



# Literature Assembly 911-0825

Contains the following:

2100-034(G)	User's Guide
2100-479	Leak Test, Evacuation, Charging
2100-383(D)	QWV Installation Instructions
2100-738(F)	QW*S3 Installation Instructions





# USER'S APPLICATION GUIDE AND TECHNICAL PRODUCT OVERVIEW

Manual: 2100-034G  
Supersedes: 2100-034F  
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[BARDHVAC.COM](http://BARDHVAC.COM)

Climate Control Solutions

## General Information

The User's Application Guide covers a wide range of heating and cooling products manufactured by Bard Manufacturing Company. It is intended to be a general guide for care and operation of typical systems and covers the most important features you should be aware of and are responsible for as the user of the equipment.

Because our product offerings are so varied and can be equipped with many features and options, it is not possible to cover all aspects of what your specific system may be configured for. Some systems may be quite simple in features to provide basic cooling and possibly heating, while other systems may also incorporate various ventilation technologies, dehumidification circuits and many different internal controls as well as room temperature controls. Therefore, you should request a detailed operation sequence and explanation of any special features from your installer and/or service company and also have them instruct you as to any routine maintenance procedures you are responsible for.

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The User's Application Guide and Technical Product Overview covers the following products:



WALL MOUNT  
Air Conditioners  
and Heat Pumps



I-TEC®  
Air Conditioners  
and Heat Pumps



Q-TEC™  
Air Conditioners  
and Heat Pumps

The User's Application Guide and Technical Product Overview covers the following topics:

- Documentation provided by Bard for proper use of your new product.
- Unit installation guidelines.
- Routine unit maintenance.
- Unit operation.
- Unit troubleshooting.

Please use this guide as a general overview regarding unit application, maintenance and troubleshooting. Refer to product installation instructions and supplemental documentation provided with the unit or go to [www.bardhvac.com](http://www.bardhvac.com) for detailed individual product information.

## Documentation

There are two sources of valuable information for your new Bard product:

- Documentation provided with your unit, normally located inside the unit control panel during shipping. This information should be saved once the unit is installed for future maintenance reference or to answer questions about equipment after installation.
- Documentation provided on the internet at [www.bardhvac.com](http://www.bardhvac.com). This may be accessed from a desktop computer at the office, a laptop or an internet-capable cell phone at the worksite. Up-to-date documentation is available, along with specification sheets and other valuable resources regarding your new Bard product.

### **Unit Literature Assembly – Documentation Provided with Your Unit**

Bard products are shipped with documentation that when used by a technician with cooling and heating knowledge, can ensure that your product is installed safely, performs optimally and achieves the longest life cycle possible.

Shipped literature includes the following:

- User Manual (this document)
- Installation Instructions
- Replacement Parts Manual
- Wiring Diagrams
- Warranty Information

Installation plays a key part in unit functionality, performance and safety. Product securing and placement, duct design and supply/return location, electrical routing and condensate and defrost drainage all play key roles in making sure a unit will perform per the design specifications.

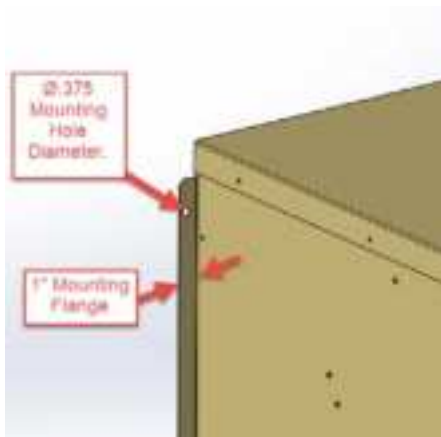
## WALL MOUNT Products – Mounting the Product on a Wall Surface



Outdoor products are normally mounted to an exterior wall surface, including brick, cement block, metal or wood construction. These products are labeled as “WALL MOUNT” units. **Before installation begins, the wall surface should be inspected by a construction professional to ensure it will support the weight of the unit and accessory items.** Approximate weights are available from the product specification sheet, and a safety factor should be designed into the installation. Typical fasteners to attach the unit to the wall using the integrated mounting flanges on both sides of the unit include tap cons, bolts, studs and other fastening devices. The selection of the fasteners to be used needs to be reviewed by a construction professional and decided upon based on the wall construction and fastener strength required. It is important to follow all guidelines and procedures covered in the installation instructions manual provided for the product.

### Built-In Mounting Flange Detail:

Outdoor WALL MOUNT products include a mounting flange that is part of the cabinet construction. Ø.375" holes are provided for unit mounting unless specified otherwise in installation instructions.



### Specification Sheets:

Unit specification sheets provided at [www.bardhvac.com](http://www.bardhvac.com) include basic unit weights and dimensions (see example below). Ventilation options and other accessories must be added into the total weight of the unit.

### Specification Sheet Example

W/FILTER (KATED-WET UNIT)	
Filter Sizes (inches) STD.	16x25x1
<b>Basic Unit Weight-LBS.</b>	<b>318</b>
Barometric Fresh Air Damper	3.5
Blank-Off Plate	1.0
Motorized Fresh Air Damper	10.0
Commercial Room Ventilator	69.0
Economizer	69.0
Energy Recovery Ventilator	50.0

## **WALL MOUNT Products – Clearances for Outdoor Condenser Fan Airflow**

Unit placement and avoidance of obstructions outside the structure are very critical to unit performance. **Avoid installing the unit in areas that will obstruct outdoor condenser fan airflow or create “pockets” of heated air being exhausted from the condenser coil.** Solid construction fences should not be placed directly in front of the unit without provisions for condenser airflow. Solid exterior walls need to be spaced as far away from units as possible to avoid pockets of heated air causing condenser air recirculation.

Solid barriers located too close to the face or side surfaces (condenser fan inlet and outlet) of the WALL MOUNT can both impede airflow and force heated air to short circuit (be returned) from the condenser outlet to the condenser inlet. Either condition will effectively raise the condensing temperature and pressure reducing cooling capacity and efficiency. In extreme cases, the unit may fail to operate due to high refrigerant pressures inside the unit, and compressor and/or fan motor failure may occur. Clearances given in installation instructions ensure components can be serviced and maintenance can be performed when needed.

National and local electrical codes must be reviewed before unit installation.

Always use common sense when installing products, follow unit clearances given in the installation instructions and contact local Bard distributors when additional knowledge is needed regarding unit clearances for proper unit functionality.

## **WALL MOUNT Products – Clearances for Indoor Supply and Return Airflow**

The Bard unit should be placed in an area where the supply (leaving conditioned air) and return (unit air intake) air paths will be unrestricted. Avoid placing objects in the structure within 24" of the return (unit air intake) grille. Avoid placing objects directly in the path of the supply (conditioned) air grille. This will inhibit the “throw” of the supply air throughout the structure and reduce the cooling and/or heating ability of the unit; in extreme cases, this may cause evaporator coil freezing issues. Supply air must be able to freely circulate conditioned air throughout the structure. Adjustment of supply grille deflectors is often necessary to ensure proper room circulation.

Ducted applications should not exceed the rated duct static pressures given in the unit specification sheets. Special requirements for duct construction and distances to combustible materials need to be followed per the installation instructions when electric heating is used.



## WALL MOUNT Products – Condensate and Defrost Drainage

Condensate drainage for air conditioning units needs to be planned before installation. Your new Bard WALL MOUNT product includes provisions to allow condensate water to exit the bottom of the unit. If condensate water is to be routed away from the unit, adequate drain sizing needs to be provided to allow proper drainage for condensate water generation. During normal air conditioning operation, large amounts of condensate water is generated inside the unit as moisture is extracted from the supply air. This is collected in an evaporator pan and drained to either a drainage system (indoor products) or outside the unit cabinet (outdoor products). Evaporator drain traps are not necessary for any of our wall mounted outdoor products, and the use of “standing water” U-shaped traps may be prone to freezing in certain climate zones.

Defrost water drainage from heat pump units needs to be planned before installation. During seasons requiring heating operation, the unit will need to warm the condenser coil to remove frost build-up (defrost). **Outdoor heat pump products include holes in the unit base under the condenser coil for proper water drainage when in the heating defrost cycle. Avoid placing the unit on a pad or blocking the base drainage holes under the condenser coil without proper allowances (6" recommended) for water drainage due to damage caused by freezing conditions.** Without proper drainage, defrost water may freeze causing ice build up and damage the lower portion of the condenser coil.

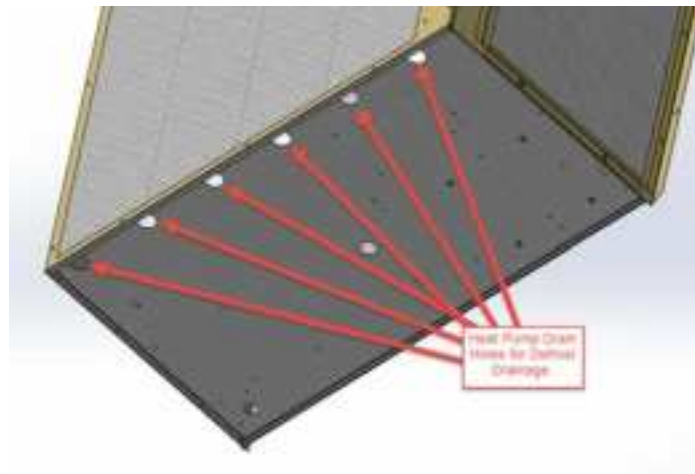
### Condensate Water Drainage:

Unit condensate water exits the base of the unit during cooling operation.



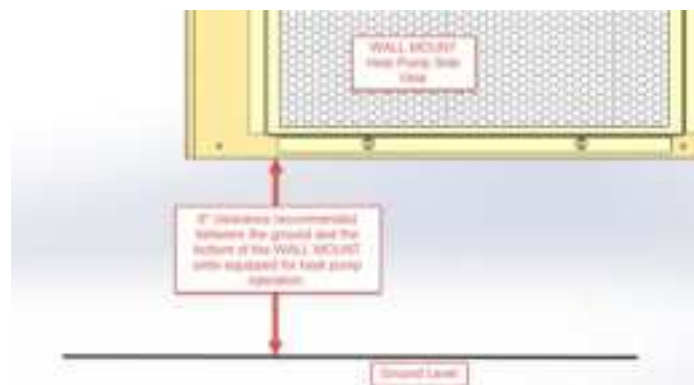
### Defrost Water Drainage:

Holes are provided in the front of the unit base for heat pump condensate water drainage.



### Defrost Water Drainage:

6" clearance is recommended under WALL MOUNT Heat Pump products to allow proper defrost water drainage.



