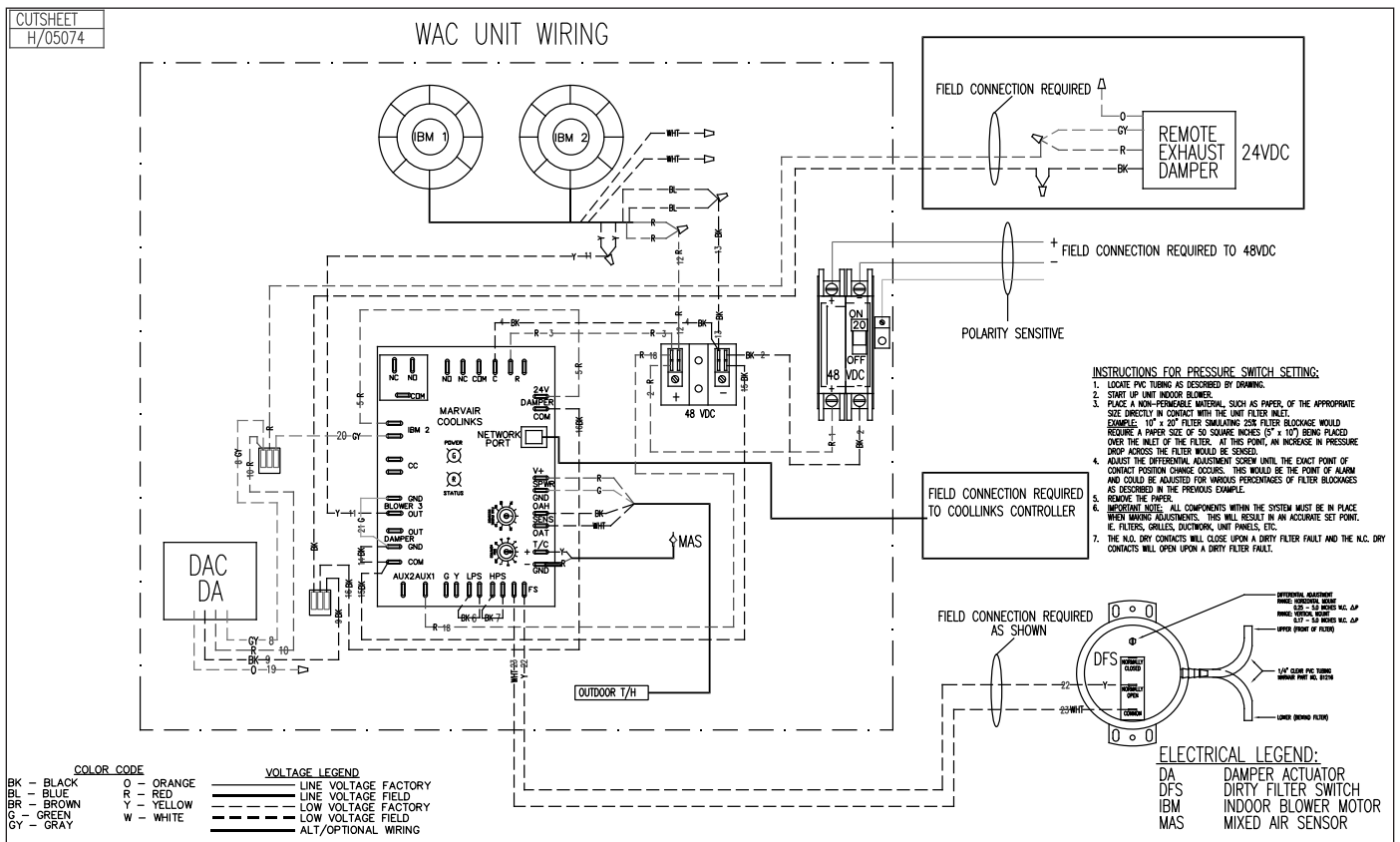
## 1.9 Modes of Operation

**Normal:** Upon a call for cooling from the CoolLinks 2.0 controller, the outside air damper and exhaust vent will be fully opened and the indoor fan will be set to the speed determined by the controller. The fan speed will be variable between 5% and 100% of rated motor speed and will be calculated by the controller based on the inside and outside ambient air temperature and humidity conditions. An interlock will prevent operation of the indoor fan if the outside air supply damper is not open.

**Standalone or Emergency Ventilation:** If the circuit board in the DAC/WAC unit is unable to communicate with the controller for a period of sixty seconds, the circuit board will automatically select standalone mode. In standalone mode, the outside air supply damper will be fully opened and the indoor fan will operate at the last speed determined by the controller. When communications with the controller is restored, the control board will automatically drop out of standalone mode and return to normal controller-defined operation.



**Figure 1a. Typical Electrical Schematic - DAC Unit**



**Figure 1b. Typical Electrical Schematic - WAC Unit**

# Chapter 2 DAC Installation

## WARNING

**Failure to observe and follow Warnings and Cautions and these Instructions could result in death, bodily injury or property damage. Read this manual and follow its instructions and adhere to all Cautions and Warnings in the manual and on the unit.**

### 2.1 Equipment Inspection

#### Concealed Damage

Inspect all cartons and packages upon receipt for damage in transit. Remove cartons and check for concealed damage. **Important: keep the unit upright at all times.** Remove access panels and examine component parts.

### 2.2 Site Scoping

1. Identify door width to ensure fit of DAC assembly on door.
2. Look at door set-up. Is there adequate clearance for the exhaust hood. Is the door stop/catch in place?
3. Identify need for grounding and any missing or improperly connected grounds.
4. Identify potential alternative locations for exhaust set-up.

### 2.3 Installation Requirements

#### General

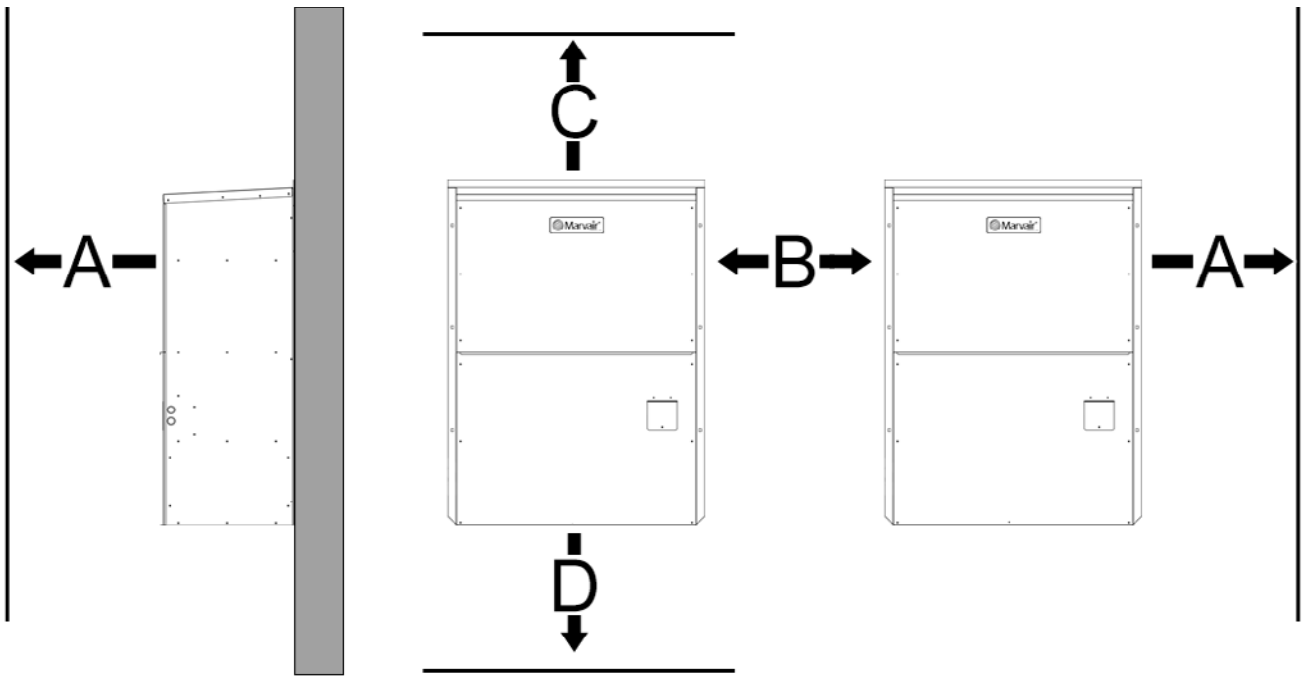
1. Inspect unit for completeness. Check for missing parts (e.g. hardware). Refer to the installation kit information in section 2.3.
2. Remove access panels and check for loose wires. Tighten screw connections.
3. Complete and mail the warranty registration card.

You must consider all of the following when choosing the installation site:

1. **Noise.** Install the unit so that the least amount of noise will be transmitted to inhabited spaces.
3. **Placement.**
  - A) Place the unit in a shaded area, if possible.
  - B) Install it above ground for protection against flooding.
  - C) The damper exhausts air. Be sure that the airflow is not impeded by shrubbery or other obstructions.
4. **Airflow Requirements:**

Do not obstruct airflow through the unit. Do not place equipment in front of the unit. The high filtration filter will require replacement/cleaning frequently.
5. **Clearances:**

Note the minimum clearances in Figure 4 required for proper operation and service.



MODEL	MIN. CLEARANCE AROUND SIDES (SINGLE UNIT)	MIN. CLEARANCE BETWEEN UNITS (TWO UNITS)	MIN. SPACE ABOVE UNIT	MIN. SPACE BELOW UNIT
	A	B	C	D
DAC2000	24 inches (61 cm)	18 inches (46 cm)	12 inches (30 cm)	24 inches (61 cm)

**Table 3. DAC Minimum Clearances**

6. **Codes:**

Make sure your installation conforms to all applicable electrical, plumbing, building, and municipal codes. Some codes may limit installation to single story structures.

7. **Electrical Supply:**

The power supply must have the appropriate voltage, polarity, and ampacity for the model selected. Voltage must be maintained above minimum specified values listed below. Refer to the data sticker on the unit for ampacity requirements.

Electrical Rating Designations	VDC
Nominal Voltage	48
Minimum Voltage	36
Maximum Voltage	57

**Table 4. DAC Voltage Limitations**

## 2.4 Installation Materials

### **Installation Kits**

Marvair DAC units are not shipped with a bottom bracket. All units have built-in full length mounting flanges. Therefore, use of mounting brackets is not required.

### **Kit Components (shipped inside unit):**

1. DAC2000 Unit
2. Return Block Off Plate
3. Exhaust Damper Hood
4. Exhaust Damper Cutout Template
5. Exhaust Damper Mounting Plate
6. Motorized Exhaust Damper Assembly
7. Exhaust Damper Screen
8. 2 Carriage Bolts, 2 Washers, 2 Wing Nuts, 3/8" Screws

### **Additional Items Needed:**

Additional hardware and miscellaneous supplies (not furnished by Marvair®) are needed for installation. For example, the list below contains approximate quantities of items typically needed for mounting a unit on a wood frame wall structure. Concrete or fiberglass structures have different requirements.

- (6) **3/8" sleeve anchors** for unit mounting flanges. The length needed is typically the wall thickness plus one inch.
- (6) **3/8" washers**
- (6) **3/8" hex nuts**
- (24) **3/8" self tapping screws**
  - **Silicone Sealer** to seal around cracks and openings
  - **Minimum 5 conductor low voltage multicolored wire cable** (i.e. thermostat wire)
  - **Appropriate electrical supplies** such as **conduit, electrical boxes, fittings, wire connectors,** etc.
  - **High voltage wire**, sized to handle the MCA (minimum circuit ampacity) listed on the data plate.
  - **Over-Current Protection Device** sized in accordance with the MFS (maximum fuse size) listed on the unit data plate.

### **WARNING - FIRE HAZARD**

**Improper adjustment, alteration, service, maintenance or installation could cause serious injury, death and/or property damage.**

**Installation or repairs made by unqualified persons could result in hazards to you and others. Installation MUST conform with local codes or, in the absence of local codes, with codes of all governmental authorities have jurisdiction.**

**The information contained in this manual is intended for use by a qualified service agency that is experienced in such work, is familiar with all precautions and safety procedures required in such work, and is equipped with the proper tools and test instruments.**

## **2.5 Porting and Duct Work**

### **General Information**

Note: The following instructions are for general guidance only. Due to the wide variety of installation possibilities, specific instructions will not be given. When in doubt, follow standard and accepted installation practices, or contact Technical Support for additional assistance.

### **Wall Openings (DAC Units)**

Measure the dimensions of the supply air opening on the unit.

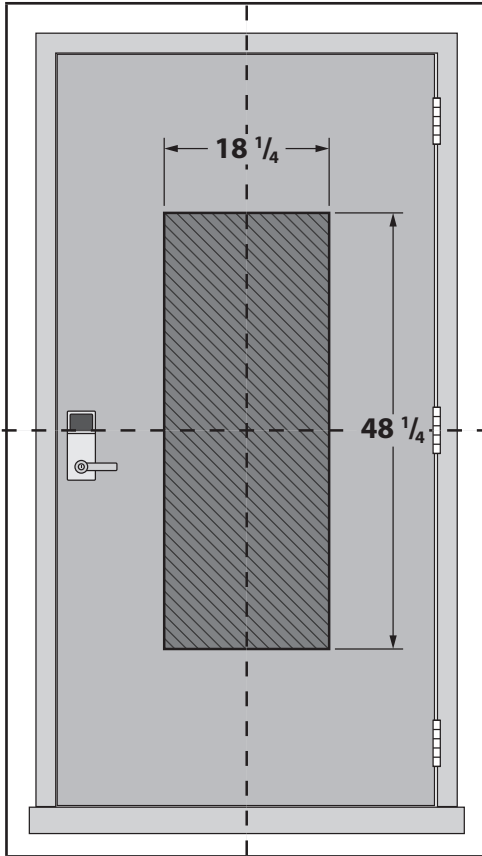
Cut the openings in the exterior wall for the supply air, or use the existing openings if replacing an air conditioner unit. Use the supplied blanking plate and foam insulation to cover any existing return air opening.

The DAC is designed to accommodate a 3 Ton to 5 Ton supply air opening. The WAC is supplied with 3 Ton supply flanges screwed to the back panel for a 3 Ton opening. For 4 and 5 Ton openings, remove the 3 Ton supply flange and bend out the 4-5 Ton supply duct flanges. See Figure 3, WAC Dimensional Drawing.

## 2.6 DAC Unit Installation

The Marvair DAC utilizes a 48VDC blower assembly installed through the shelter entry door. To relieve pressure and expel exhaust, a damper installed in place of a wall mount HVAC unit.

Use the following instructions to install the door-mounted DAC assembly and exhaust hood.



1

Locate the horizontal and vertical center of the door and mark the location of 18 1/4" W x 48 1/4" H DAC cutout, ensuring that it's level and square.

Be mindful of clearances for the door handle, hinges and other obstructions and adjust the cutout position as needed to allow adequate clearance.

**Note:** The door cutout is slightly oversized to allow for adjusting the alignment of the DAC unit.

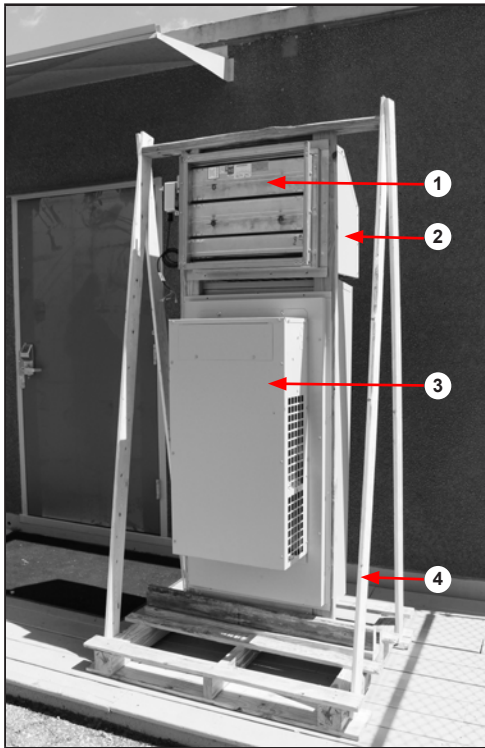


2

Using the marks made in Step #1 as a guide, cut out and remove the section of the door to make an opening for the DAC installation.

**Note:** Utilize proper safety equipment and flame retardant material to prevent sparks, dust, and debris from damaging equipment during door cutting procedure.





**3**

Carefully remove the DAC from the shipping pallet and identify each component.

- 1. Exhaust Damper
- 2. Exhaust Damper Hood
- 3. DAC Unit with Exterior Hood
- 4. Shipping Pallet



**4**

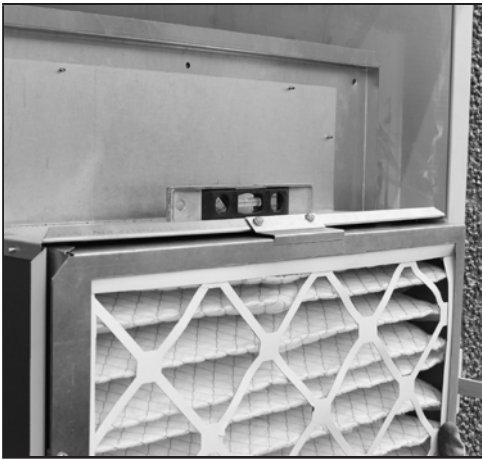
Using a 5/16" driver, remove the two screws securing the DAC exterior hood to the shipping pallet and remove the hood by lifting it up from the bottom.



**5**

Using the same 5/16" driver, remove the screws securing the DAC unit mounting bracket and filter assembly to the shipping pallet.





**6**

Working from the ***outside*** of the door apply silicone sealant to the mating surface of the DAC mounting bracket back plate and center the bracket in the door cutout.

Use a level to ensure the bracket is installed square to the door.



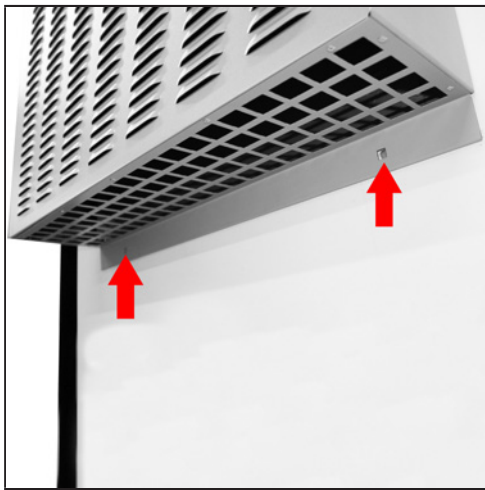
**7**

Use 3/8" self-tapping screws to secure the DAC mounting bracket to the door.



**8**

This completes the installation of the DAC mounting bracket and filter assembly to the shelter door.

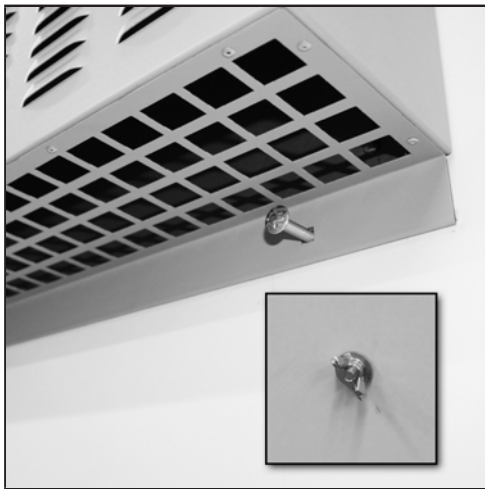


**9**

Working from the ***outside*** of the door, position the DAC hood by hanging it on the flange at the top of the previously installed DAC mounting bracket and filter assembly.

Using the holes in the hood lower flange as a guide, drill two holes through the door for the mounting bolts.

Marvair requires adding a bead of caulk around the WAC exterior exhaust hood.



**10**

Working from the ***outside*** of the door, install a carriage bolt through the hole in the lower flange of the exhaust hood and the door.

From the ***inside*** of the door, install a washer and nut on each carriage bolt to secure the hood to the door.



**11**

Using a 5/16" driver, remove the screws securing the DAC unit assembly to the shipping pallet and carefully remove the unit from the pallet.



**12**

From the *inside* of the door, position the top of the DAC unit assembly over the mounting flange at the top of the mounting bracket to position it on the door.

Use 3/8" self-tapping screws to secure the DAC unit assembly to the door.



**13**

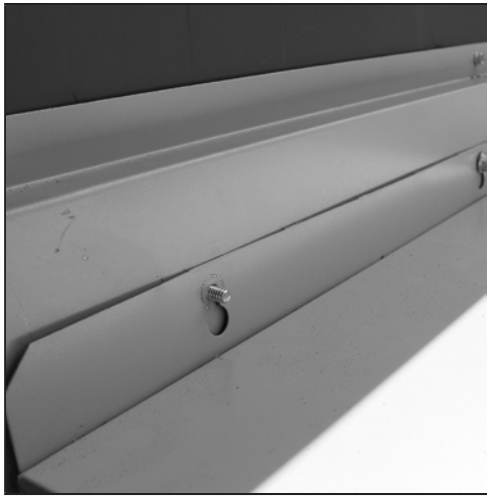
This completes the installation of the DAC unit assembly to the shelter door.



**14**

Feed the wires from the DAC unit assembly through the opening in the back of the interior hood and through the front of the electrical controls box.





**15**

Locate the two pre-installed mounting studs near the top of the DAC unit assembly and use them to hang the interior hood/ electrical controls box. Feed the wires.



Secure the interior hood with nuts.



**16**

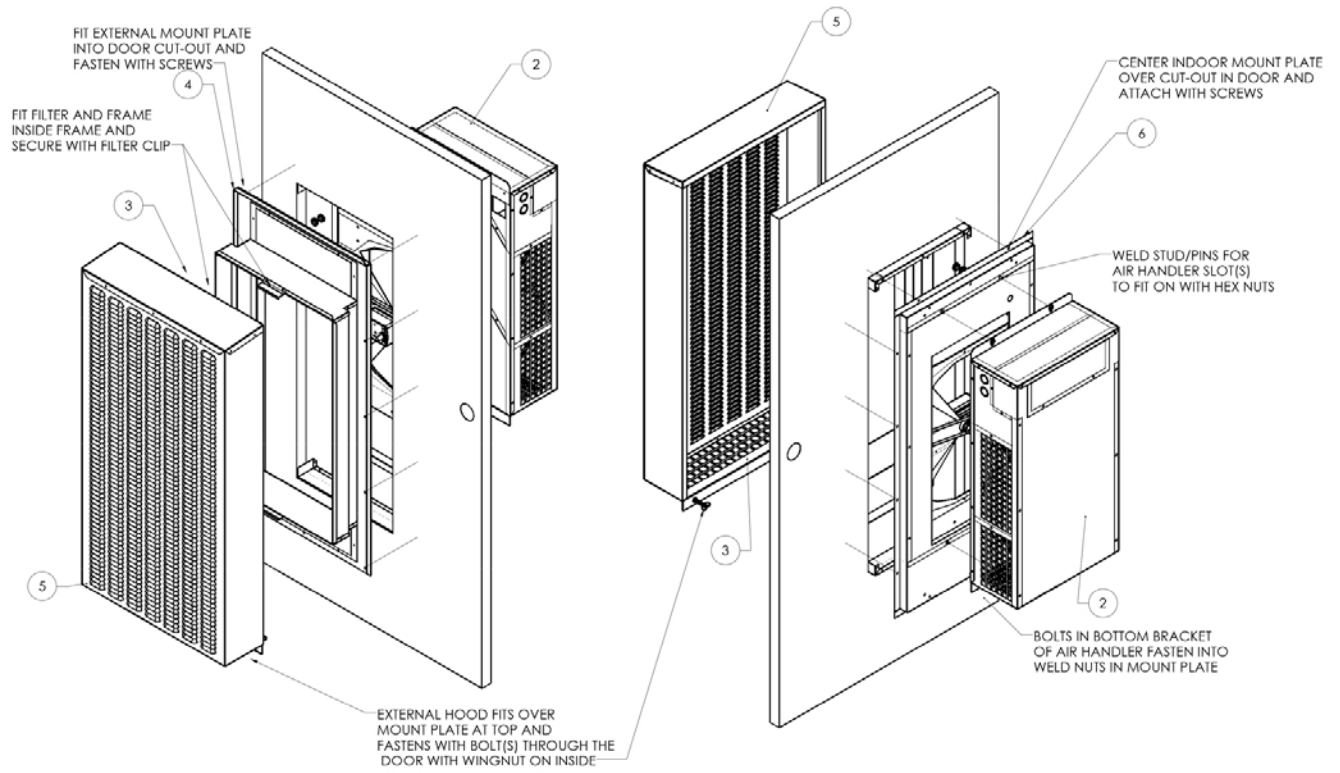
This completes the installation of the DAC unit.

Refer to the wiring diagrams for the required electrical connections.

This completes the installation of the DAC unit. See Chapter 4 for electrical connections.

### **Minimum Airflow Requirements**

The DAC is a free blow unit with a high filtration capability. The MERV 13 disposable filter should be changed regularly for the unit to maintain its full 100% design airflow capability.



ITEM NO.	PART NUMBER	DESCRIPTION	UNIT ASSEMBLY /QTY.
2	SD12481	BLOWER BOX ASSEMBLY	1
3	SD12485	FILTER HOLDER ASSEMBLY	1
4	SD12483	EXTERNAL MOUNTING PANEL ASS'Y	1
5	SD12484	DAC EXTERNAL HOOD ASS'Y	1
6	SD12482	INTERNAL DOOR MOUNT ASSEMBLY	1

Figure 2. DAC Installation Detail

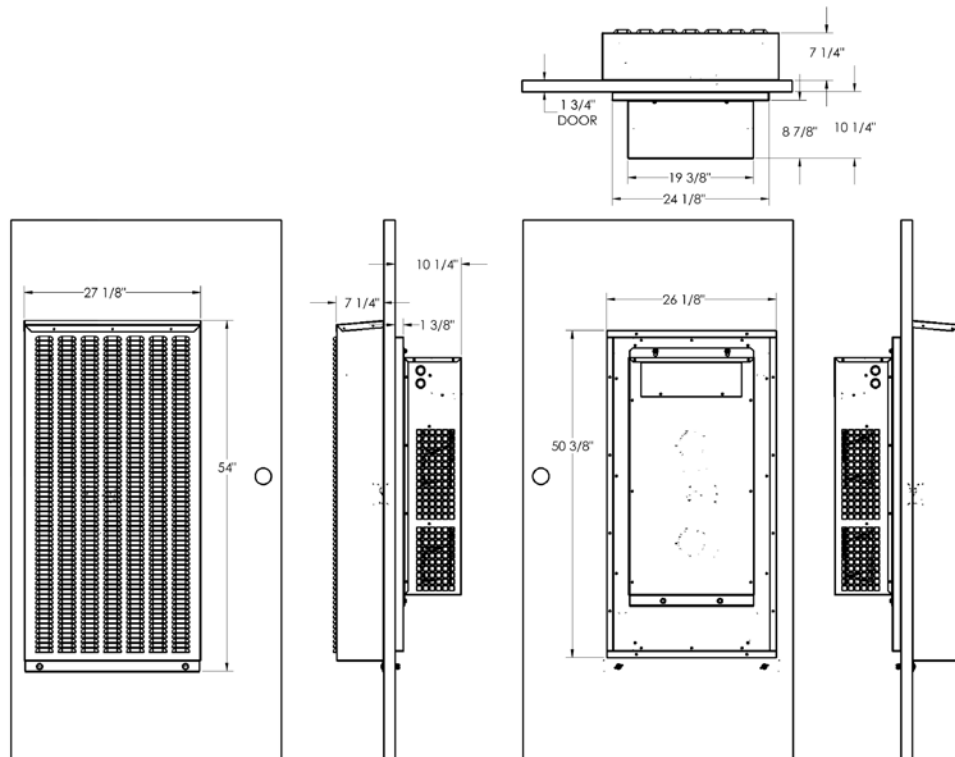
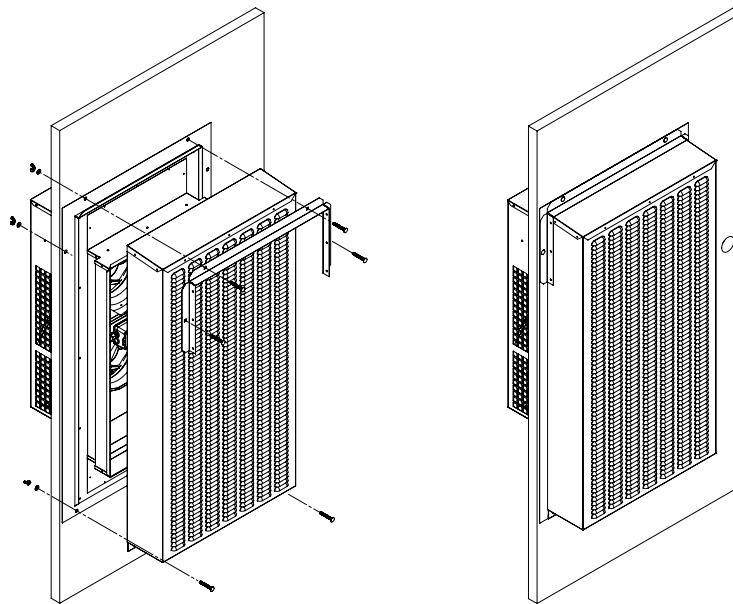
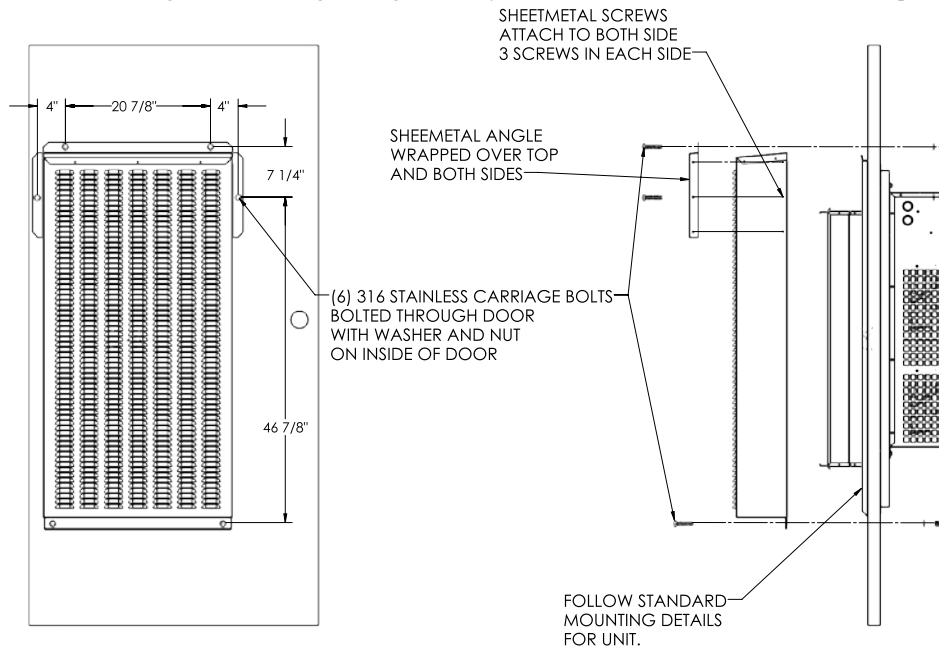