## I-TEC and Q-TEC Products – Installing the Product Inside a Room



I-TEC



Q-TEC

Indoor products are normally supported by the floor surface and are adjacent to an interior wall surface, including brick, cement block, metal or wood construction. These products are normally labeled as “I-TEC” or “Q-TEC” units. **Before installation begins, the floor surface should be inspected by a construction professional to ensure it will support the weight of the unit and accessory items.** Approximate weights are available from the product specification sheet, and a safety factor should be designed into the installation.

A sheet metal sleeve is normally installed in the wall allowing vent and condenser fan air to enter and exit the unit. Different sleeve depths are available for installation into various wall depths. Typical fasteners to attach the sleeve to the outside surface of the wall include tap cons and other fastening devices. The I-TEC or Q-TEC unit is then slid up to the wall surface and connected to the sleeve using screws. Trim kits are available to enclose gaps between the wall surface and the unit. A louver grille is used to cover the external wall opening and fasteners used during sleeve installation.

### Wall Sleeve:

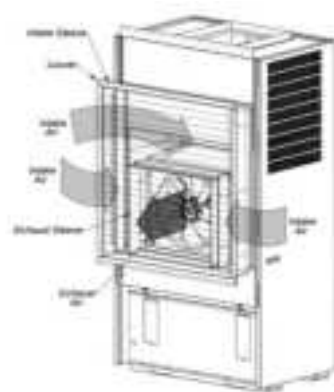
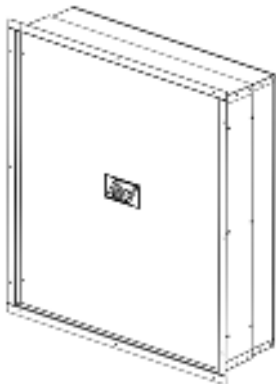
Wall sleeves allow for outdoor air to enter and exit the unit inside the room.

### Air Paths:

Air paths through the unit allow for cooling operation and fresh air to enter the structure (I-TEC shown).

### Louver Installation:

Outdoor louvers provide an esthetically pleasing look to the installation and cover the unit opening (I-TEC shown).



## I-TEC and Q-TEC Products – Clearances for Outdoor Condenser Fan Airflow

Solid barriers located too close to the face of the outdoor louver of the I-TEC or Q-TEC can both impede airflow and force heated air to short circuit (be returned) from the condenser outlet to the condenser inlet. Either condition will effectively raise the condensing temperature and pressure reducing cooling capacity and efficiency. In extreme cases, the unit may fail to operate due to high refrigerant pressures inside the unit, and compressor and/or fan motor failure may occur. It is recommended to allow 15' (457.2 cm) in front of unit louver for proper condenser airflow. Always use common sense when installing products, follow unit clearances given in the installation instructions and contact local Bard distributors when additional knowledge is needed regarding unit clearances for proper unit functionality.

## I-TEC and Q-TEC Products – Clearances for Indoor Supply and Return Airflow

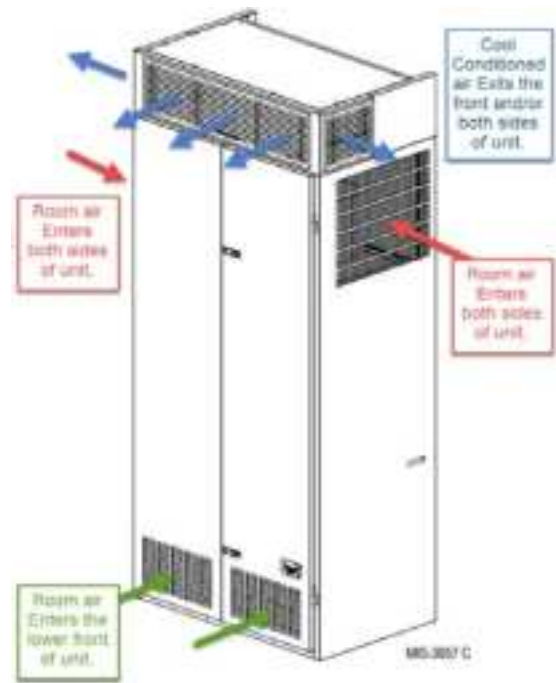
The Bard unit should be placed in an area where the supply (leaving conditioned air) and return (unit air intake) air paths will be unrestricted. Avoid placing objects inside the room within 24" of the return (unit air intake) louvers or grille. Avoid placing objects directly in the path of the supply (conditioned) air grilles. This will inhibit the “throw” of the supply air throughout the structure and reduce the cooling and/or heating ability of the unit and in extreme cases may cause evaporator coil freezing issues. Ducted applications should not exceed the rated duct static pressures given in the unit specification sheets. Special requirements for duct construction and distances to combustible materials need to be followed per the unit installation instructions when electric heating is used.

### I-TEC Air Path

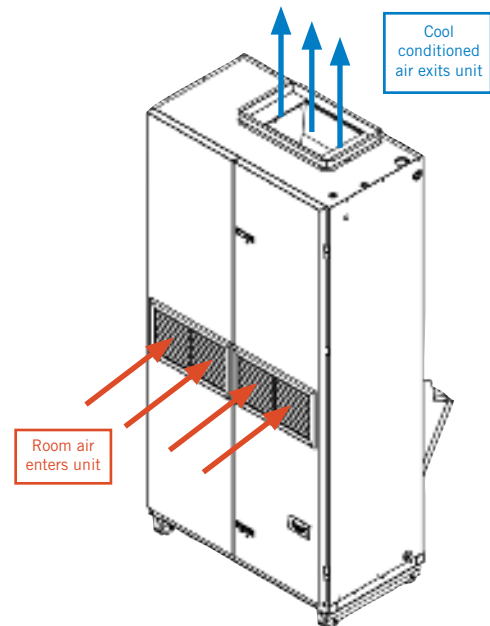
The I-TEC product has been engineered for extremely quiet unit operation and has multiple air paths for air entering and exiting the unit. Room air enters the upper sides to be conditioned (cooled) inside the unit and exits the unit top. The unit will either be ducted to supply registers or have a supply air plenum box installed. A supply air plenum box allows quiet operation without ducting the air leaving the unit. Room air also enters the bottom of both front doors during ventilation operation.

### Q-TEC Air Path

The Q-TEC product has been engineered for efficient, economical unit operation and has a mid-mounted front grille for air entering the unit. The unit will either be ducted to supply registers or have a supply air plenum box installed. A supply air plenum box allows quiet operation without ducting the air leaving the unit.



Typical I-TEC Installation



Typical Q-TEC Installation

The I-TEC and Q-TEC product installation instructions contain additional information regarding unit air paths and required clearances. This information may be accessed at [www.bardhvac.com](http://www.bardhvac.com).

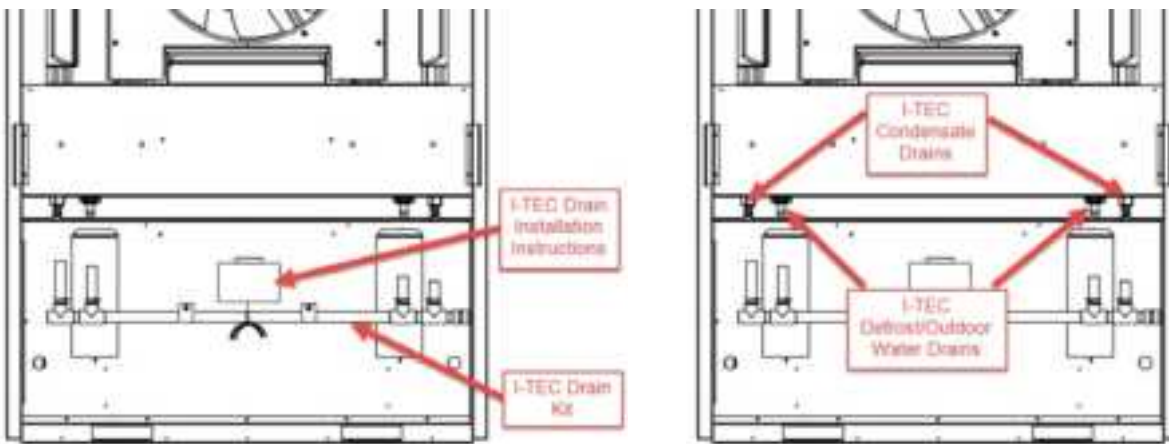
## I-TEC and Q-TEC Products – Condensate Drainage

Condensate drainage for Bard indoor cooling units is a very important part of unit installation. During normal air conditioning operation, large amounts of condensate water are generated inside the unit as moisture is extracted from the supply air. This is collected in an evaporator pan and needs to be drained to an external drainage system. Your new Bard product includes provisions to allow condensate water to exit the unit and fittings will need to be field supplied to connect the unit drain to the building. Adequate drain sizing needs to be provided to allow proper drainage for condensate water generation and restriction in drain lines should be avoided. Evaporator drain traps are not necessary unless required by local codes.

Defrost water for heat pump operation and outdoor water entering the condenser area also needs to be drained out of the unit. The I-TEC product uses a combined defrost and outdoor water drainage system. The Q-TEC has a combined defrost and evaporator drain connection unless an optional in-wall drain box is used. Outdoor water exits the Q-TEC through the wall sleeve. Follow all instructions provided in the unit installation instructions regarding drain connections and sleeve installation to avoid water leakage inside the building or structure.

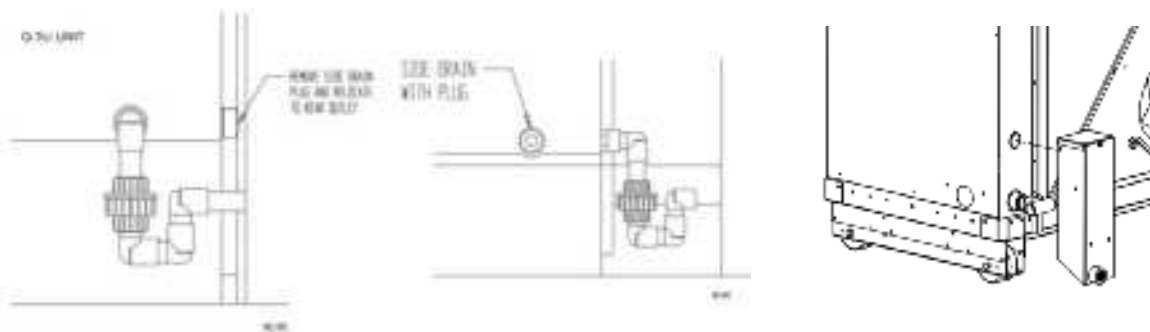
### I-TEC Drain System:

The I-TEC drainage system consists of a manifold drain kit that combines all drains behind the unit to allow connection to the building system.