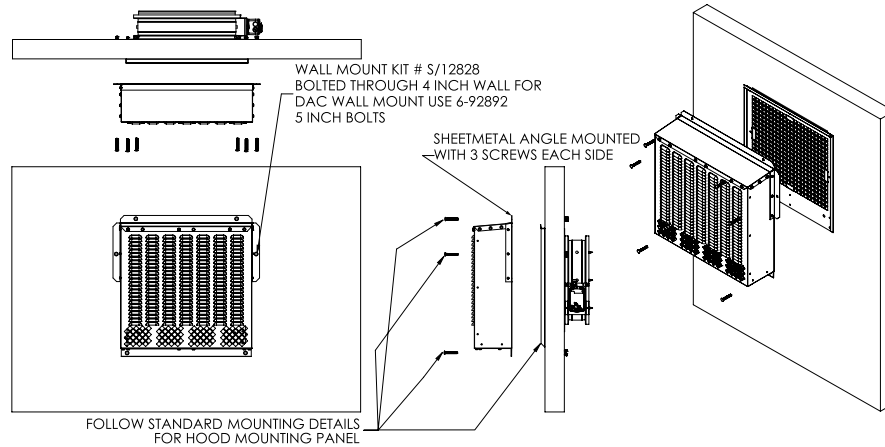
Figure 3. DAC Dimensional Drawing

## 2.7 DAC Florida Hurricane Kit Detail (Kit #K/11114)

Complies with the Florida Building Code including the High Velocity Hurricane Zone NOA No. 19-0219.13 Exp Date: January 30,2025

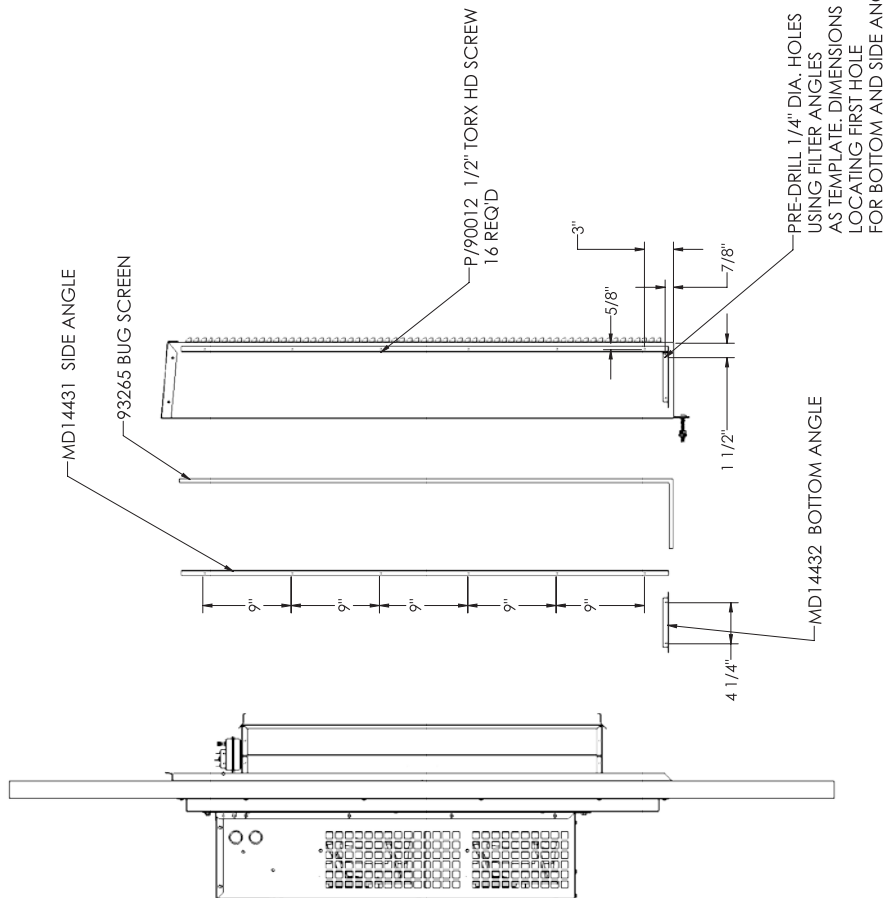
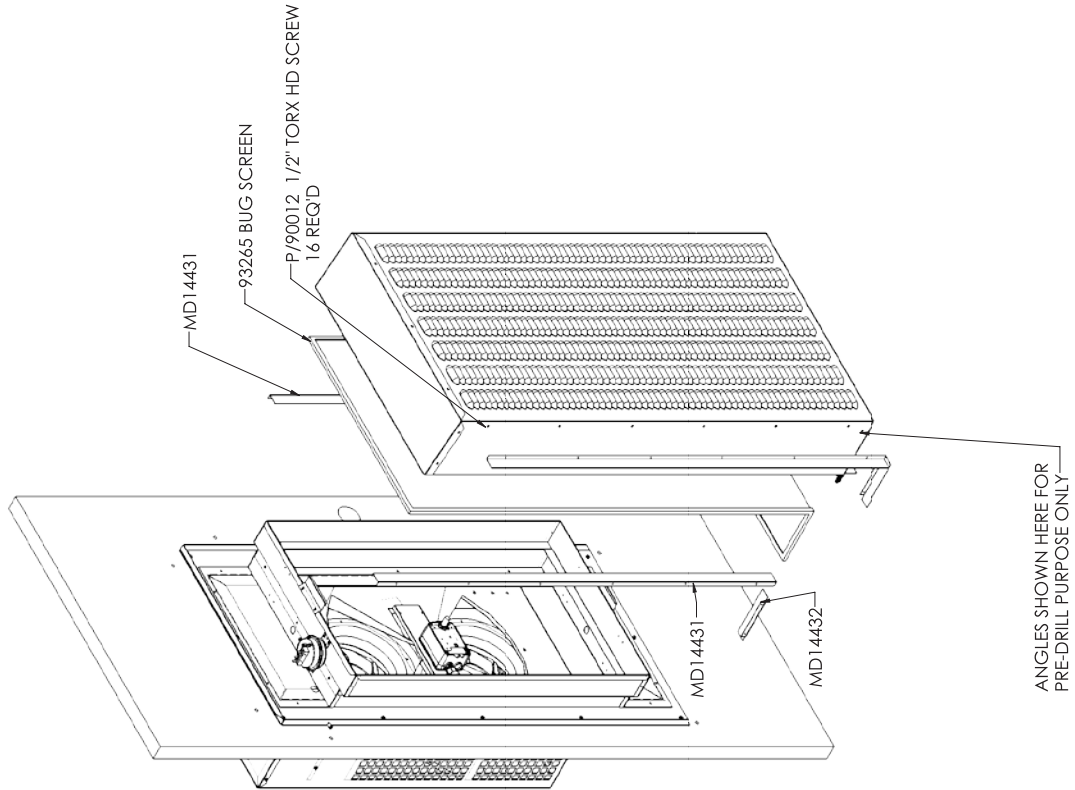


### DAC Hurricane Kit Damper Installation Detail





## 2.8 DAC Pre-Filter Detail



# Chapter 3 WAC Installation



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## 3.1 Equipment Inspection

### Concealed Damage

Inspect all cartons and packages upon receipt for damage in transit. Remove cartons and check for concealed damage. **Important: keep the unit upright at all times.** Remove access panels and examine component parts.

## 3.2 Site Scoping

1. Identify door width to ensure fit of exhaust hood on door.
2. Look at door exhaust set-up. Is there adequate clearance for the exhaust hood. Is the door stop/catch in place?
3. Identify need for grounding and any missing or improperly connected grounds.
4. Identify potential alternative locations for exhaust set-up.

## 3.3 Installation Requirements

### General

1. Inspect unit for completeness. Check for missing parts (e.g. hardware). Refer to the installation kit information in section 2.3.
2. Remove access panels and check for loose wires. Tighten screw connections.
3. Complete and mail the warranty registration card.

You must consider all of the following when choosing the installation site:

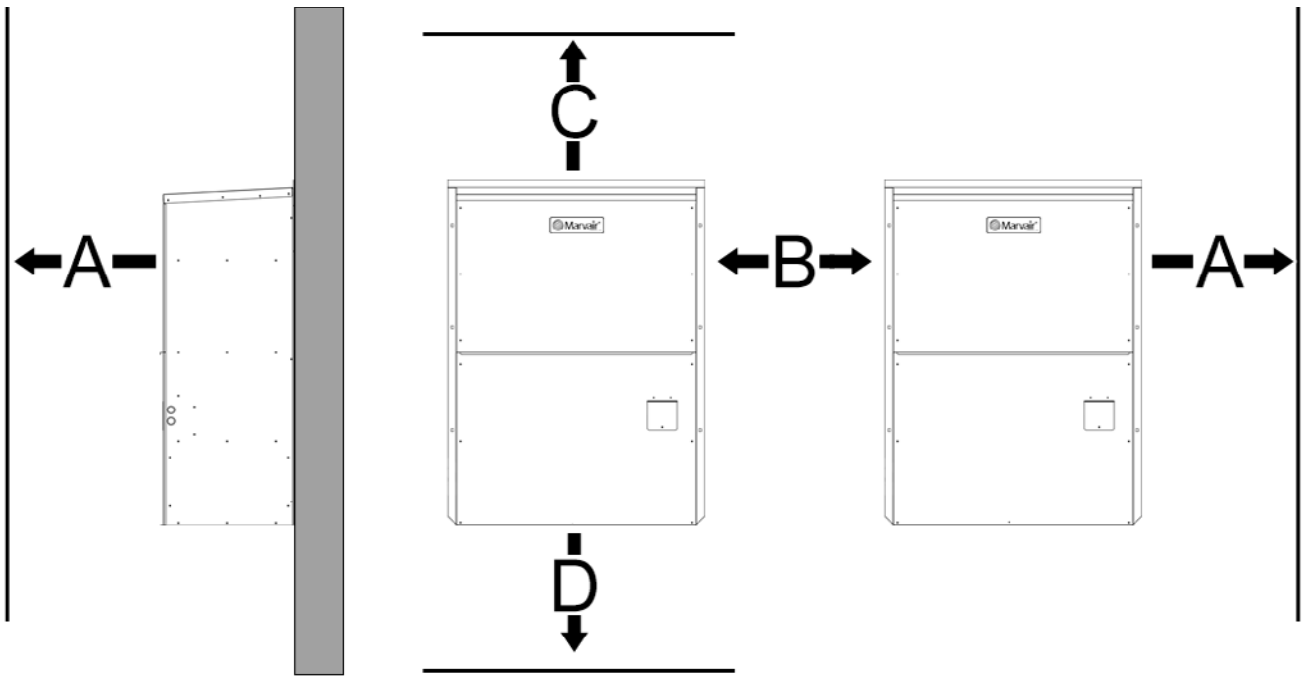
1. **Noise.** Install the unit so that the least amount of noise will be transmitted to inhabited spaces.
3. **Placement.**
  - A) Place the unit in a shaded area, if possible.
  - B) Install it above ground for protection against flooding.
  - C) The damper exhausts air. Be sure that the airflow is not impeded by shrubbery or other obstructions.
4. **Airflow Requirements:**

Do not obstruct airflow through the unit. Do not place equipment in front of the unit. The high filtration filter will require replacement/cleaning frequently.

### 5. **Clearances:**

Note the minimum clearances in Figure 4 required for proper operation and service.





MODEL	MIN. CLEARANCE AROUND SIDES (SINGLE UNIT)	MIN. CLEARANCE BETWEEN UNITS (TWO UNITS)	MIN. SPACE ABOVE UNIT	MIN. SPACE BELOW UNIT
	A	B	C	D
WAC2000	30 inches (76 cm)	18 inches (46 cm)	24 inches (61 cm)	24 inches (61 cm)

**Table 5. WAC Minimum Clearances**

6. **Codes:**

Make sure your installation conforms to all applicable electrical, plumbing, building, and municipal codes. Some codes may limit installation to single story structures.

7. **Electrical Supply:**

The power supply must have the appropriate voltage, polarity, and ampacity for the model selected. Voltage must be maintained above minimum specified values listed below. Refer to the data sticker on the unit for ampacity requirements.

Electrical Rating Designations	VDC
Nominal Voltage	48
Minimum Voltage	36
Maximum Voltage	57

**Table 6. WAC Voltage Limitations**

### 3.4 Installation Materials

**Installation Kits**

Marvair WAC units are not shipped with a bottom bracket. All units have built-in full length mounting flanges. Therefore, use of mounting brackets is not required.

### Kit Components (shipped inside unit):

1. WAC2000 Unit
2. Return Block Off Plate
3. Exhaust Damper Hood
4. Exhaust Damper Cutout Template
5. Exhaust Damper Mounting Plate
6. Motorized Exhaust Damper Assembly
7. Exhaust Damper Screen
8. 2 Carriage Bolts, 2 Washers, 2 Wing Nuts, 5/16 Screws

### Additional Items Needed:

Additional hardware and miscellaneous supplies (not furnished by Marvair®) are needed for installation. For example, the list below contains approximate quantities of items typically needed for mounting a unit on a wood frame wall structure. Concrete or fiberglass structures have different requirements.

(6) **5/16 or 3/8 sleeve anchors** for unit mounting flanges. The length needed is typically the wall thickness plus one inch.

(6) **5/16 or 3/8" washers**

(6) **5/16 or 3/8" hex nuts**

- **Silicone Sealer** to seal around cracks and openings
- **Minimum 5 conductor low voltage multicolored wire cable** (i.e. thermostat wire)
- **Appropriate electrical supplies (conduit, electrical boxes, fittings, wire connectors, etc.)**
- **High voltage wire**, sized to handle the MCA (minimum circuit ampacity) listed on the data plate.
- **Over-Current Protection Device** sized in accordance with the MFS (maximum fuse size) listed on the unit data plate.

### **WARNING - FIRE HAZARD**

**Improper adjustment, alteration, service, maintenance or installation could cause serious injury, death and/or property damage.**

**Installation or repairs made by unqualified persons could result in hazards to you and others. Installation MUST conform with local codes or, in the absence of local codes, with codes of all governmental authorities have jurisdiction.**

**The information contained in this manual is intended for use by a qualified service agency that is experienced in such work, is familiar with all precautions and safety procedures required in such work, and is equipped with the proper tools and test instruments.**

## 3.5 Porting and Duct Work

### General Information

Note: The following instructions are for general guidance only. Due to the wide variety of installation possibilities, specific instructions will not be given. When in doubt, follow standard and accepted installation practices, or contact Technical Support for additional assistance.

**Note:** Follow local codes and standards when designing duct runs to deliver the required airflow. Minimize noise and excessive pressure drops caused by duct aspect ratio changes, bends, dampers and outlet grilles in duct runs.

### Wall Openings (WAC Units)

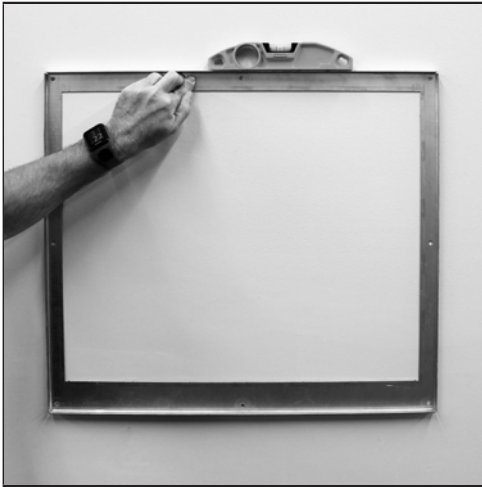
Measure the dimensions of the supply air opening on the unit.

Cut the openings in the exterior wall for the supply air, or use the existing openings if replacing an air conditioner unit. Use the supplied blanking plate and foam insulation to cover any existing return air opening.

The WAC is designed to accommodate a 3 Ton to 5 Ton supply air opening. The WAC is supplied with 3 Ton supply flanges screwed to the back panel for a 3 Ton opening. For 4 and 5 Ton openings, remove the 3 Ton supply flange and bend out the 4-5 Ton supply duct flanges. See Figure 3, WAC Dimensional Drawing.

## Damper Assembly Installation

To provide complete ventilation and pressure relief, the Marvair WAC uses a damper assembly and exhaust hood installed in the shelter door. The damper actuation is automatically controlled by the WAC. Use the following instructions to install the door-mounted damper assembly and exhaust hood.



**1**

Locate the included template to mark the location of the through-the-door cutout.

Position the template for the cutout on the ***outside*** of the door making sure it's level and properly centered.

Make cutout 1/8" larger all the way around.

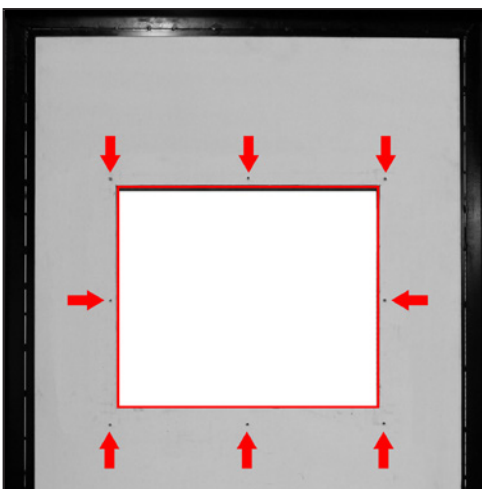
Position motorized damper and using a marker, locate the mounting holes.

Drill holes for the motorized damper mounting.



**2**

Mark the position of the through-the-door cutout and exhaust hood mounting panel installation pilot holes.



**3**

Using recommended "Diablo Steel Demon" circular saw blade, cut the through-the-door opening and drill the exhaust hood mounting panel pilot holes.



**Note:** Utilize flame retardant material to prevent sparks, dust, and debris from damaging equipment during door cutting procedure.



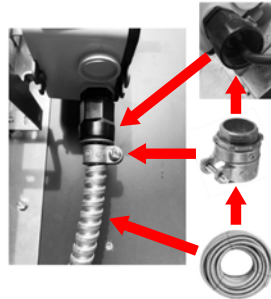
4

Working from the ***inside*** of the door, center the damper assembly over the through-the-door hole and mount it in place.



5

Working from the ***inside*** of the door, install the wiring connection to the WAC unit and make the electrical connections according to the wiring diagram.



**Note:** Marvair recommends the use of “greenfield” metallic, flexible conduit from wall to louver control input to eliminate the need for a junction box at louver control input.



6

Make sure to loop enough conduit so that the door opens completely without pulling on the conduit.



7

Working from the ***outside*** of the door, temporarily install the exhaust hood mounting panel.

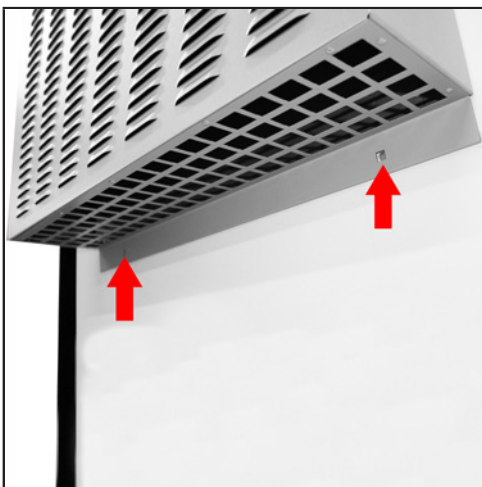


**Note:** The exhaust hood mounting panel has a built-in alignment flange to ensure proper installation.



8

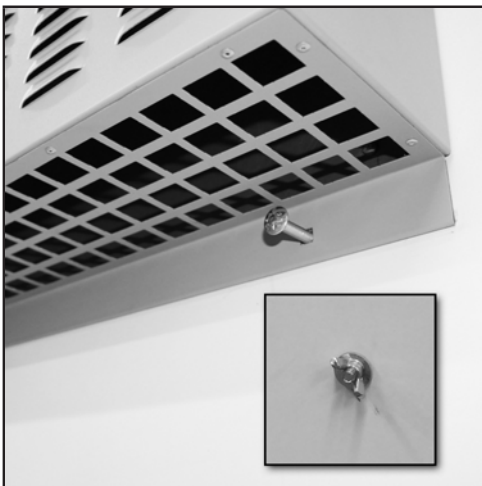
Working from the ***outside*** of the door, position the door screen frame to align it with the pre-drilled pilot holes, then complete the installation of the exhaust hood mounting panel by installing mounting screws through the door screen frame and exhaust hood mounting panel and into the door.



9

Working from the ***outside*** of the door, position the exhaust hood by hanging it on the flange at the top of the previously installed mounting panel.

Using the holes in the exhaust hood lower flange as a guide, drill two holes through the door for the mounting bolts.



10

Working from the ***outside*** of the door, install a carriage bolt through the hole in the lower flange of the exhaust hood and the door.

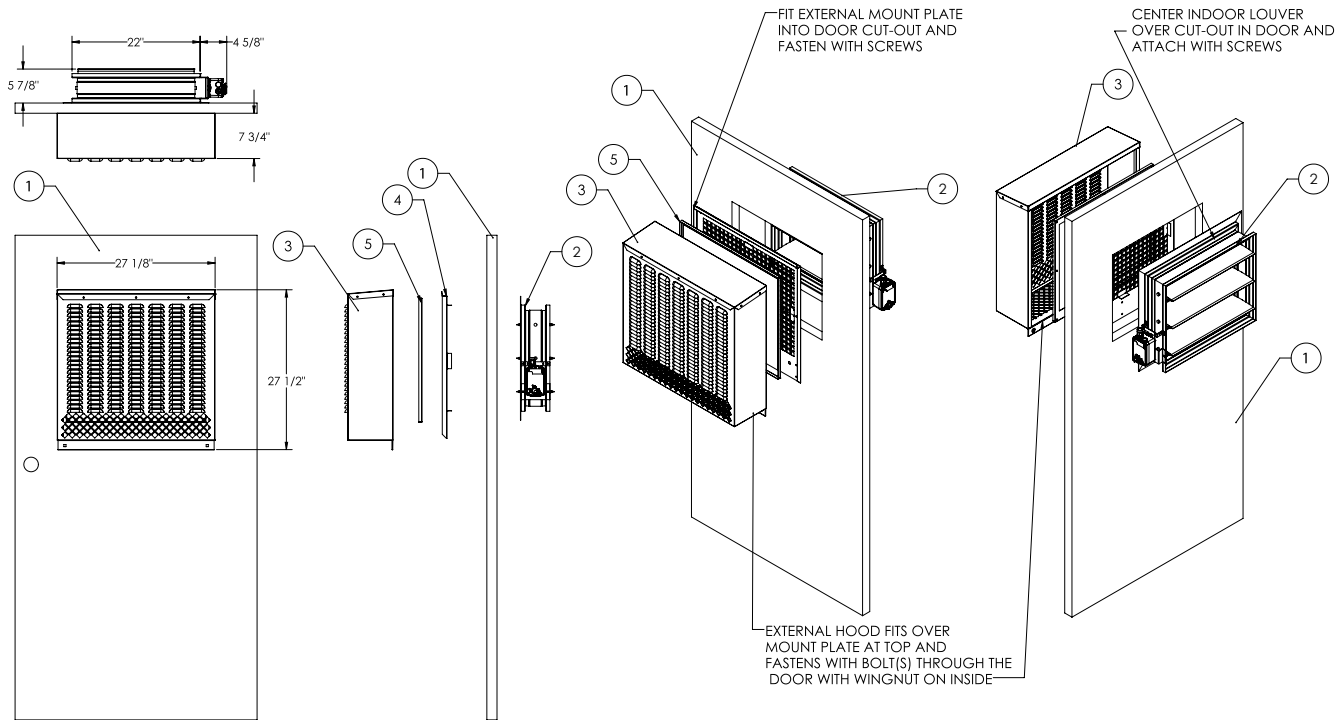
From the ***inside*** of the door, install a washer and nut on each carriage bolt to secure the exhaust hood to the door.

Marvair requires adding a bead of caulk around the WAC exterior exhaust hood.

As needed/identified in Section 2.2, Site Scoping, install door stop/catch to prevent damage caused from exhaust hood striking shelter.

Replace door signage after louver/exhaust hood installed on door.

This completes the installation of the damper and exhaust hood assemblies.