### Q-TEC Drain System:

The Q-TEC drainage system consists of a lower right side or lower right rear connection fitting. An optional in-wall drain box may also be purchased as an accessory that allows separate evaporator and defrost water drainage.



Lower Right Side Drain

Lower Right Rear Drain

Optional In-Wall Drain Box

## All Products – Power Supply Verification

It is very important to follow all electrical and mechanical safety guidelines and instructions provided in the product installation instructions. Failure to do so may result in death, injury or product damage.

A proper power supply to your new Bard unit is very important. Be sure to verify the following with a multi-meter or other power measuring device before applying power to your Bard product.

### *Field-Supplied Voltage*

Electrical voltage ratings and proper voltage operating ranges are provided in the unit specification sheets and installation instructions. It is important that power supplied to the unit stay in the specified operating voltage range. Voltage above or below the minimum operating value given could result in improper unit startup, unit shutdown, low unit performance, improper thermostat and unit controller operation, compressor damage and premature failure of functional parts. As a general guideline, it is always best if the power source for the unit supplies the nominal electrical rating value given in the specification sheets, installation instructions and unit serial plate for the product being used. To do so will provide the best unit performance possible from your new Bard product.

### *Single and Three Phase Power*

Bard products are available in single and three phase power options. It is important to connect the proper phase listed on the unit serial plate. Three phase power is often used to reduce energy usage, and units rated for 3 phase operation are equipped with a phase monitor safety device. The phase monitor will not allow unit operation with improper phase connection and a red LED light on the monitor indicates phase wiring issues. Connecting 3 phase power to a single phase unit will result in component damage and improper unit operation. Connecting single phase power to a 3 phase unit will also result in component damage and improper unit operation.

### *Hertz (Frequency)*

Bard products are available in 50hz and 60hz power options. It is important to connect power with the proper hz value listed on the unit serial plate. 60hz power is often used in the United States and Canada and units rated for 50hz operation are normally for international sales outside of this area. Connecting 50hz power to a 60hz unit not rated for 50hz operation may result in component damage and improper unit operation. Some equipment may be rated for 50/60hz operation. Review the unit specifications and installation instructions for further information regarding the power requirements of the unit.

The product installation instructions and unit specification sheets contain additional information regarding unit electrical data. This information may be accessed at [www.bardhvac.com](http://www.bardhvac.com).

## Unit Maintenance

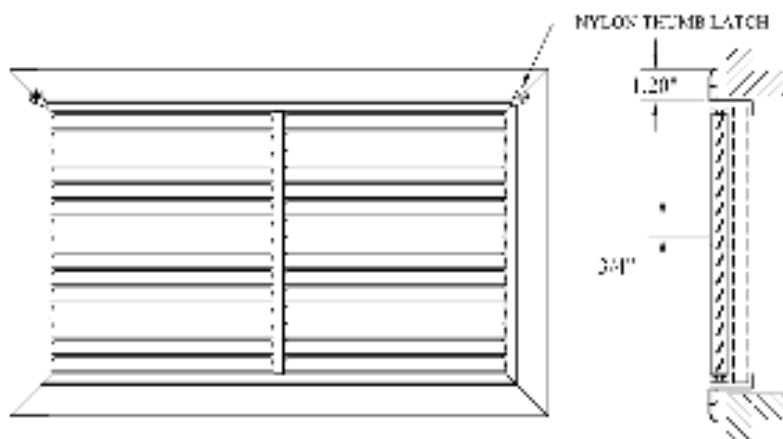
### All Products – Filters and Filter Servicing

All Bard products contain air filters that must be cleaned or replaced on a regular basis.

Keeping air filter(s) clean is the single most important responsibility of the user of the equipment. Each type of system must be equipped with an air filter(s) in the indoor circulating air system to clean the air, keep the system itself clean for peak efficiency and capacity and prolong the useful life of the equipment. DO NOT operate the system without the proper air filters. Filters should be inspected at least monthly and replaced or cleaned (depending on type) as needed. The useful life of an air filter can vary widely depending upon application and use of the equipment, and it is critical to monitor filter condition and establish an acceptable maintenance schedule. Failure to do so will increase operating and repair costs, decrease capacity and efficiency and shorten the service life of the equipment. A common symptom of a dirty filter in the cooling mode is a freeze-up of the indoor coil. The air filters used may be a disposable (throwaway) type or may be a cleanable type that can be thoroughly cleaned, rinsed and reused many times. It is important to make sure that the correct filter size and type for your system is always used. If there is any question as to acceptable filter size or type, review the installation instructions for the specific equipment involved, if available. Otherwise, consult with your installing dealer or service company. Most equipment can have the filters inspected and serviced by the user with no problems. In some instances, because of equipment design or specific installation conditions, it may be necessary to have this procedure done by a qualified service company. Have your installer or service company show you where the filter(s) are and demonstrate the service procedure or make arrangements for them to provide this service on an as-needed basis.

#### Outdoor Unit Wall Mount Room Air Filters

Wall mount filters are normally accessed from the outside of the building. Bard does offer a return air grille with a filter frame built-in for indoor filter access. The return air filter grille is not acceptable as the only source of filtration if vent options are installed in the wall mount unit.



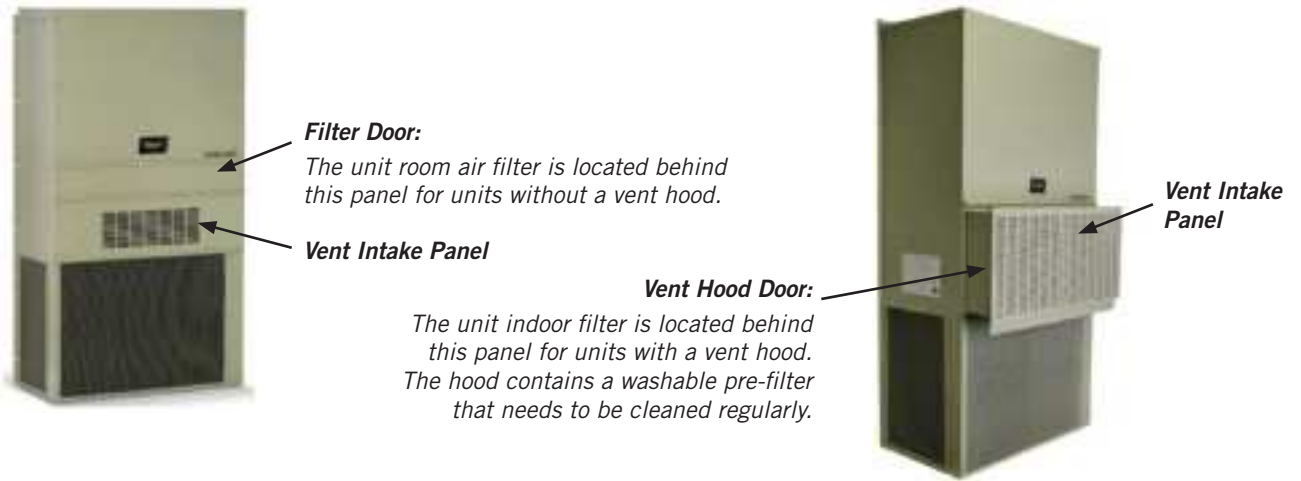
#### Return Air Filter Grille:

Bard offers the RFG return air filter grille, which may be used in applications where outdoor air is not brought into the structure through vent options. If vent options are used, the filter tray inside the Bard Wall Mount unit must be used.

The product installation instructions contain additional information regarding unit maintenance. This information may be accessed at [www.bardhvac.com](http://www.bardhvac.com).

## WALL MOUNT Products – Filters and Filter Servicing

The built-in filter tray and room air filters in the wall mount are located in the middle of the cabinet below the indoor blowers. Units with vent options will have a washable screen behind the vent intake panel.



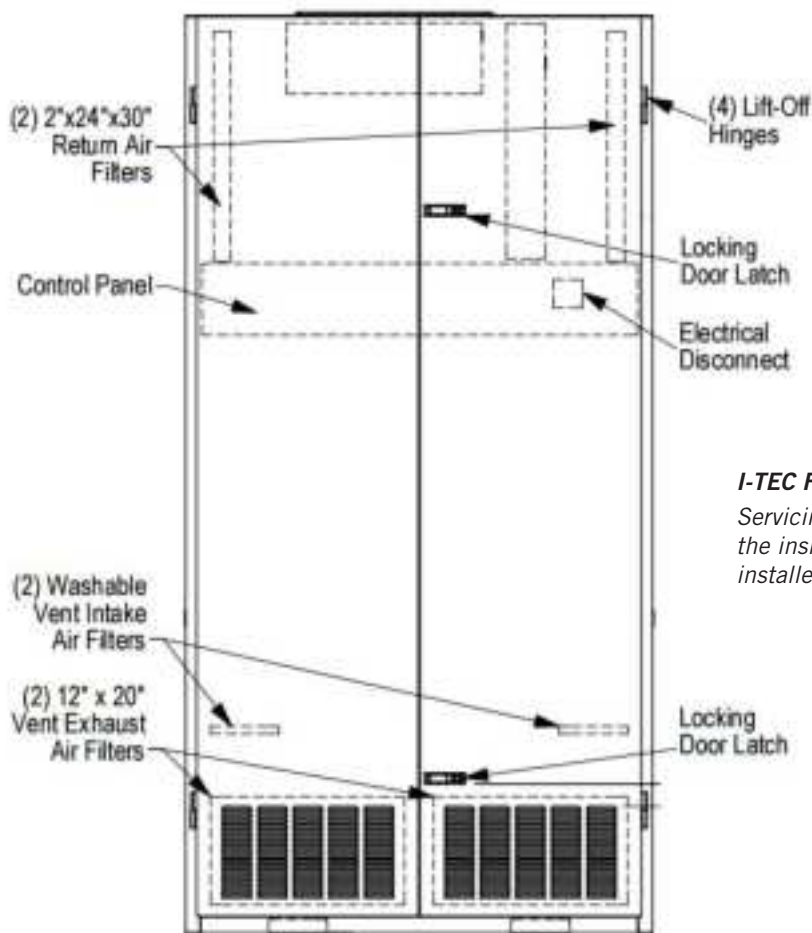
## I-TEC Indoor Products – Filters and Filter Servicing

The I-TEC indoor air conditioners and heat pumps have multiple filters that must be maintained and inspected when servicing the unit. Filters play an important part in proper unit operation and prevent dirt and dust buildup inside the I-TEC and the room the unit is installed in. To access the unit filters, open the front hinged doors by unlocking the door latches. The doors fold outward and are on hinges with lift-off pins. Use care when opening doors. If doors are lifted off of the hinge pins, use care as the dense insulation used for sound reduction causes the doors to be heavy.