Item Number	Part Number	Description
1	N/A	Sample Door
2	80963	Damper 22x18.25 Steel Airfoil
3	MD12836-GA	Exhaust Hood Assembly
4	Hood Screen	
5	MD12839	Door Screen Frame - Exhaust Hood
6	MD12840	Screen - Exhaust Hood

Figure 4. WAC Damper Installation Detail

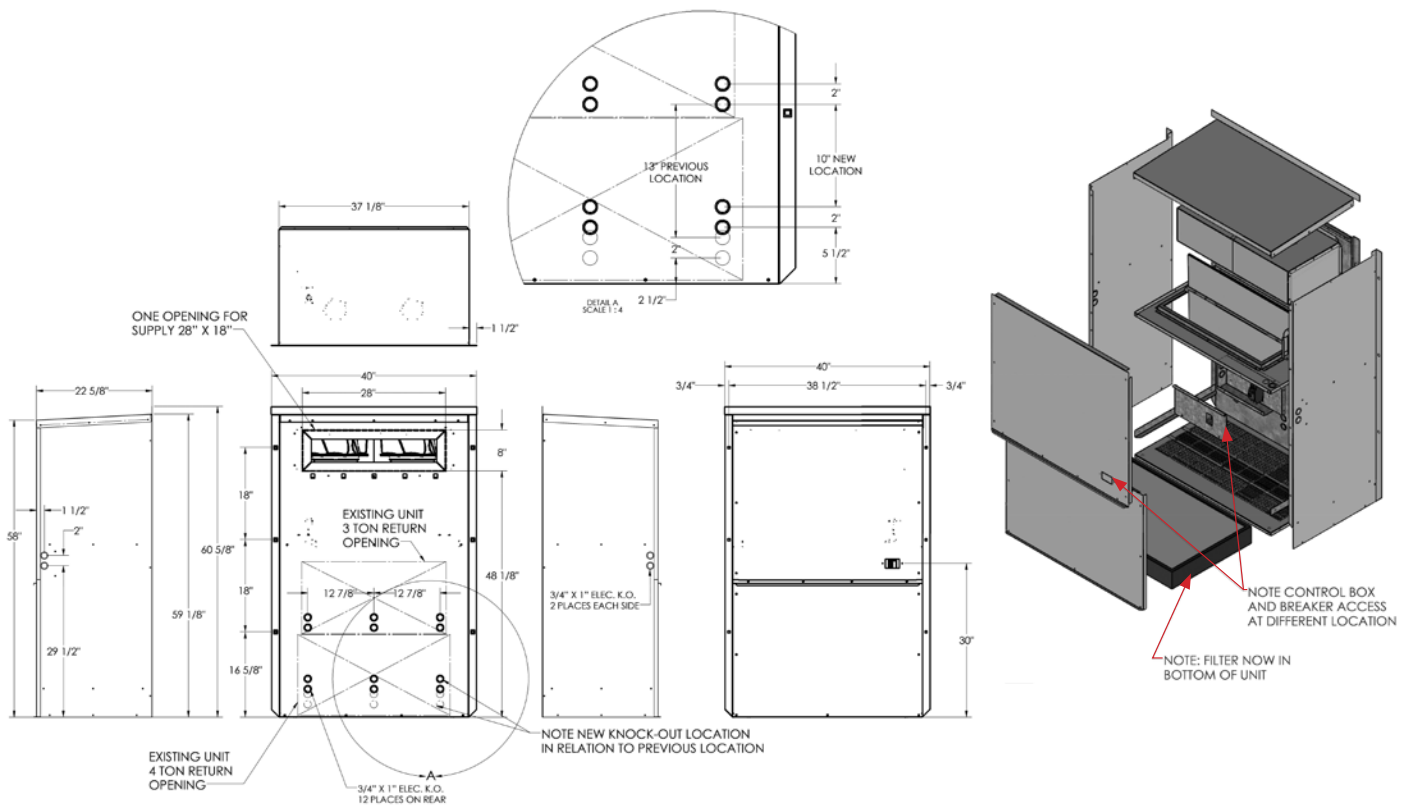
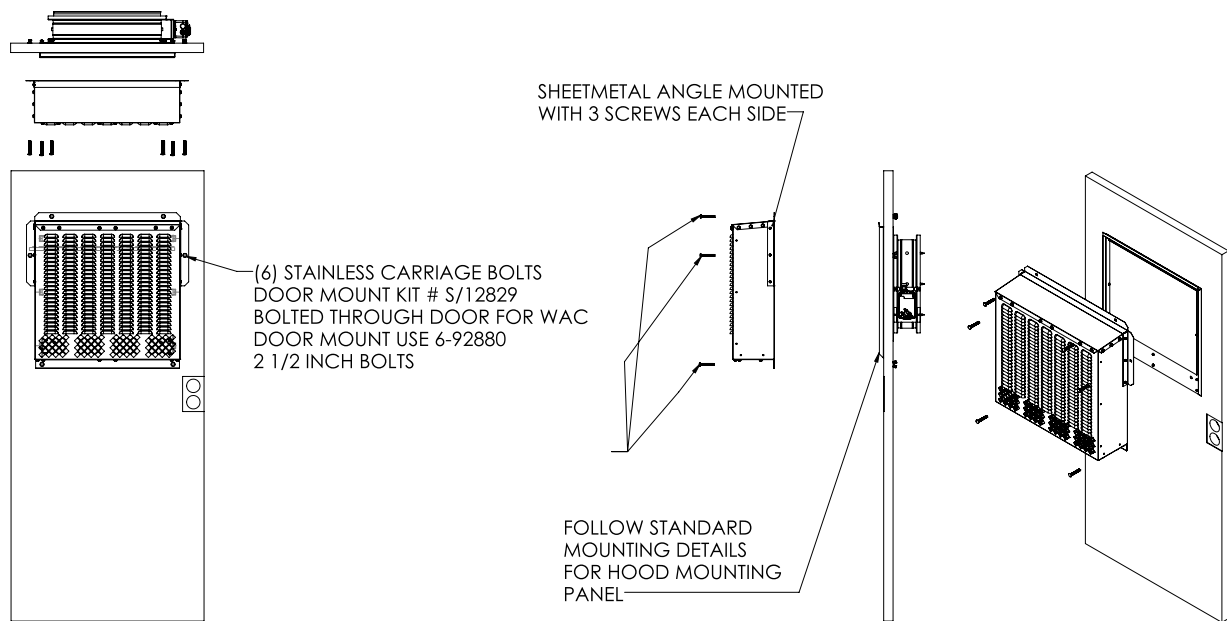


Figure 5. WAC Dimensional Drawing





**Figure 6. WAC Hurricane Kit Damper Detail**

### **Minimum Airflow Requirements**

The WAC is a free blow unit with a high filtration capability. The MERV 13 disposable filter should be changed regularly for the unit to maintain its full 100% design airflow capability. If a washable filter is used instead, it should be cleaned regularly.

### **3.6 Bracket Installation**

1. All models have built-in mounting flanges.
2. Apply a bead of silicone sealer on the wall side of the bottom support brackets on the unit. Circle the mounting holes with the silicone bead.

For example, on wooden structures, use 3/8" x 2-1/2" all-thread lag screws. The screws must penetrate the center of the wall stud. Drill a pilot hole in the stud to prevent it from splitting.

### **3.7 Mounting The Unit**

1. For wiring into the back of unit, locate the lower of the two knockouts on the wall side of the unit. Drill a one inch hole in the shelter wall to match this opening. Allow sufficient clearance to run 3/4" conduit through the hole and to the unit.
2. Make sure that the duct flanges are properly aligned with the wall opening. Adjust as necessary.
3. Note the holes in each side flange. Using the holes for guides, drill holes through the wall with a 3/8" drill bit. Insert the 3/8" x 5" bolts through the flanges. Install nuts and washers on the inside of the shelter. Tighten the bolts to secure the unit.
4. Apply a bead of silicone where the mounting flange contacts the unit and the shelter wall.
5. Good practice for redundant weather proofing is to fabricate and install a drip guard above the unit.
6. Install insulation panel in outside part of return opening to close gap/insulate between WAC unit and interior shelter wall.
7. On the inside of the shelter, install the wall sleeves in the supply opening. The sleeves may be trimmed to fit flush with the inside wall.
8. Check the fit of each sleeve to its mating flange for possible air leaks. Apply silicone sealer to close any gaps. Install the air return block-off plate and supply grille. Ground the return block-off panel with through-bolts prior to mounting panel to wall, installing conduit, etc.

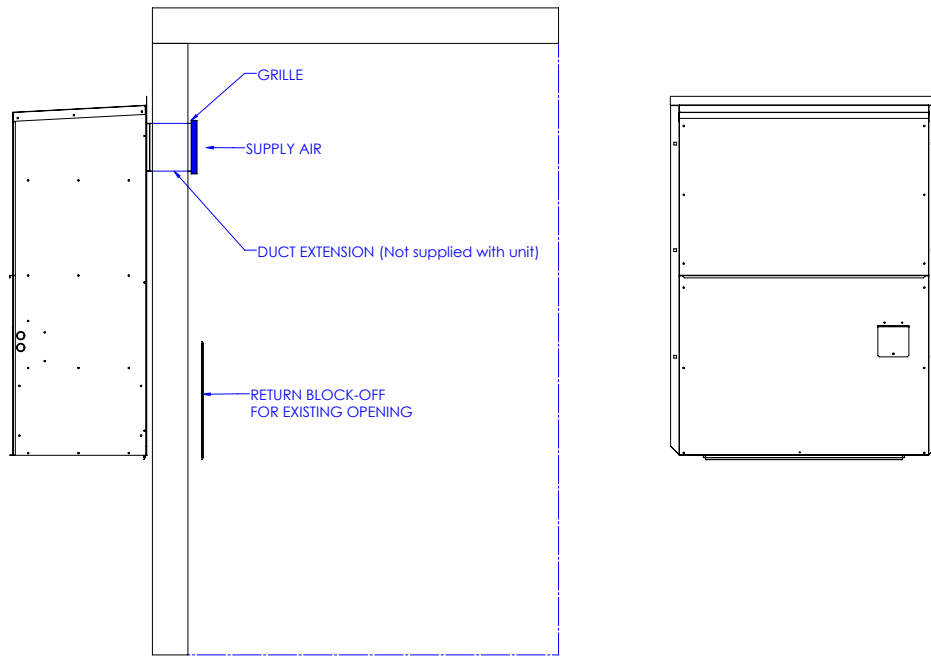
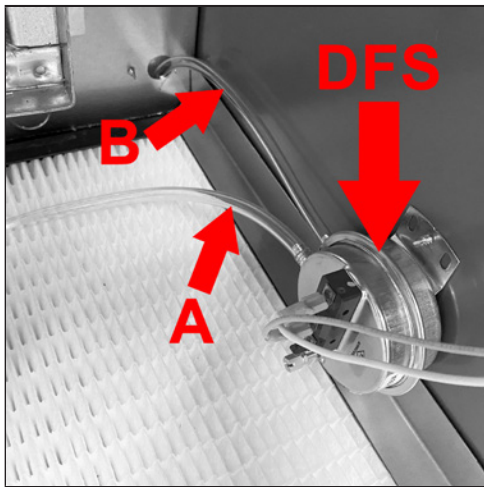


Figure 7. WAC Wall Mount Detail

### 3.8 Dirty Filter Sensor Connections

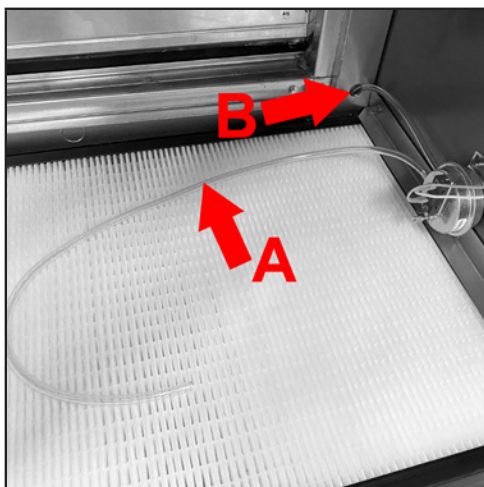


1

Locate the Dirty Filter Sensor (DFS) in the lower portion of the WAC unit, near the filter.

Refer to this photo to insure the hoses are properly connected and routed.

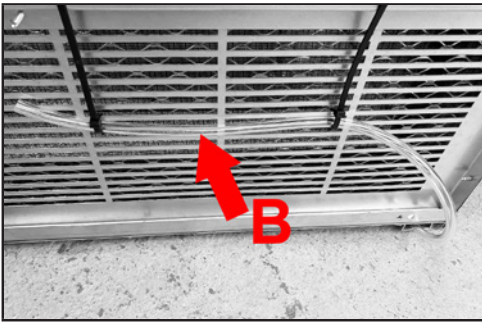
- A. Above Filter
- B. Below Filter



2

Position the "A" Hose on top of the filter and the "B" Hose must exit through the hole at the back of the unit.

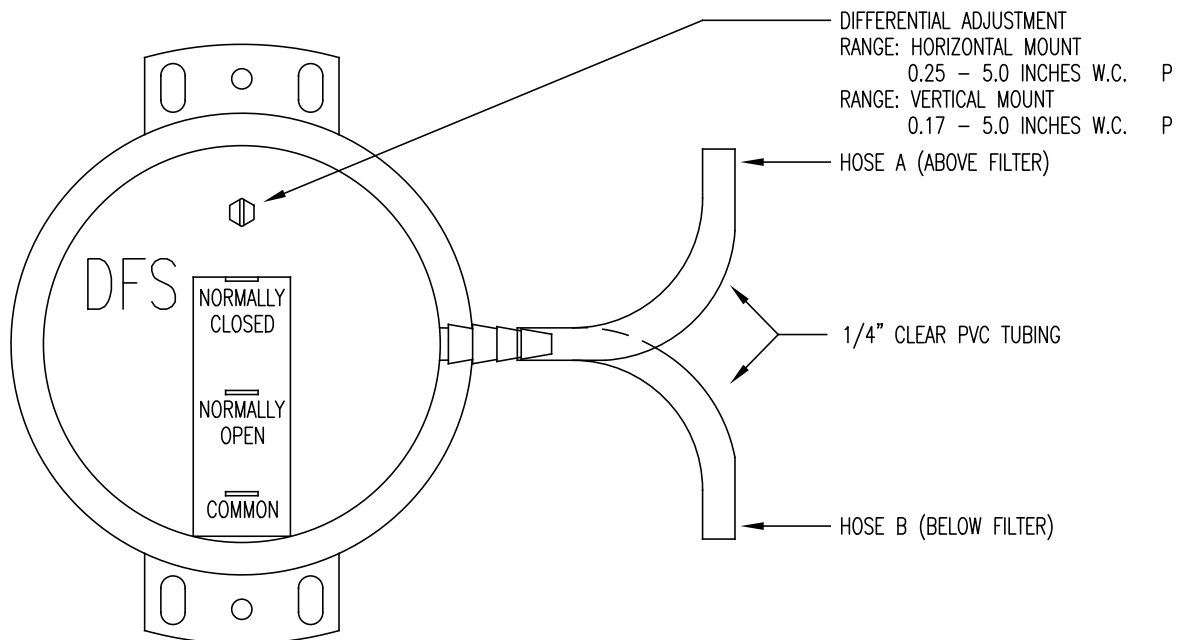




**3**

Ensure that the "B" Hose is routed out through the bottom of the unit and secured with wire ties..

### 3.9 Dirty Filter Sensor Adjustments



1. Locate PVC tubing as described by drawing.
2. Start up unit indoor blower
3. Place a non-permeable material, such as paper, of the appropriate size directly in contact with the unit filter inlet.  
 EXAMPLE: 10" x 20" filter simulating 25% filter blockage would require a paper size of 50 square inches (5" x 10") being placed over the inlet of the filter. At this point, an increase in pressure drop across the filter would be sensed.
4. Adjust the differential adjustment screw until the exact point of contact position change occurs. This would be the point of alarm and could be adjusted for various percentages of filter blockages as described in the previous example.
5. Remove the paper.
6. **IMPORTANT NOTE:** All components within the system must be in place when making adjustments. This will result in an accurate set point. IE, filters, grilles, ductwork, unit panels, etc. A temporary panel made of cardboard or foam board with an access hole may be used to make setpoint adjustments.
7. The N.O. dry contacts will close upon a dirty filter fault and the N.C. dry contacts will open upon a dirty filter fault.

# Chapter 4 Electrical Connections

## 4.1 Electrical Connections

### WARNING

#### ELECTRICAL SHOCK HAZARD

Failure to follow safety warnings exactly could result in serious injury, death, and/or property damage.

Turn off electrical power at fuse box or service panel **BEFORE** making any electrical connections and ensure a proper ground connection is made before connecting line voltage.

#### Important

All electrical work must meet the requirements of local codes and ordinances. Work should be done **only** by qualified persons.

Before beginning installation:

1. Identify the specification for communication wire between WAC and door damper unit.
2. Clear/clean controller and junction boxes from extraneous metal shavings (prevent electrical shorts).

To ease installation and electrical wiring, the WAC unit has an internal wiring channel around the knock-outs. Remove the cover panel to access the channel.

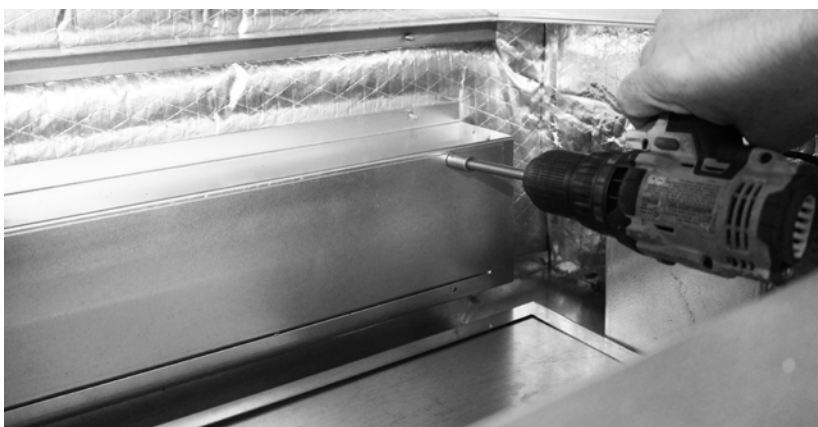


Figure 8 WAC Electrical Wiring Channel Access

#### High Voltage Wiring - (Single Units)

The power supply should have the proper voltage, phase, and ampacity for the selected model.

1. Refer to the electrical data on the data sticker on the unit for field wiring requirements of the unit. Size the incoming power supply lines and the fuse(s) or HACR breaker(s) according to requirements described in the National Electric Code. Run the power conductors through the knockouts on the side or back of the unit. Use appropriate conduit and strain reliefs.

### CAUTION

**Note: Power supply service must be within allowable range (+10% - 5%) of rated voltage stamped on the unit rating plate.**

2. Connect the wires to the input side of the internal breaker or terminal block and pay careful attention to (+) and (-) polarity.
3. Install the ground wire on the ground lug.

## **⚠ CAUTION**

**The external breaker(s) that provide power to the unit must be sized per the maximum Fuse Size (MFS) shown on the Unit's data label.**

### **48 VDC Wiring**

The DAC and WAC units requires 48 Volt DC power to operate the air movers and the free cooling damper motor. The control board in the WAC powers the 100% DC free cooling damper.

1. If the unit is powered, remove DC power to the WAC by switching the breakers in the shelter to the OFF position. Size a 2 conductor wire 12 AWG cable per NEC standard. Connect the cable between a DC breaker in the DC power plant and the DC breaker in the WAC unit. The DC breaker in the WAC is located inside the unit control box.
2. Size the DC conductor wires per NEC standard. Distances of up to approximately 30 feet (9 meters) require a 12AWG feed. For distances greater than 30 feet (9meters), size the DC wire accordingly. Wire sizes 14AWG thru 10AWG shall be TelcoFlex®III or KS24194®L3 type wiring. Wire sizes 8AWG or larger shall be TelcoFlex®IV or KS24194®L4 telecommunications type wiring. All wire connections to the DC power plant must utilize 2-hole compression lugs sized per the wire being installed. 1-hole lugs are prohibited unless the DC plant cannot accommodate 2-hole lugs. Connect the cable between a DC breaker in the DC power plant and the DC breaker in the air conditioner. The DC breaker in the air conditioner is located on the right side of the bank of breakers.
3. Install a 20A DC breaker in the power plant. Breaker will be supplied by the end user or local market for the applicable DC power plant.
4. Prior to turning on the breaker in the DC power plant, ensure the 48 VDC polarity is correct.

### **Verifying Polarity at the WAC unit**

1. Turn the DC breaker/disconnect in the air conditioner to the OFF position.
2. Turn DC breaker in the shelter's DC power plant to the ON position.
3. Place the RED test probe on the + (positive) terminal and the BLACK probe on the – (negative) terminal at the top of the breaker/disconnect as shown below.



DC Field Voltage  
Connections at Top of the  
Breaker

DC Field Voltage  
Connections at Bottom of  
the Breaker

4. If the test meter reads a NEGATIVE voltage turn OFF the DC power to the breaker/disconnect and reverse the power leads on the input of the DC breaker in the air conditioner.



5. Turn DC breaker in the shelter's DC power plant to the ON position.



6. Repeat step 3 to make certain that the DC power is POSITIVE voltage.
7. When the test meter reads POSITIVE, the DC breaker/disconnect in the WAC can be switched to the ON position.

The CoolLinks™ 2.0 controller requires a 5A DC breaker in the DC power plant rather than the 20A breaker necessary for each air conditioner. Other than breaker size, the steps for installation and verification of the 48 VDC supply to the CoolLinks PLC controller are similar to the above steps.

## 4.2 Installation of the CoolLinks™ 2.0 Controller

Installation instructions for the CoolLinks controller are in Appendix A and the CoolLinks enclosure.

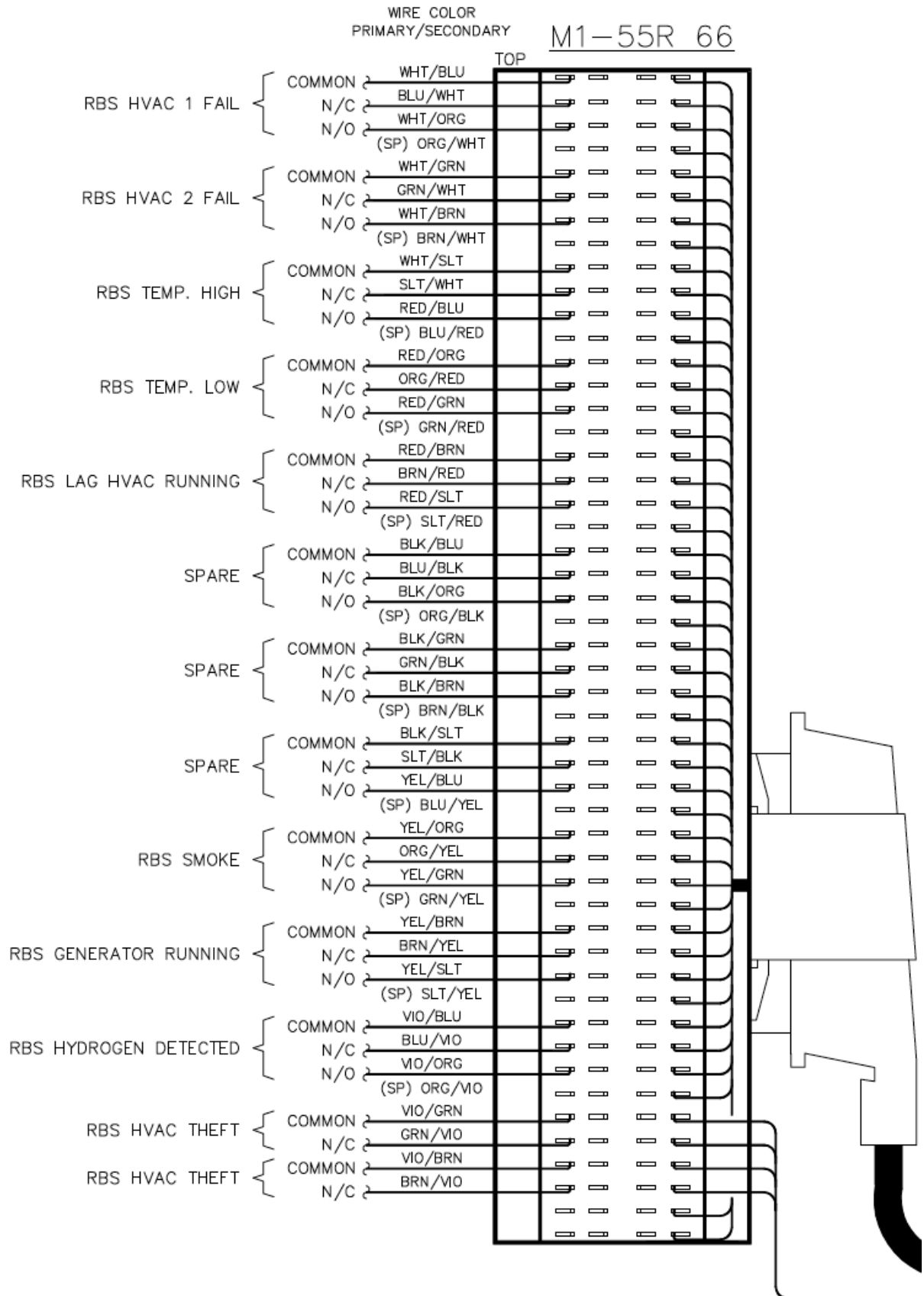


Figure 9. CoolLinks Punch Down Block

# Chapter 5 Troubleshooting

## 5.1 Overview

A comprehensive understanding of the operation of the DAC/WAC is a prerequisite to troubleshooting. Please read the Chapter 1 for basic information about the unit.

WAC cooling units are thoroughly tested before they are shipped from the factory. Although unlikely, it is possible that a defect may escape undetected, or damage may have occurred during transportation. However, the great majority of problems result from installation errors.

If you experience difficulties with your WAC unit, please review the installation steps in Chapter 2.

Much time can be saved by taking a thoughtful and orderly approach to troubleshooting. Start with a visual check - are there loose wires, missing parts, etc? Begin deeper analysis only after making this initial inspection.

The troubleshooting information in this manual is basic.

Not every problem can be anticipated. If you discover a problem that is not covered in this manual, we would be very grateful if you would bring it to the attention of our service department for incorporation in future revisions.

As always, please exercise caution and good judgement when servicing the unit. Use only safe and proven service techniques.

## 5.2 Failure Symptoms Guide

PROBLEM/SYMPTOM	LIKELY CAUSE(S)	CORRECTION
A. Unit does not run.	<ol style="list-style-type: none"> <li>1. Power supply problem.</li> <li>2. Tripped internal disconnect.</li> <li>3. Unit off.</li> <li>4. Internal component or connection failure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check power supply for adequate phase and voltage. Check wiring to unit and external breakers or fuses.</li> <li>2. Check internal circuit protection devices for continuity.</li> <li>3. Check power to unit.</li> <li>4. Check for loose wiring. Check components for failure.</li> </ol>
D. Unit blows fuses or trips circuit breaker.	<ol style="list-style-type: none"> <li>1. Inadequate circuit ampacity.</li> <li>2. Short, loose, or improper connection in field wiring.</li> <li>3. Internal short circuit. Loose or improper connection(s) in unit.</li> <li>4. Excessively high or low supply voltage..</li> <li>5. Check for polarity (+48VDC)</li> </ol>	<ol style="list-style-type: none"> <li>1. Note electrical requirements in Chapter 2 and correct as necessary.</li> <li>2. Check field wiring for errors.</li> <li>3. Check wiring in unit. See wiring and schematic diagrams. Test components (especially the compressor) for shorts.</li> <li>4. Note voltage range limitations specific to the WAC.</li> <li>5. Correct polarity to +48VDC</li> </ol>

# Chapter 5 Maintenance

## 5.1 Scheduled Maintenance

Marvair strongly recommends that the air conditioner be serviced a minimum of twice a year – once prior to the heating season and once prior to the cooling season. At this time the filters should be serviced as described below. Also at this time, the WAC unit should be operated as described in Chapter 3, Start-Up. In addition to this seasonal check-out, the WAC should be maintained as follows:

### Air Filter

Replace the air filter whenever it is visibly dirty. Never operate the unit without the filter in place.

### Cabinet

The cabinet may be cleaned with a sponge and warm, soapy water or a mild detergent. Do not use bleach, abrasive chemicals or harmful solvents.

### Lubrication

Fan motor and damper actuator are sealed and do not require oiling/lubrication.



**Sever hazard. This unit contains moving parts capable of causing serious injury or death. Disconnect power before removing the covering panel.**



# Appendix A

## CoolLinks 2.0 Controller Installation

### Installation Notes:

- 1. If no termination of alarms, set “Dayton” at 98 degrees.
- 2. Labeling note: Reference to P-tag kit for labeling.