The upper section of the unit contains two 2" x 24" x 30" throwaway filters as standard with every unit. MERV ratings of the filter are available up to MERV13. These filters filter the air used for cooling inside the classroom or structure and should be changed regularly.

If the unit has an air intake vent option installed, two 1" x 12" x 20" filters are located in the lower section of the front doors behind the louvers. These filters help keep the vent option clean and operating properly.

Two washable filters are also installed in the air intake vent option. These should be inspected during servicing and cleaned when necessary. The washable filters are used to remove dirt and dust from outdoor air that is entering the vent area. If at any time these filters are damaged, they must be replaced with Bard-approved filters.



### ***I-TEC Filter Locations:***

*Servicing the filters in your unit will help keep the inside of the unit clean and also the area it is installed in.*

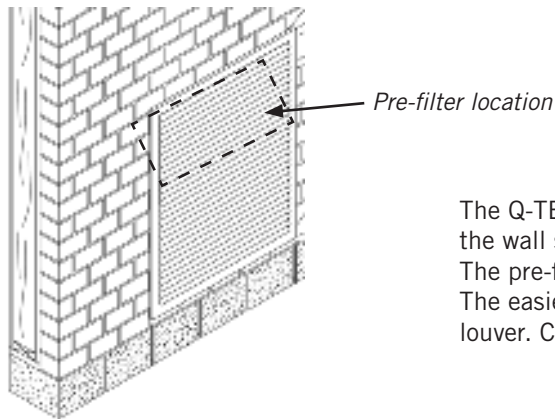
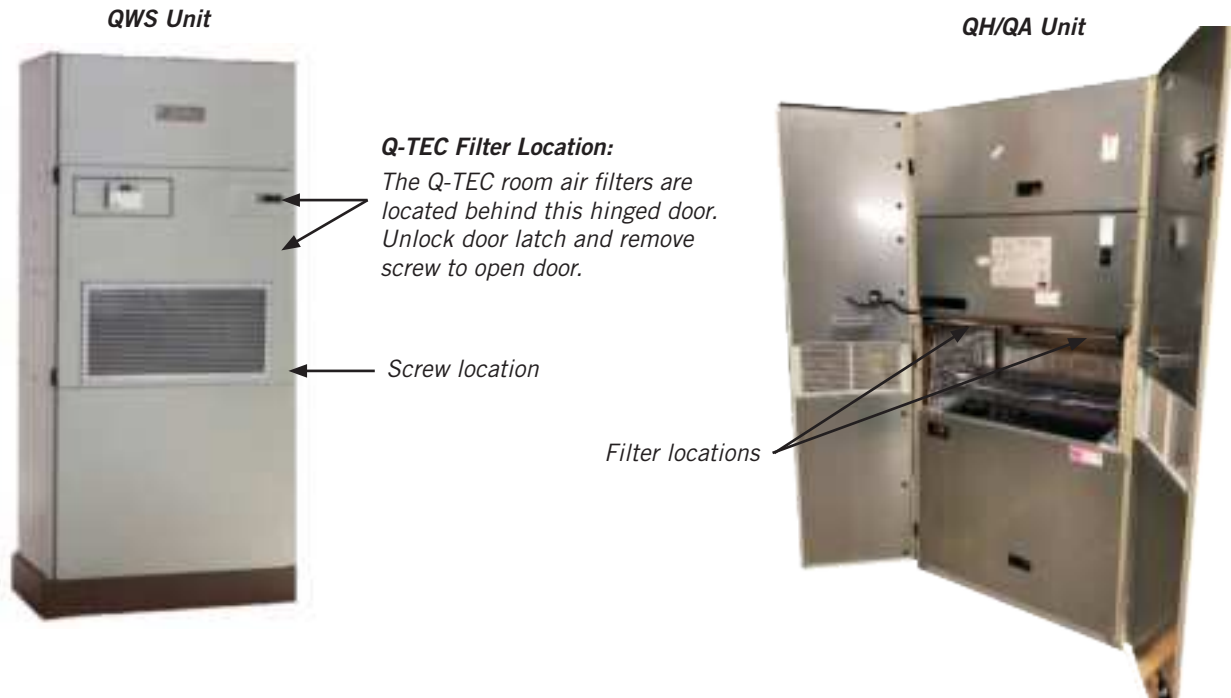
The I-TEC product installation instructions contain additional information regarding unit maintenance. This information may be accessed at [www.bardhvac.com](http://www.bardhvac.com).



## Q-TEC Indoor Products – Filters and Filter Servicing

The Q-TEC indoor air conditioners and heat pumps have two room air filters that must be replaced when servicing the unit. Filters play an important part in proper unit operation and prevent dirt and dust buildup inside the Q-TEC and the room the unit is installed in. To access the unit filters, open the front hinged door by unlocking the door latch. The door folds outward and is on hinges with lift-off pins. Use care when opening doors. If the door is lifted off of the hinge pins, use care as the insulation and louver grille cause the door to be heavy.

The upper section of the Q-TEC contains two 1" throwaway filters standard with every unit. These filters filter the air used for cooling inside the classroom or structure and should be changed regularly.



The Q-TEC will have a permanent pre-filter installed inside the wall sleeve if air intake vent options are inside the unit. The pre-filter must be inspected and cleaned when necessary. The easiest way to remove the pre-filter is through the outdoor louver. Clean the pre-filter with soapy water.

The Q-TEC product installation instructions contain additional information regarding unit maintenance. This information may be accessed at [www.bardhvac.com](http://www.bardhvac.com).

## All Products – Coil Cleaning

The outdoor coil must be kept clean and free of any airborne debris, which can accumulate over time. Large volumes of air are circulated over the coil, and airborne debris such as lint, dust, materials shed from trees, paper or other types of airborne material that can become airborne can collect on the entering coil surface. The outdoor coil must dissipate heat during the cooling mode and for a heat pump, also absorb heat during the heating mode. If the coil is dirty and matted with debris, the airflow across the coil will be reduced causing poor performance, increased operating run time and associated utility bills and in extreme conditions can shorten the useful life of the equipment.

Depending on the specific equipment involved, the surface that can accumulate debris can be on the opposite side that is exposed to view when standing in front of the machine. Closely review the machine when operating to see which direction or path the airflow takes as it moves through the machine. If the air inlet side of the coil is hidden, try to observe the back (hidden) side by looking into the side grilles, using a flashlight if necessary. While the user of the equipment needs to be aware of the potential of clogging of the outdoor coil surface, actual cleaning of the outdoor coil should not be attempted under most circumstances. If the user should attempt this procedure on their own, never do so without first having the installing dealer or service company instruct you in the proper procedure and technique.

**WARNING: Do not open or enter the equipment without first turning off the electrical service disconnect. Failure to do so can result in personal injury due to moving parts and/or electric shock hazard resulting in death.**

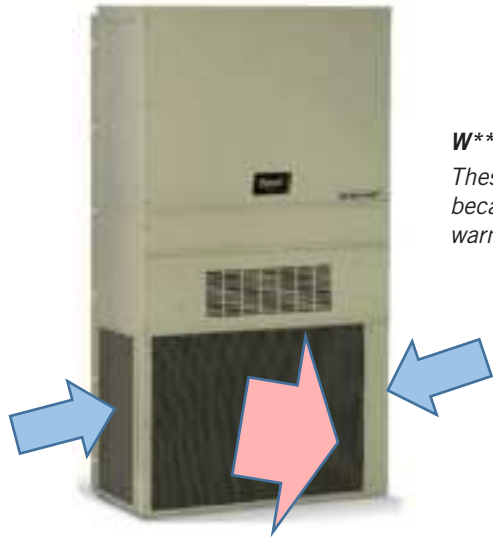
Other conditions that can cause reduction of airflow across the outdoor coil are flowers, shrubbery or other growth too near the outdoor coil air inlet and outlet openings. These living things, especially as they mature and grow, will be just as effective in blocking the airflow and create the same problems as will stacking things against the equipment. These conditions can be easily managed and controlled by the user, as they do not require actually entering into the equipment enclosure, which should only be done by qualified service technicians.

### **Equipment Corrosion Protection**

1. Avoid having any lawn sprinkler spray directly on the equipment, especially if from a brackish water source.
2. In coastal areas or corrosive environments, locate equipment as far away from the corrosion source as feasible. Units exposed directly to salt spray should be coated by a secondary protective coating operation to reduce corrosion on copper tubing, fasteners, motors and other metal parts. Coils should be ordered with a corrosion protective coating. Contact Bard for coating options.
3. Frequent cleaning and waxing of the cabinet using a good automobile polish will help extend its original appearance and protect painted surfaces.

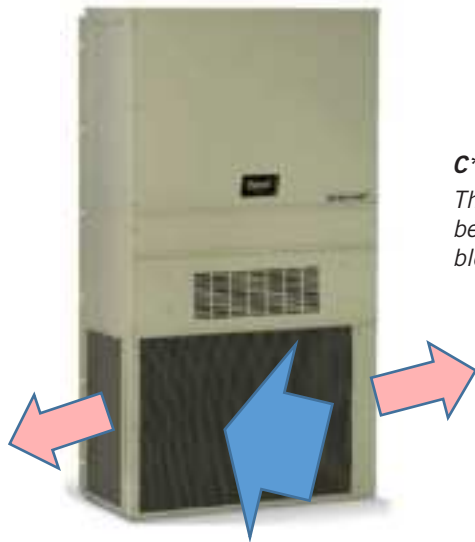
The product installation instructions contain additional information regarding unit coil cleaning. This information may be accessed at [www.bardhvac.com](http://www.bardhvac.com).