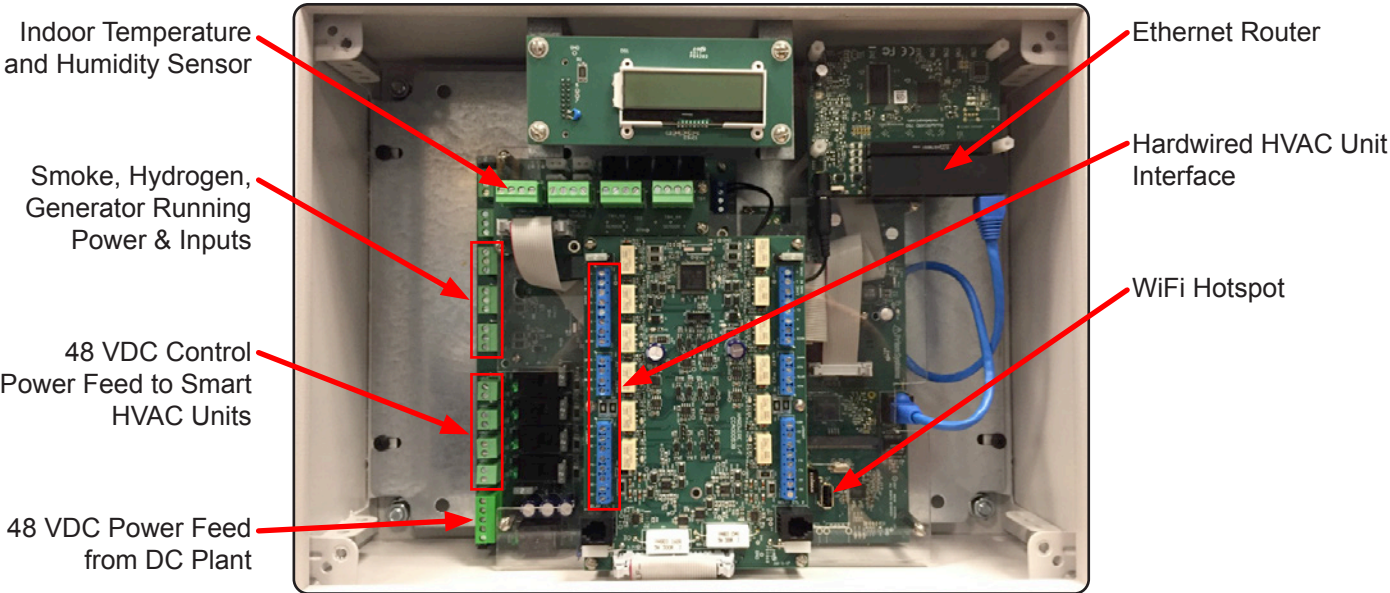


Figure 1a. CoolLinks Controller Connections

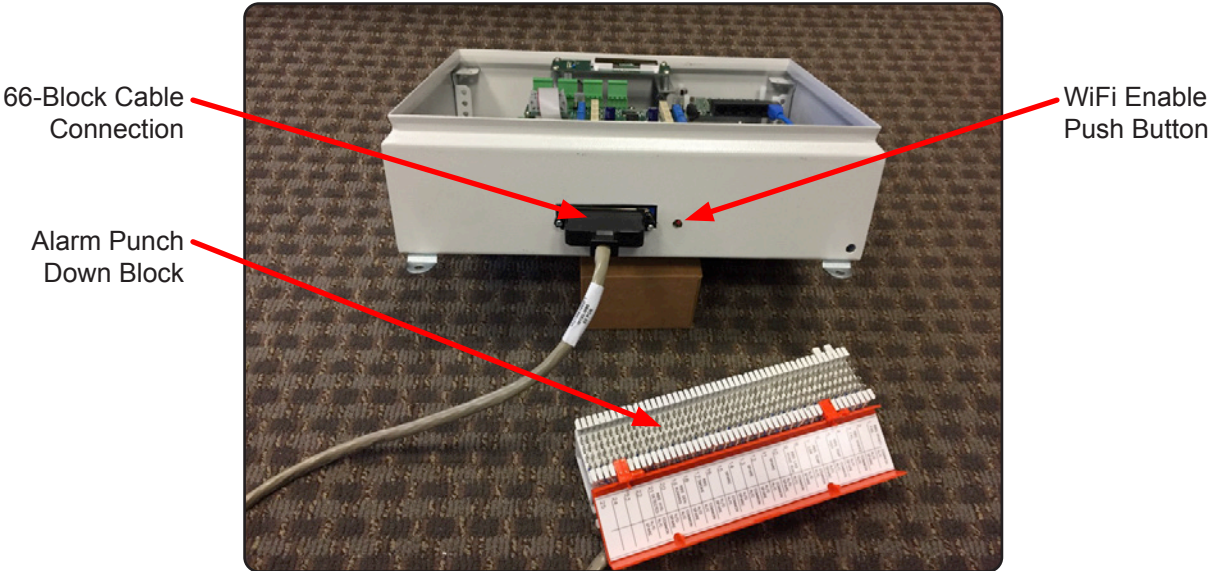


Figure 1b. CoolLinks Controller Connections

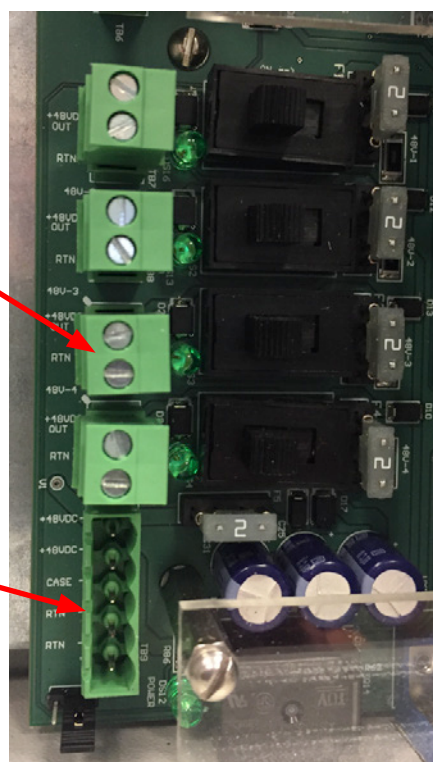


Four independent 48VDC power feeds to CoolLinks-equipped HVAC controllers.

- Maximum 2A per feed with individual switch and LED indication.
- Separate 2A removable automotive fuse.
- Feed automatically disabled if smoke detected to ensure shutdown of CoolLinks HVAC units.
- Removable terminal block to simplify field wiring connections.

48-60VDC 2A power feed from DC Plant.

- Polarity protection: controller will not power-up if polarity is reversed.
- Separate 2A removable automotive fuse.
- Removable terminal block to simplify field wiring connection.



**Figure 2. CoolLinks Power Distribution**

General purpose Aux1 & Aux2 inputs

- Normally-closed contacts.
- Supplies +24VDC & 24 VDC Return.
- Removable terminal blocks.

Generator Running input

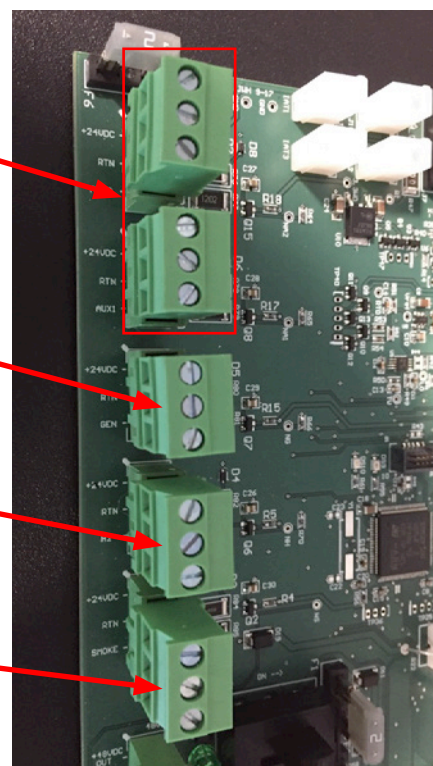
- Normally-closed contact.
- Supplies +24VDC & 24 VDC Return.
- Removable terminal block.

Hydrogen detector input

- Normally-closed contact.
- Supplies +24VDC & 24 VDC Return.
- Removable terminal block.

Smoke detector input

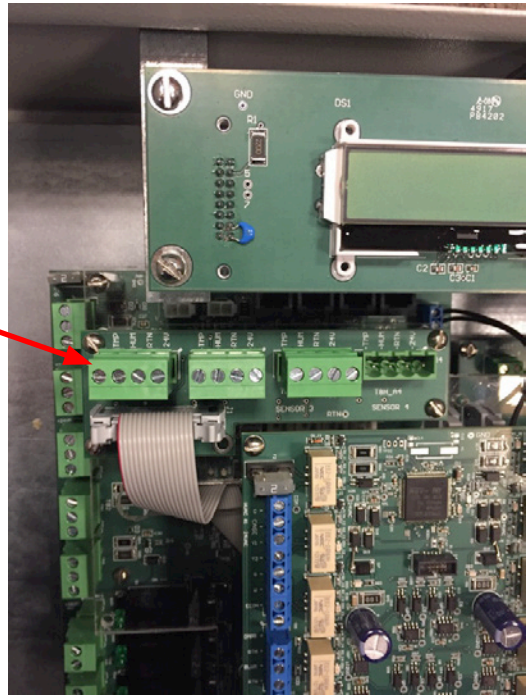
- Normally-closed contact.
- Supplies +24VDC & 24 VDC Return.
- Removable terminal block.



**Figure 3. CoolLinks External Equipment**

Inside temperature & humidity sensor

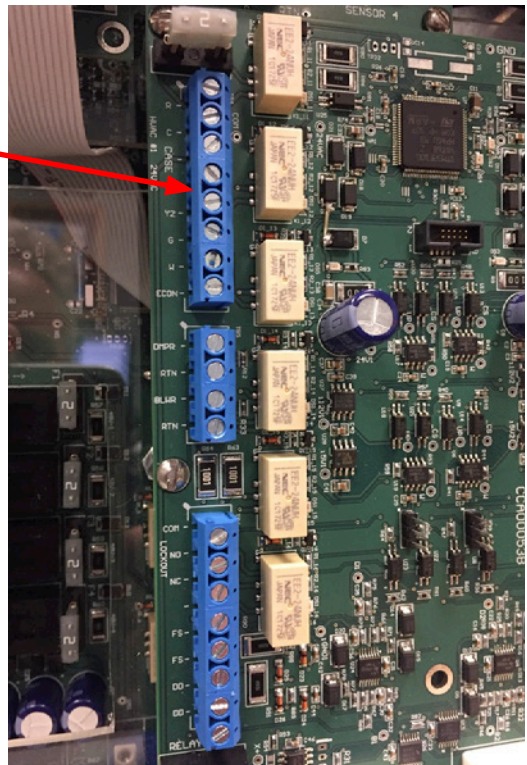
- Temperature, 0-10VDC, 32–122F.
- Humidity, 0-10VDC, 0–100%.
- Supplies +24VDC & 24 VDC Return.
- Removable terminal block.
- Up to four independent sensors.



**Figure 4. CoolLinks Sensors**

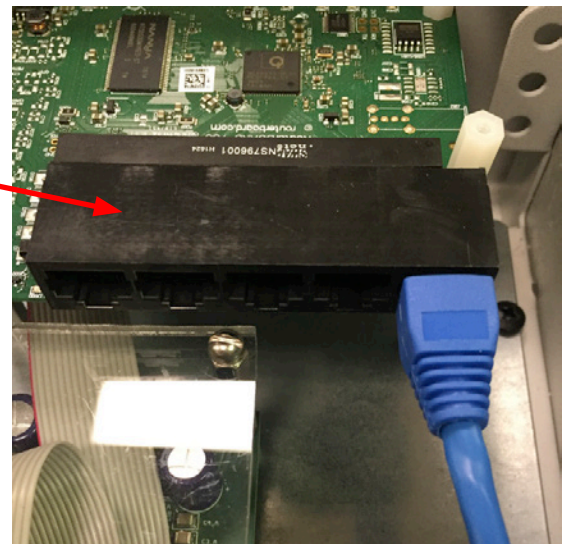
Hardwired interface to control mechanical cooling and heating functions for third-party HVAC units.

- Minimum five-wire connection as follows:
  - R – 24VAC power from HVAC unit transformer
  - C – 24VAC neutral from HVAC unit transformer
  - Y1 – Call for cooling to HVAC unit
  - G – Call for evaporator blower to HVAC unit
  - W – Call for heating to HVAC unit
- Remaining connections for future use
- Supports two hardwired interfaces



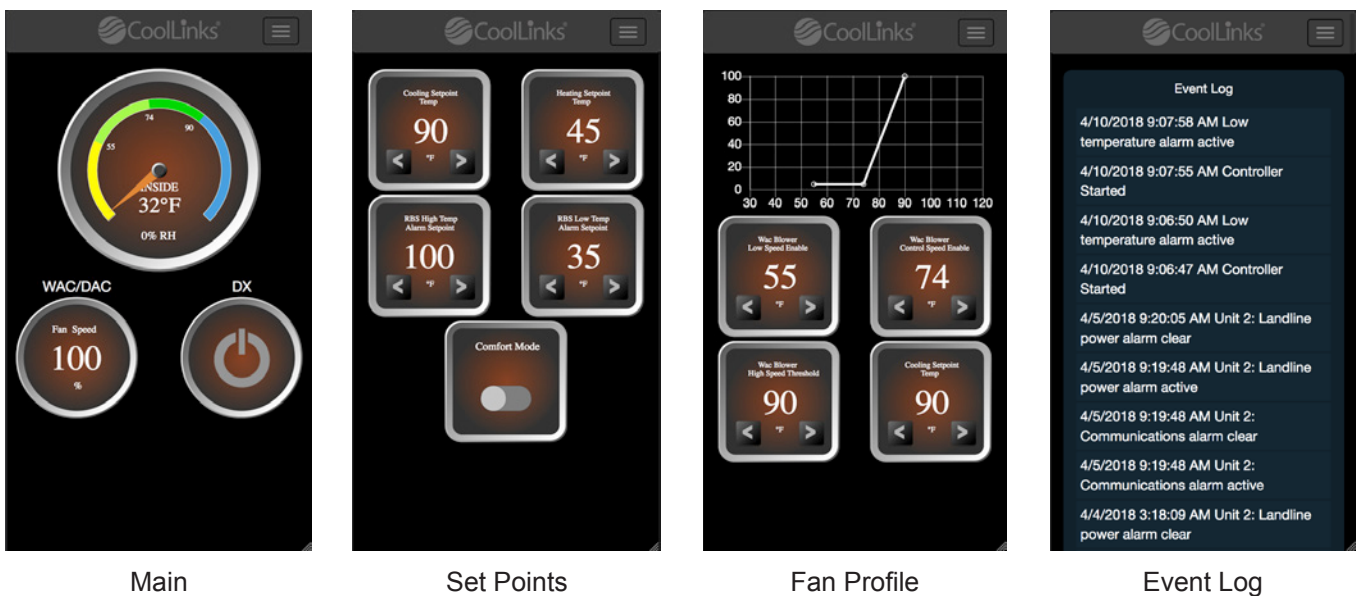
**Figure 5. CoolLinks Hardwired Interface**

- Five-port Ethernet switch supports up to four CoolLinks-equipped HVAC units (WAC, DAC, DX unit).
- One port can be configured for external WAN access with port forwarding.
- Optional additional five-port switch can be added to support further HVAC units.



- Pressing push button enables NGCL WiFi hotspot for 30 minutes for access to user interface through smart phone or tablet.
- Note:** WPA2 password is *prismsystems* (all lower case).

**Figure 6. CoolLinks Network and WiFi Interface**



Main

Set Points

Fan Profile

Event Log

**Figure 7. CoolLinks Mobile App User Interface**



# Appendix B

## WAC Filter System Maintenance

### 93220 & 93218 Filter Replacement

These instructions show the required tools, supplies and methods to properly clean the Marvair DAC/WAC Filter Systems.

This appendix will explain recommended intervals between cleaning and replacement of the filters used in the Marvair DAC & WAC equipment.

Filter cleanings are recommended annually to optimize WAC/DAC efficiency. The preferred timing is just after the pollen season to ensure that both the intake bug screens as well as the filters are optimally cleaned.

Replacement of filter cartridges is expected at a 2-3 year interval. These intervals can vary dependent on the level of contamination at an individual site.

### IMPORTANT

**DAMAGED OR TORN FILTERS MUST BE REPLACED!**

**ORDERING DETAILS ARE FOUND ON THE LAST PAGE OF THIS APPENDIX.**

The system provides for a filter clog alarm with a Normally Closed alarm output on the Power and Alarm interface panel and a LED on the front panel of the fan tray. For this application, the filter clog alarm is reported as a WAC/DAC Control Fail.

#### Required Tools:

1. Screwdrivers (flat head & Phillips head)
2. Nut driver set
3. Pump sprayer with 2 to 5 gallons of fresh water or water tank with garden hose & sprayer

#### Filter Types:



**93220**



**93218**

There are two filter types available for the WAC Wall Ambient Cooling System:

1. 93220 –MERV 16, Potted Aluminum Frame, Salt Fog Compliant Cassette for sites within 3 miles of the ocean.
2. 93218 –MERV 14, Plastic Frame for all other applications.

## Major Component Identification:



**WAC Exterior**



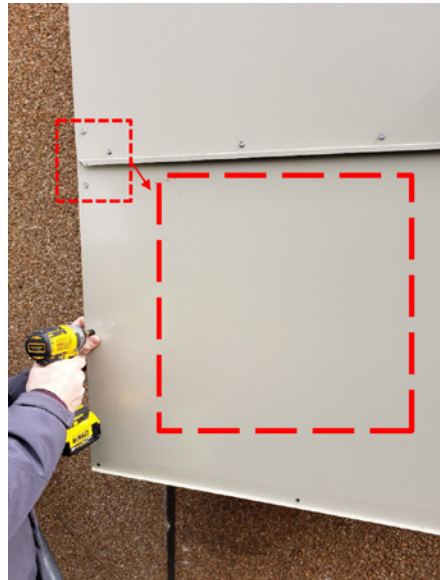
**Filter Cover**



**Filter Under Cover**

### Step 1: Locate the Filter Cover of WAC System

1. Confirm the Controller is in AC mode so the WAC will not be running during maintenance.
2. Remove the fasteners holding of the bottom half of the unit.



3. Place fasteners in a secure place as they can be easily lost.

## Step 2. Remove Cover & Expose the Filter

1. After removing the fasteners, the cover will pull away at the bottom and then down out from under the upper cover.



2. Place cover in safe out of the way location.
3. The filter will be exposed.



### Step 3. Remove the Filter

1. There are two angle iron brackets holding the filter down. These will need to be removed to remove the filter.
2. They have fasteners holding them in place which will need to be removed from the outside of the unit.



3. Keep fasteners safe together with the cover screws.
4. Remove the angle irons hold the filter down then remove the filter.





#### Step 4. Clean Intake Housing

1. Using a pump sprayer and cleaning brush, work all of the dirt and debris from the intake inlets.



2. Rinse out top and bottom sides completely.
3. Once cleaned, the filter can be replaced.

#### Step 5. Replacing the Filter

1. Replace the filter in the housing with the gasket up and the label arrow pointing in the direction of the air flow (upward).



2. Then re-install the angle iron brackets to hold the filter in place.

### **Step 6. Re-assembling the WAC Housing**

1. Carefully slide the lower cover up under the upper cover.



2. Then align so a fastener can be installed but not tightened. TIGHTENING a fastener all the way before they are all in can result in a mis-alignment which can be avoided by installing them most of the way allowing the cover to float and align for the next fastener.
3. Once all fasteners are installed then tighten them all the way. Use care not to overtighten. Overtightening can cause the fasteners to strip the threads in the sheet metal covers.

### **Step 7. Reset the Controller to Normal Run Mode**

# Appendix C

## WAC Filter System Type Identification

The Marvair DAC/WAC units are equipped with one of two filter systems:

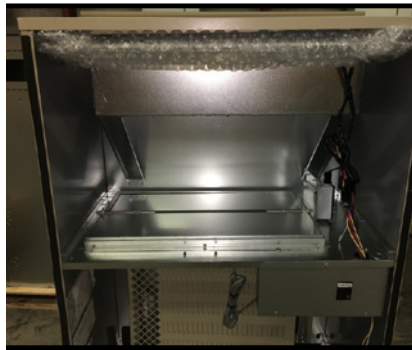
1. Standard Filter Package
2. Coastal Filter Package "K"

The purpose of this appendix is to assist in identifying which package is installed in a WAC/DAC unit. Use the photos below to identify the installed filter package.

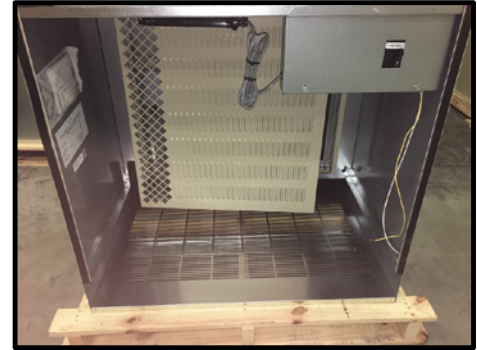
### Standard Filter Package



Full View



Above the Divider

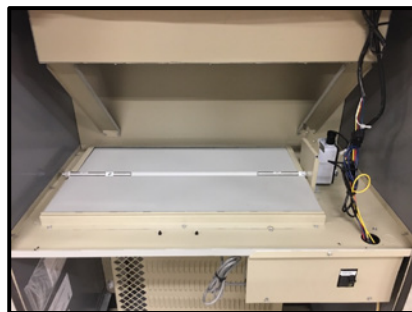


Below the Divider

### Coastal ("K") Filter Package



Full View



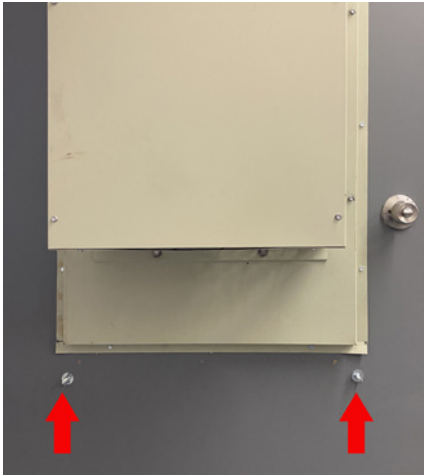
Above the Divider



Below the Divider

# Appendix D

## DAC Filter Replacement



1

From inside the shelter/enclosure, remove the two wing nuts and washers at the bottom of the DAC unit.



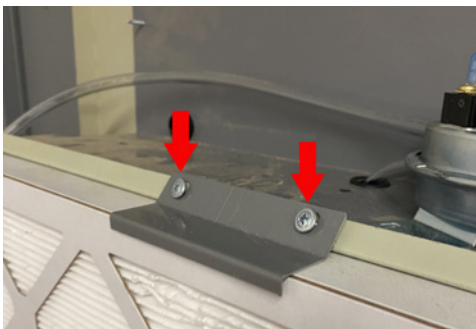
2

From outside the shelter/enclosure, remove the two carriage bolts at the bottom of the DAC unit.



3

To access the filter, tilt the air Intake Hood from the bottom out, then lift up to remove from the DAC unit.



4

Using a phillips head screwdriver, loosen the two screws on the filter retainer bracket.

**Note:**

It is not necessary to completely remove the screws/bracket.





5

Lift the filter retainer bracket and tilt the filter out to remove it. Install the new filter.



6

When installing the new filter, be sure to make note of the proper orientation. The "Air Flow" arrow and sealing gasket must face toward the DAC unit.



7

Reassembly is the reverse of removal.

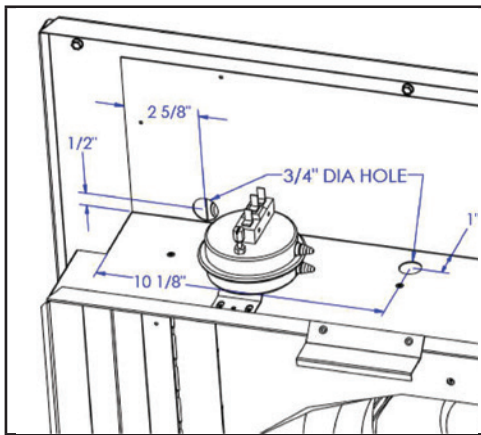
**Note:**

When reinstalling the Air Intake Hood, be sure that the inner flange is hooked over the flange on the DAC unit.



# Appendix E

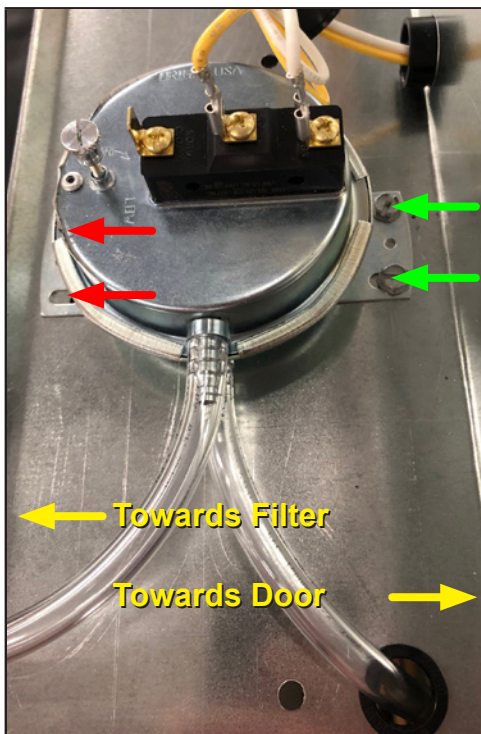
## DAC Field Installed Dirty Filter Switch



1

Remove exterior hood to gain access to filter frame.

Drill (qty. 2) 3/4" Holes for routing hose and wiring. Use the dimensions shown for drill hole locations.



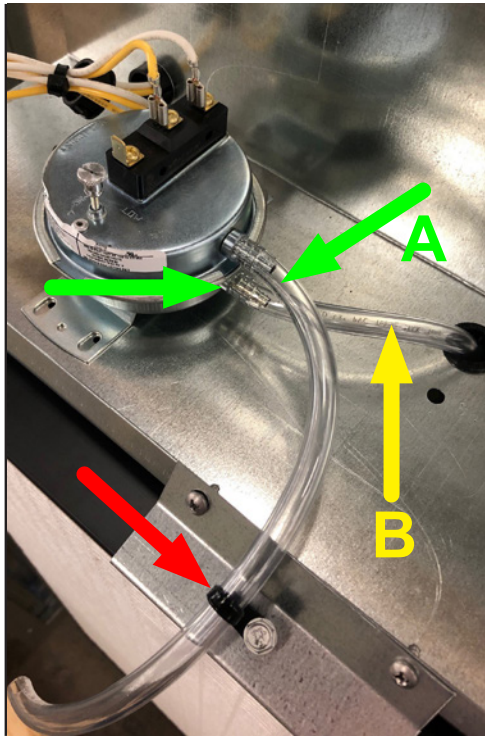
2

Mount the differential pressure switch to the top panel of the filter frame as shown (green arrows). Use the holes on the back side of the pressure switch mounting bracket for mounting with drill point screws.

**Note:**

Mounting holes towards the filter will not be used (red arrows).





**3**

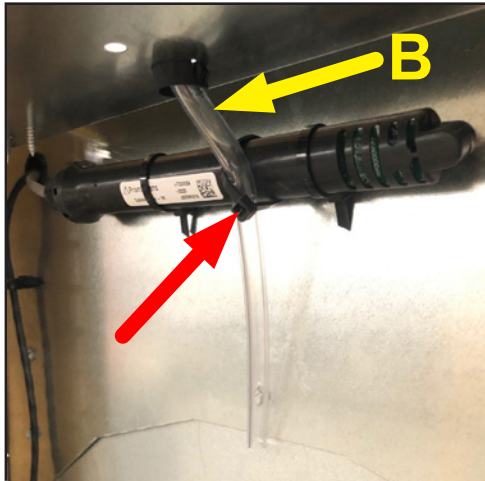
Route hose "A" (green arrow) and hose "B" (yellow arrow) as shown.

Hose "A" should be routed in front of the filter and secured with screw down wire tie.

Hose "A" (top hose) in front of filter

Hose "B" (bottom hose) behind filter

Secure with screw down wire tie (red arrow).

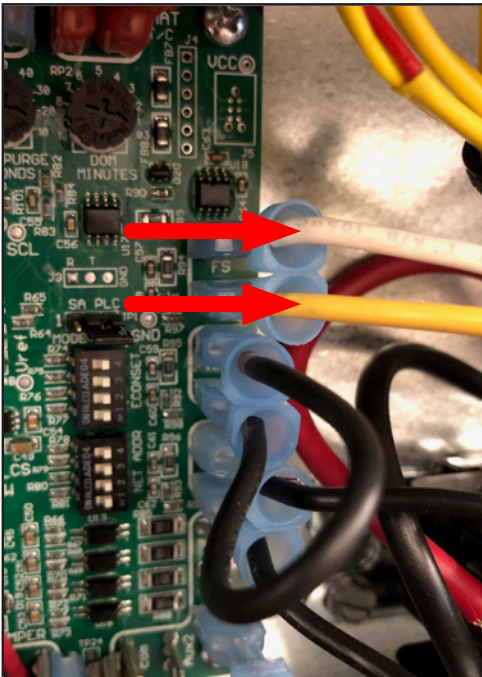


**4**

Hose "B" (yellow arrow) routes below top filter frame and is secured with a wire tie (red arrow) as shown to the existing outdoor temperature sensor.

**Note:**

Filter removed to show hose location.



**5**

Connect wires from pressure switch (red arrows) to the control board "FS" terminals inside the DAC system (green arrow).



**6**

Insert snap bushing in previously drilled hole (red arrow) and route wires from the pressure switch through the hole and into the control box area of the DAC system.