## All Products – Condenser Airflow



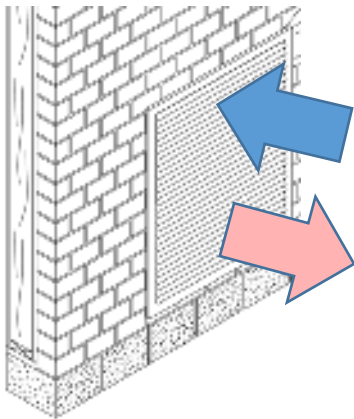
### **W\*\*A, W\*\*H, T\*\*H, T\*\*S, W\*RV Wall Mount Units:**

*These units are called “blow through condenser airflow” units because they draw cool outdoor air from the sides and blow the warm condenser air exiting the coil through the front grille.*



### **C\*\*H Wall Mount Units:**

*These units are called “draw through condenser airflow” units because they draw cool outdoor air in the front through the coil and blow the exiting warm condenser air through the unit sides.*



### **I-TEC and Q-TEC Units:**

*These units draw the cool outdoor air through the top section of the wall louver and exhaust the warmer condenser air out of the lower section of the louver. I-TEC units also draw a small amount of air through the outer right and left side of the louver.*

# Unit Operation

## Air-to-Air Cooling Products (Air Conditioners)

The cooling mode operates similar to a refrigerator, removing heat from inside the conditioned space and rejecting it outside of the space being controlled. There are three main parts of the system:

1. The evaporator (indoor) coil where cold refrigerant absorbs heat from the air, which circulates from the conditioned space through the machine and is returned to the space at a lower temperature and with some of the humidity (moisture) removed. The moisture exits through a condensate drain system. A motor/blower assembly moves the indoor air through the system.
2. The compressor, which is a sealed pump that moves the refrigerant through the system.
3. The condenser (outdoor) coil where the heat that was absorbed from the indoor space is discharged to the outdoor environment. A motor/fan system moves the outdoor air across the condenser coil. A properly sized air conditioner cannot cool a structure off rapidly and instead will pull down the temperature slowly. It also will remove a certain amount of moisture (humidity) from the circulating airstream in the process. It may take several hours to pull down a hot, moist building or structure on initial startup or anytime the system has been turned off for a long period of time. It is generally best to set the thermostat at a comfortable temperature and let it control the system as needed, rather than turning it on and off.

Moisture (humidity) removal with a conventional air conditioner (cooling) unit, or heat pump when operating in the cooling mode, is not directly controlled and is a by-product of the unit operating to control temperature in response to the temperature (thermostat) control device. **Oversized equipment can easily control temperature but will have short run-times, thus reducing its ability to remove moisture from the circulating air stream.**

There are also many additional influences that can affect humidity levels within the conditioned space such as laundry appliances, cooking, showers, exhaust fans and any other items that can generate moisture or affect its removal from the space. Therefore, while operation of the air conditioning or heat pump system in the cooling mode will remove some amount of moisture as it reduces the air temperature, precise humidity regulation in the conditioned space cannot be assured and additional equipment such as a dedicated dehumidifier may be required.

## Air-to-Air Cooling and Heating Products (Heat Pumps)

A heat pump is a refrigerant-based system that has additional components and controls that both heats and cools using a compressor for both modes of operation. Most heat pumps will also be equipped with some amount of electric heat to supplement the heating capacity of the compressor system on an as-needed basis. This operation is entirely automatic and is controlled by the indoor thermostat and possibly also an outdoor thermostat.

### **Cooling Mode**

The cooling mode of a heat pump is exactly the same as that described for an air conditioner in the above section.

### **Heating Mode**

The system operates in reverse cycle, meaning that it absorbs and moves heat from the outdoors and transfers it indoors to be rejected into the circulating air stream. Even though it seems cold to humans, there is usable heat that can be extracted efficiently from the outdoor air down to 0°F, although the colder the air is there is less heat to extract and the operating efficiency is diminished.

### **Defrost Cycle**

When operating in the heating mode, the outdoor coil will be colder than the outdoor air that is forced over it by the fan system. When the outdoor air temperature is above approximately 40°F, moisture can accumulate on the coil and it will drain down and out the base of the unit. As the air temperature gets below approximately 40°F, the coil temperature will start to drop below 32°F, and frost or ice will begin to form on the coil.

An automatic defrost system keeps track of system run time when the outdoor coil temperature is in the freezing zone and will initiate a defrost cycle at the appropriate time. The unit continues to operate during the defrost cycle, but the outdoor fan motor will stop and the reversing valve will shift positions to flow hot refrigerant gas through the outdoor coil to melt the accumulated frost. Water will start to drain freely from the unit, and steam may be emitted from the unit.

The length of the defrost cycle will vary depending upon actual outdoor temperature, humidity levels and amount of accumulated frost. It could range from 1-2 minutes up to but not exceeding 8 minutes. When the defrost cycle

terminates, the reversing valve will shift back to heating mode and the outdoor fan will restart. There is typically a large puff of steam emitted as the fan restarts. When the heat pump shifts from cool to heating mode, from heating to cooling mode and especially during defrost cycles, there will be a pressure transfer sound heard as the reversing valve redirects the flow of refrigerant. This is commonly described as a hissing noise and is a normal sound for this type equipment.

For air source heat pumps, it is important to keep heavy snow from accumulating around the machine to the point of blocking the inlet and outlet openings to the outdoor coil section. For wall mounted or other equipment that is elevated, this should not be a factor; but for equipment installed on or near the ground, this can be an issue in areas prone to heavy and/or blowing snow. The air source heat pump cannot operate effectively and efficiently when snowbound just as a car cannot function well in heavy snow conditions.

### ***Water-to-Air Cooling and Heating Products (Geothermal Heat Pumps)***

These types of heat pumps are also commonly referred to as water source or geothermal systems. Just like the air source heat pump, they are refrigerant-based systems that both heat and cool using a compressor for both modes of operation. The primary difference is that the system uses water or antifreeze-protected water solution instead of an air-cooled outdoor heat transfer coil, and there is no outdoor motor/fan system but instead a water pump to provide adequate water flow to the system.

#### ***Cooling Mode***

The cooling mode of a water-to-air heat pump is exactly the same as that described for an air conditioner in the previous Air Conditioner section, except that the outdoor coil uses water instead of air for the heat transfer medium.

#### ***Heat Mode***

The system operates in reverse cycle, meaning that it acquires and moves heat from the water supply flowing through the water to refrigerant coil and transfers it indoors to be rejected into the circulating air stream.

Most water-to-air heat pumps (but not all) will also be equipped with some amount of electric heat to supplement the heating capacity of the compressor system on an as-needed basis. This operation is entirely automatic and is controlled by the indoor thermostat.

Because of the design of water-to-air heat pumps and the water temperatures involved, no defrost system is required as in air-to-air heat pumps.

#### ***Water Supply Systems***

Depending upon the type and application of the water-to-air heat pump, the water side of the system could be one of the following:

1. Individual closed loop buried in a trench or vertical bore hole(s).
2. Individual loop submerged in a pond.
3. Water supplied from a well and discharged into pond, stream, ditch or another well.
4. Water supplied from a boiler/tower system, typically only in larger multi-unit installations.

# Dehumidification and Ventilation Operation

## Dehumidification (Air-to-Air or Water-to-Air Systems)

Many Bard systems, typically those used in schools or other commercial applications, have a dedicated dehumidification capability by having a special additional refrigeration circuit (factory-installed option only) in addition to the basic system. These special systems, sometimes also referred to as hot gas reheat, are designed to control humidity on demand from a humidity controller much the same as the basic cooling and/or heating system is controlled by a wall thermostat. Consult your installer and/or service company to determine if your installation has any of these devices and for any instructions or maintenance requirements you should be aware of as the user.

## Ventilation Options (Air-to-Air or Water-to-Air Systems)

All Bard systems are available with factory-installed vent options. Most units can have ventilation field installed after unit installation.

Ventilation has multiple purposes:

- Outside air intake for occupied structures
- Positive pressurization
- Energy savings when outdoor air can be used for cooling
- Agricultural use of bringing in outdoor air and exhausting room air
- Equipment and electronics ventilation

Review product specifications and manuals for more details regarding available ventilation options and features. Product documentation is shipped with the product and also available at [www.bardhvac.com](http://www.bardhvac.com).

## All Units – Troubleshooting

Your Bard product is made to operate for many trouble-free years if installed properly and maintenance practices are followed. Be sure to verify that all filters are clean, and condenser coils are free of dirt and debris. Often these items may look clean at first, but upon closer inspection, show signs of dirt and debris build-up. New units on new structures may have dirt and dust in filters from the building construction process.

Thermostats and unit controllers often contain vent holes for proper sensor measurement inside the device. Make sure the thermostat or controller are not full of dirt and dust from building construction or years of use.

Verify all requirements in the installation instructions and specification sheets are met. Unit voltages, airflow clearance requirements and clean unit power without brownouts or spikes play a critical role in unit performance. If 208 VAC power is supplied to the unit, the 208V tap must be used on the 24 VAC transformer located inside the control panel. Common sense must also be used when installing the unit in an environment that may put the unit at risk of improper operation.

## Helpful Hints and Good Operating Practices

The following information will help you enjoy the full comfort and benefits of your Bard cooling and heating system, maximize the performance and efficiency and help extend the life of your system.

1. Always keep the equipment in peak operating condition with routine scheduled maintenance, especially for the air filters, and to assure a clean outdoor coil.
2. For most efficient operation, set the thermostat at the temperature you prefer and then let it take control. If any changes to the settings are required, they should be made in small adjustments and the system be allowed time to respond. Rapid changes either up or down should not be done.
3. Setting the thermostat very high does not make the system heat faster and setting it very low does not make it cool faster.
4. It is not recommended to turn the system "Off" then back "On" when you need it. This can allow temperature and humidity to build up in warm weather conditions and force the system to run continuously to try and catch up. If the building is to be unoccupied for a lengthy period, it is best to adjust the thermostat to a reasonable higher (or lower—depending on the season) setting rather than turning it completely off. Upon return, the inside conditions will not be totally out of control and recovery time to desired conditions would be much shorter.
5. Airflow inside the room or building is very important. Keep all supply registers open and all returns free and unrestricted. Avoid placing objects in areas that will hinder unit airflow. The heating and cooling system is designed to have a certain amount of airflow for proper operation. Therefore, closing off registers, in unused rooms as an example, could reduce airflow below acceptable levels and should not be done without review by your service company who can assess the overall situation and advise you accordingly.
6. Heat pumps, especially air-to-air heat pumps, may have the system (compressor) run continuously at lower outdoor temperatures, and this is normal. The heat pump (compressor) mode is controlled by the beginning stages of the thermostat and delivers the most efficient heat. As the outdoor temperature drops off, the heat pump mode heat will also diminish (because there is less heat in the outdoor air to absorb) and must be supplemented by additional electric heat stages, which are not as efficient as the heat pump. The thermostat automatically controls everything and the backup heat will only operate on demand as needed to maintain the desired temperature.
7. The thermostat or controller is the user's primary connection to the system so it is very important to have a thorough understanding of how it works and how to use it properly. Have your installer or service company explain and demonstrate proper operation of the controls.
8. Make sure you thoroughly understand how the heating and cooling system itself is intended to operate and what to expect from it. Have your installer or service company explain and demonstrate proper operation of the heating and cooling system.



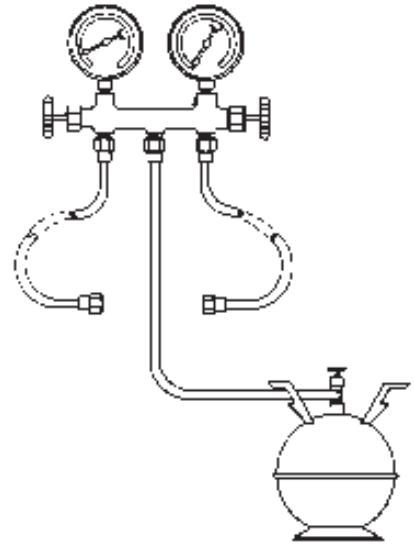


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# SERVICING PROCEDURE

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## R-410A LEAK TEST EVACUATION CHARGING



Bard Manufacturing Company, Inc.  
Bryan, Ohio 43506  
*Since 1914...Moving ahead, just as planned.*

Manual No.: 2100-479  
Supersedes: NEW  
File: Volume I, Tab 1  
Date: 03-08-07

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# GENERAL

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## WARNING

The oils used with R-410A refrigerant are hygroscopic and absorb water from the atmosphere readily. Do not leave systems open to the atmosphere for more than 5 minutes. If the system has been open for more than 5 minutes, change the filter dryer immediately before evacuation. Then recharge the system to the factory specified charge.

### Recovery equipment rated for R-410A refrigerant

R-410A has an ozone depletion potential of zero, but must be reclaimed due to its global warming potential.

The gauge manifold set is specially designed to withstand the higher pressure associated with R-410A. Manifold sets are required to range up to 800 psig on the high side and 250 psig on the low side with a 250 psig low side retard.

All hoses must have a service rating of 800 psig. (This information will be indicated on the hoses.)

Vacuum Pump and micron gauge must be used when evacuating a system to 500 microns.

### Leak Detectors

An electronic leak detector capable of detecting HFC refrigerant can be used with R-410A refrigerant.

## GAUGE MANIFOLD



## WARNING

Gauge manifold must be suitable for use with R-410A refrigerant and POE oils.

A necessary instrument in checking and serving air conditioning and heat pump equipment is the gauge manifold. Its purpose is to determine the operating refrigerant pressures in order for the serviceman to analyze the condition of the system.

The valving on the manifold is so arranged that when the valves are closed (front-seated) the center port on the manifold is closed to the gauges and gauge ports. With the valves in the closed position, the gauge ports are still open to the gauges, permitting the gauges to register system pressures. Opening either valve opens the center port to that side of the manifold and system.

## ATTACHING GAUGE MANIFOLD

For leak testing, purging, checking charge, charging liquid or evacuating, connect high pressure side of gauge manifold to Schrader valve on liquid or discharge line. Connect suction side of gauge manifold to Schrader valve on suction line. On heat pumps the suction line is between compressor and reversing valve.

## ATTACHING MANIFOLD HOSE TO SCHRADER VALVE



### WARNING

As a safety measure, it is wise to detach refrigerant hoses at the lowest pressure readings on the system. To do this:

- A. Put high pressure hose "B" on first. (Unit should not be running.)
- B. Put low pressure hose "A" on second. (Unit should be running.)

1. Remove cap from valve.
2. Make sure gauge manifold valves are closed.
3. If hose does not have an unseating pin, a number 395 Superior or equivalent unseating coupler must be used.
4. Make sure coupler is lined up straight with Schrader valve. Screw coupler on to valve.
5. Open gauge manifold valve slightly and purge air from hose with refrigerant.
6. Read the suction pressure on compound gauge and heat pressure on pressure gauge.
7. To remove, push end of hose tight against end of Schrader valve and hold in place while quickly unscrewing coupler nut from Schrader valve.
8. Remove coupler from Schrader valve. Replace caps on valve.

### Leak Test

1. Remove gauge port cap from suction and liquid service valve ports and attach manifold gauge hoses. Connect an upright R-410A drum to center port of gauge manifold. Open refrigerant drum valve and manifold high pressure gauge valve to pressurize system to a positive pressure with refrigerant vapor. Pressurize the complete system with dry nitrogen, or CO<sub>2</sub> until the pressure reaches 200 psig. **Do not** exceed 250 psig.
2. Close manifold high pressure gauge valve. Check all soldered joints, including those on the evaporator coil with an Electronic Leak Detector suitable for use with HFC refrigerants or R-410A. If a leak is found which requires soldering, pressure in the system must be bled off since it is impossible to solder with unit pressurized. Be sure all leaks are located and marked before bleeding pressure from system.

3. Close drum valve and disconnect from center port. Release nitrogen or CO<sub>2</sub> into the atmosphere through suction line of gauge manifold.
4. Correct any leaks and recheck. When leaks, if any, have been repaired, system is ready to be evacuated and charged. Relieve all pressure from the system down to 0 psig.
5. Change the filter dryer. When leaks, if any, have been repaired, system is ready to be evacuated and charged. Relieve all pressure from the system down to 0 psig.

### EVACUATION

#### Evacuation

An evacuation to 500 microns is usually sufficient to remove moisture from a system using R-22 and mineral oil lubricant. A 500 micron evacuation, however, will not separate moisture from Polyol Ester oil (POE) in R-410A systems.

In addition to a 500 micron evacuation, the liquid line filter dryer (R-410A compatible) must be replaced any time the system is open. When removing a filter dryer from a system, do not use a torch; use a tubing cutter to avoid releasing moisture back into the system.

Older R-22 leak detectors, as well as halide torch leak detectors, will not detect leaks in R-410A systems. Never use air and R-410A to leak check, as the mixture may become flammable at pressures above 1 atmosphere. A system can be safely leak-checked by using nitrogen or a trace gas of R-410A and nitrogen.

**Remember:** *Always use a pressure regulator with nitrogen and a safety valve down stream - set at no more than 150 psig.*

1. Evacuate system to less than 500 microns, using a good vacuum pump and an accurate high vacuum gauge. Operate the pump below 500 microns for 60 minutes and then close valve to the vacuum pump. Allow the system to stand for 30 additional minutes to be sure a 500 micron vacuum or less is maintained.



### WARNING

At no time use the compressor to evacuate the system or any part of it.

2. Disconnect charging line at vacuum pump and connect to refrigerant supply. Crack the cylinder valve and purge charging line at center on manifold. Then close cylinder valve.
3. The system is now ready for the correct operating charge of Refrigerant R-410A.

### R-410A System Charging

Even though R-410A has a very small fractionation potential, it cannot be ignored completely when charging. To avoid fractionation, charging of an air conditioner or heat pump system incorporating R-410A **shall be done with “liquid”** to maintain optimum system performance. To insure that the proper blend composition is charged into the system, it is important that liquid only be removed from the charging cylinder. Some cylinders supplied by manufacturers have dip tubes, which allow liquid refrigerant to be removed from the cylinder when it is in the upright position. Cylinders without dip tubes have to be tipped upside down in order for liquid to be removed. The Service Technician must differentiate between which type of charging cylinder they are using to avoid removing vapor refrigerant instead of liquid refrigerant to avoid fractionation and for safety concerns.

Connect the gauge manifold to the high and low side. Allow liquid to enter the high side only. The high side will hold 80-100% of the total charge. When liquid stops flowing, close high side port. The remainder of the charge will be added to the low side. Keep in mind two issues: first, never start the compressor with less than 55 psig of suction pressure. Secondly, make sure the liquid is throttled, thus vaporized into the low side of the system to avoid compressor damage. A throttling valve can be used to insure that liquid is converted to vapor prior to entering the system. Proper manipulation (restricting) of the manifold gauge set can also act as a throttling device to insure liquid is not entering the compressor.

### CHARGING

1. **Single Package Units**—Refer to the unit serial plate for the full operating charge.

### PRELIMINARY CHARGING STEPS

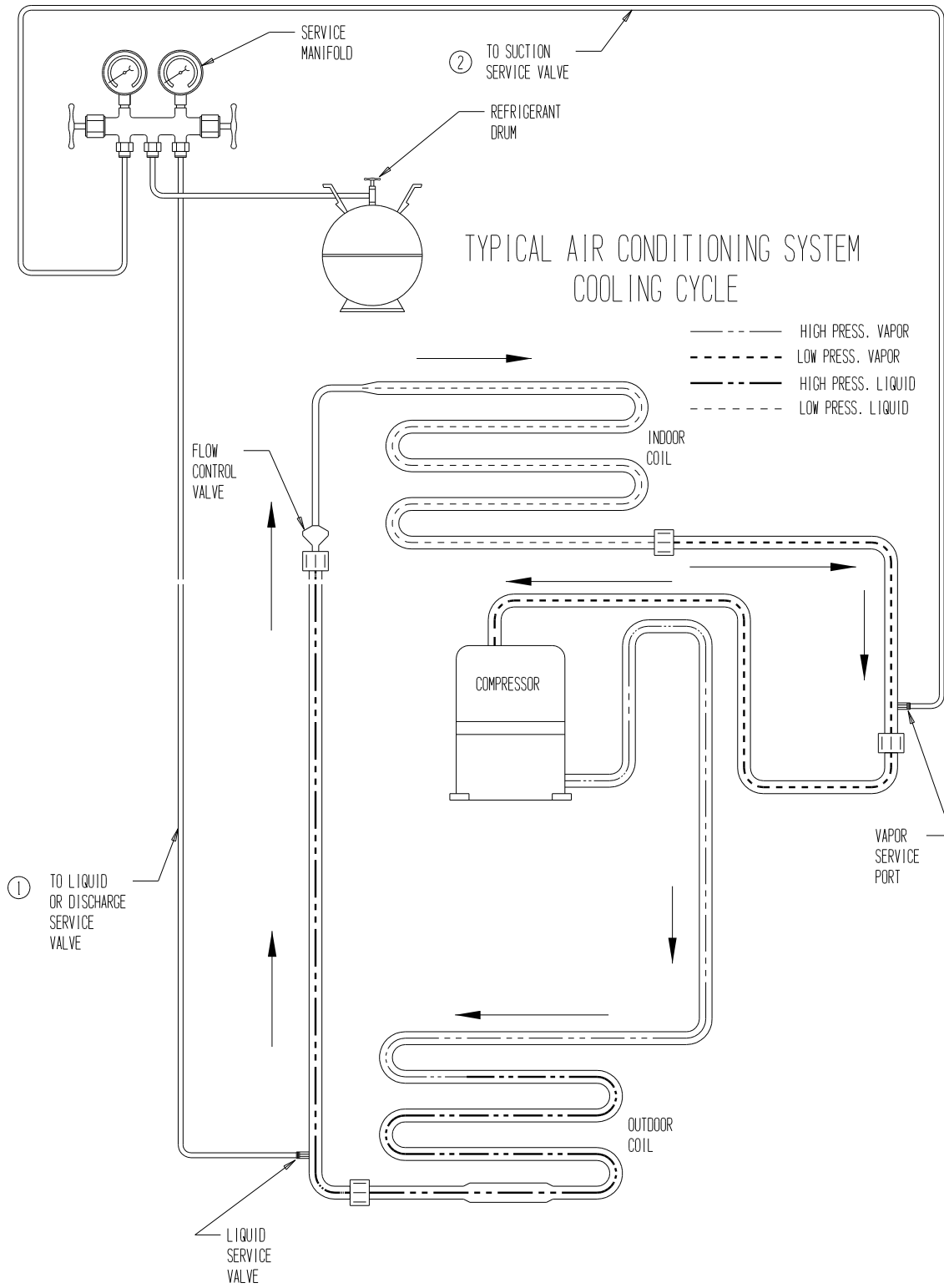
If the system has been open to the atmosphere, the filter dryer should be replaced and then evacuated. Then proceed as follows:

1. Attach a drum of proper, clean refrigerant to the center port of the charging manifold with one of the charging hoses.
2. Attach a second charging hose to the suction gauge (low pressure) side of the gauge manifold.
3. Remove the cap from the suction line valve.
4. Loosely attach the suction gauge hose to the line valve. Open the valve on the refrigerant drum and the suction valve on the charging manifold slightly to purge the air from the manifold and hoses before tightening the fitting.
5. Attach the third hose to the high pressure side of the manifold and the liquid line valve. Repeat steps 3 and 4 above.

### CHARGING THE SYSTEM BY WEIGHT

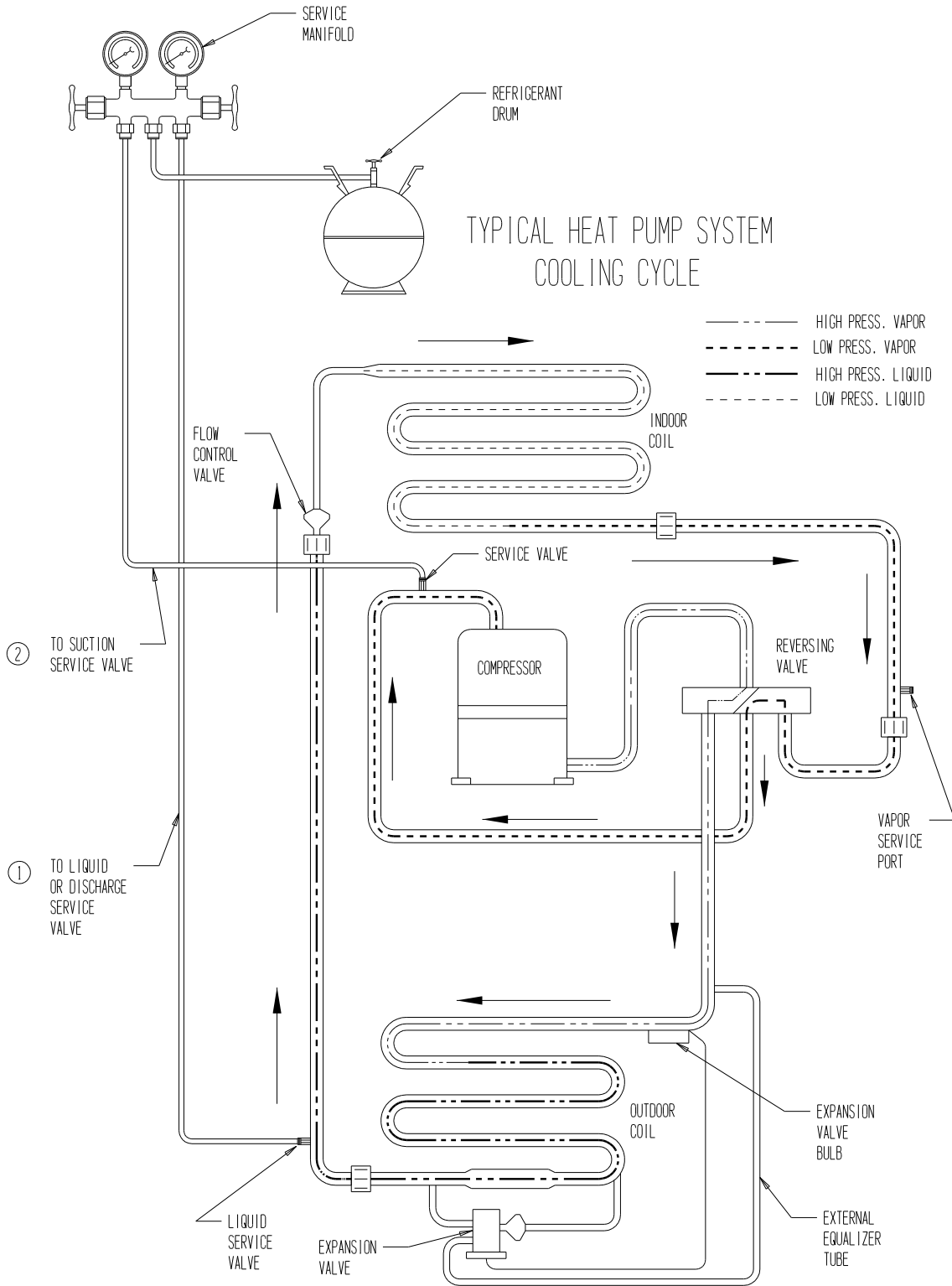
1. Connect manifold as instructed.
2. Place refrigerant drum upright on scale and determine exact weight of the refrigerant and cylinder.
3. With manifold suction valve closed and manifold discharge valve open, open refrigerant cylinder liquid valve and allow pressure in system to balance with pressure of cylinder or 80% of charge is in the unit - whichever comes first.
4. When there is approximately an 80% charge, front seat (close) the discharge manifold valve and let the system stabilize for about five minutes.
5. Start compressor by setting thermostat.
6. Finish charging with liquid by cracking the suction valve. Open the manifold low pressure valve to allow refrigerant to flow into the system. Throttle the manifold valve to keep pressure about 100 psig for R-410A.
7. When the correct weight of refrigerant has been added to the unit, close refrigerant cylinder valve and allow unit to run for 30 minutes. Refer to Start-Up Procedure and Check List for further start-up details.
8. Front seat gauge manifold valves, disconnect charging and gauge hoses and replace all valve caps.

**FIGURE 1  
TYPICAL AIR CONDITIONING SYSTEM COOLING CYCLE**



**MIS-369**

**FIGURE 2**  
**TYPICAL HEAT PUMP SYSTEM COOLING CYCLE**



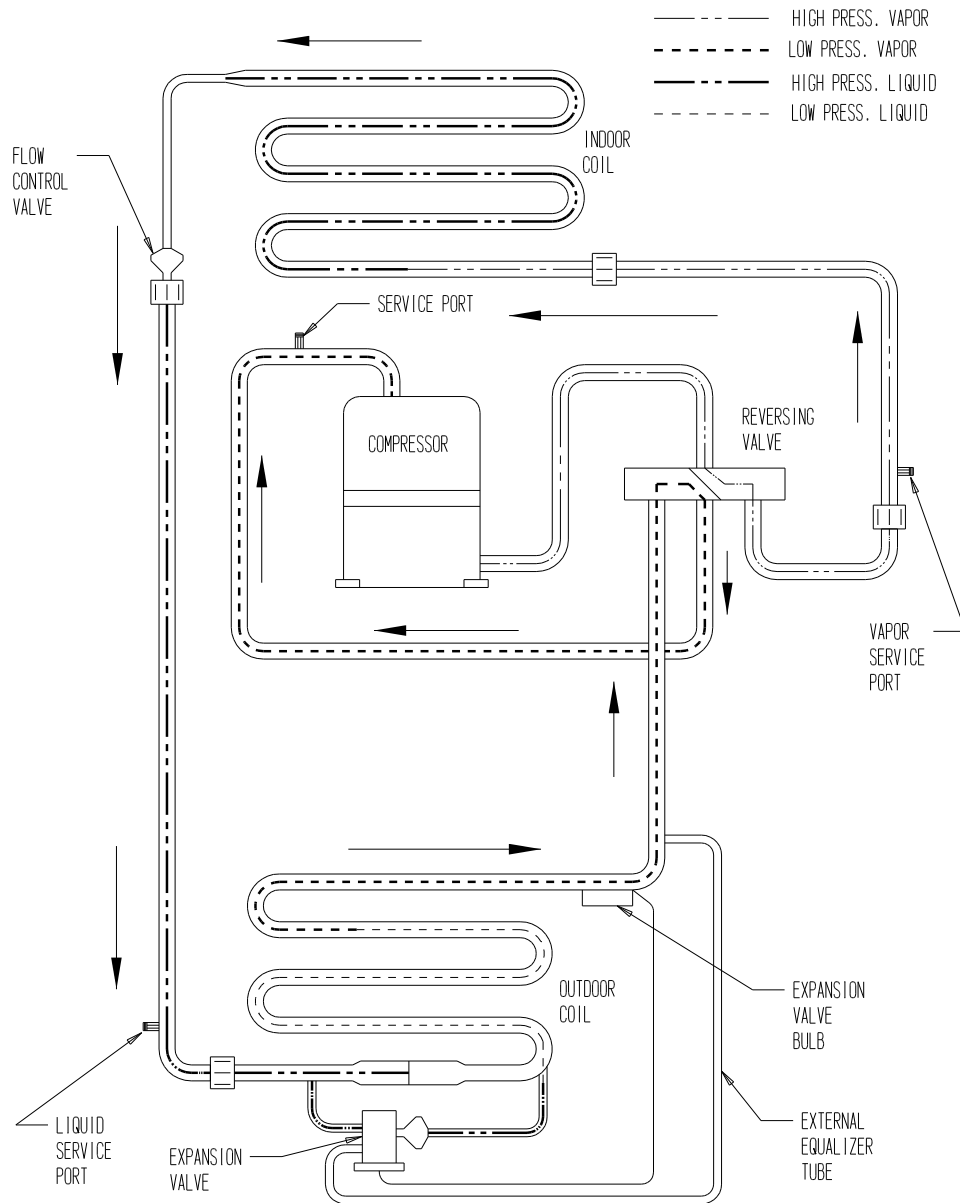
MIS-368



# WARNING

To speed refrigerant flow, it may be necessary to place refrigerant drum in a pan of warm water (not greater than 130°F). Remember to either consider the total weight of the pan of water or remove the drum for weighing frequently to keep track of the charging process.

**FIGURE 3  
HEATING CYCLE**



MIS-289



# **TROUBLESHOOTING THE MECHANICAL SYSTEM**

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## **AIR CONDITIONING AND HEAT PUMP — COOLING**

### **LOW SUCTION—LOW HEAD PRESSURE**

1. Restricted airflow over indoor coil.
2. Defective indoor fan motor.
3. Low indoor temperature
4. Iced indoor coil.
5. Restricted liquid line, dryer, metering device, etc.
6. Low charge.
7. Low ambient entering air temperature. (Low entering water temperature to water coil.Ⓢ)

### **HIGH SUCTION—LOW HEAD PRESSURE**

1. Defective or broken valves.
2. IPRV valve open.
3. Defective reversing valve.

### **LOW SUCTION—HIGH HEAD PRESSURE**

1. Partial restriction and then overcharged.

### **HIGH SUCTION—HIGH HEAD PRESSURE**

1. High entering outdoor air temperature. (High entering water temperature.Ⓢ)
2. Low airflow outdoor coil. (Low water flow.Ⓢ)
3. Overcharged.
4. Air in system.
5. Restricted outdoor coil. (Restricted water coil.Ⓢ)
6. High indoor air temperature.

Ⓢ Water source heat pump.

## **HEAT PUMP — HEATING**

### **LOW SUCTION—LOW HEAD PRESSURE**

1. Restricted airflow through outdoor coil. (Restricted water flow through water coil.Ⓢ)
2. Defective outdoor motor. (Defective water pump.Ⓢ)
3. Low outdoor air temperature. (Low water temperature.Ⓢ)
4. Frozen outdoor coil. (Frozen water coil.Ⓢ)
5. Restricted liquid line, dryer, metering device, etc.
6. Low charge.
7. Low indoor air temperature.

### **HIGH SUCTION—LOW HEAD PRESSURE**

1. Defective or broken valves.
2. IPR valve open.
3. Defective reversing valve.

### **LOW SUCTION—HIGH HEAD PRESSURE**

1. Partial restriction and then overcharged.

### **HIGH SUCTION—HIGH HEAD PRESSURE**

1. High entering outdoor air temperature. (High entering water temperature.Ⓢ)
2. Low indoor airflow.
3. Overcharged.
4. Air in system.
5. Restricted air coil.
6. High indoor air temperature.

Ⓢ Water source heat pump.



# TROUBLESHOOTING CHART FOR AIR TO AIR HEAT PUMPS

	Power Supply				Control Circuit				Compressor							Refrigerant System							Outdoor Section				Indoor Section			Aux Heat					
	Line Voltage				Control Circuit				Compressor							Refrigerant System							Outdoor Section				Indoor Section			Check					
Compressor and O.D. blower do not operate	•	•	•	•																															
Compressor will not run	•	•	•	•																															
O.D. fan motor runs	•	•	•	•																															
Compressor "thums" but will not start	•	•	•	•																															
Compressor cycles on overload	•	•	•	•																															
Compressor off on high pressure control	•	•	•	•																															
Compressor noisy																																			
Head pressure too high																																			
Head pressure too low																																			
Suction pressure too high																																			
Suction pressure too low																																			
ID blower will not start	•	•	•	•																															
ID coil freezing or icing																																			
High compressor amps																																			
Compressor runs continuously—no cooling																																			
Liquid refrigerant flooding back to compressor																																			
Compressor runs continuously—no heating																																			
Defrost cycle initiates no ice on coil																																			
Refrigerant valve does not stift																																			
Ice build up on lower part of O.D. coil																																			
Liquid refrigerant flooding back to compressor																																			
Auxiliary heat on ID, blower off																																			
Excessive operating costs																																			
Excessive ice on O.D. coil																																			

• Denotes common cause.  
♦ Denotes occasional cause.



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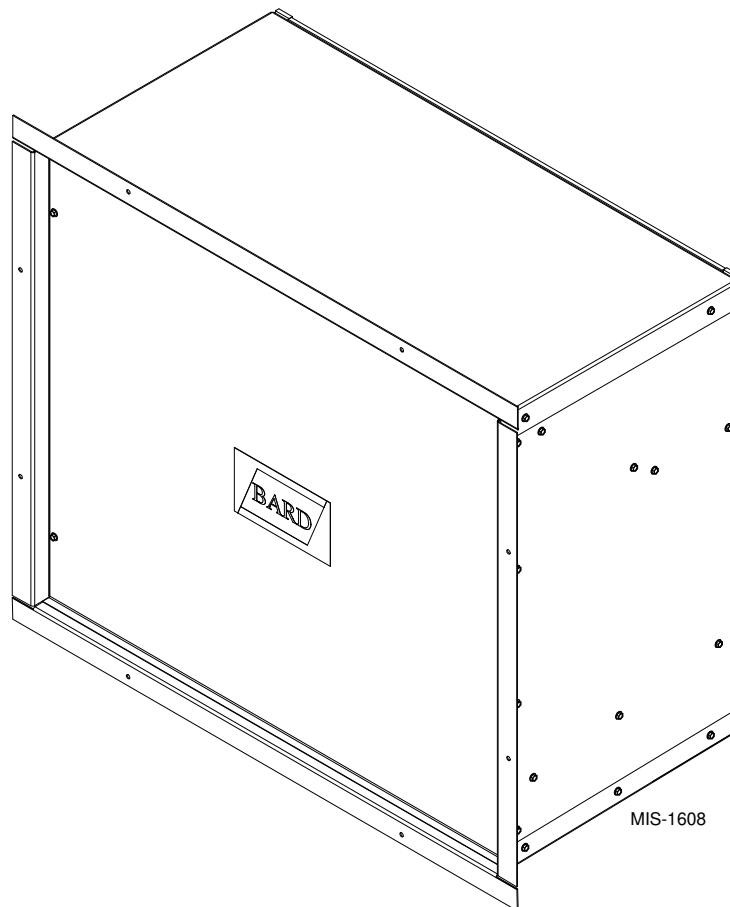
# INSTALLATION INSTRUCTIONS

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## QW Series Wall Sleeve

Models:

QWVS42 QWVS42-19 QWVS42-H



*Climate Control Solutions*

Bard Manufacturing Company, Inc.  
Bryan, Ohio 43506  
[www.bardhvac.com](http://www.bardhvac.com)

Manual: 2100-383D  
Supersedes: 2100-383C  
Date: 4-28-20

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## **GETTING OTHER INFORMATION AND PUBLICATIONS**

The following publications can help when installing the wall sleeve. They can usually be found at the local library or purchased directly from the publisher. Be sure to consult the current edition of each standard.

Standard for the Installation of Air Conditioning and Ventilating Systems.....ANSI/NFPA 90A

Standard for Warm Air Heating and Air Conditioning Systems .....ANSI/NFPA 90B

In addition, it may be helpful to consult the latest revision of QW Installation Instructions manual 2100-381.

For more information, contact these publishers:

**ACCA**      **Air Conditioning Contractors of America**  
1712 New Hampshire Ave. N.W.  
Washington, DC 20009  
Telephone: (202) 483-9370  
Fax: (202) 234-4721

**ANSI**      **American National Standards Institute**  
11 West Street, 13th Floor  
New York, NY 10036  
Telephone: (212) 642-4900  
Fax: (212) 302-1286

**ASHRAE**    **American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.**  
1791 Tullie Circle, N.E.  
Atlanta, GA 30329-2305  
Telephone: (404) 636-8400  
Fax: (404) 321-5478

**NFPA**      **National Fire Protection Association**  
Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9901  
Telephone: (800) 344-3555  
Fax: (617) 984-7057

# INSTALLATION

## Shipping Damage

Upon receipt of equipment, the carton should be checked for external signs of shipping damage. If damage is found, the receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent.

## General

The QWVS42 wall sleeve is designed for use with QW Series water-to-air heat pumps where vent options are utilized. The QWVS42 is for use on installations where wall thickness is 14" or less. The QWVS42-19 is for use on installations where wall thickness is 16" or less.

The QWVS-H is for use with an outdoor louver grille that meets hurricane impact requirements, and is for use where wall thickness is 14" or less.

The equipment covered in this manual is to be installed by trained service and installation technicians.

These instructions explain the recommended method to install the wall sleeve.

These instructions and any instructions packaged with any separate equipment required to make the entire air conditioning system should be carefully read before beginning the installation.

While these instructions are intended as a general recommended guide, they do not supersede any national and/or local codes in any way. Authorities

having jurisdiction should be consulted before the installation is made.

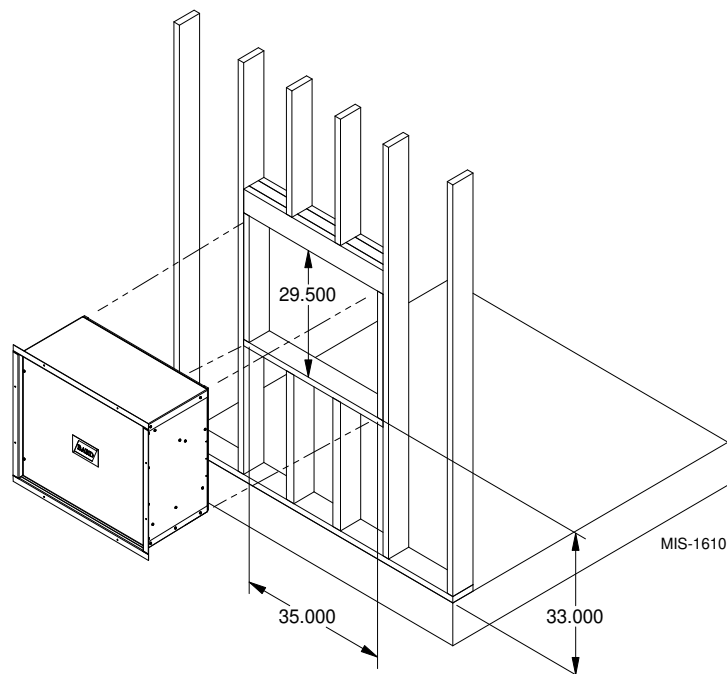
## Installation – Wood Framed Walls

For wood frame construction walls, the dimensions of the opening must be 29.5" tall by 35" wide. A 2 x 6 header will be required for the opening. The sides of the opening must have trimmer studs to support the header and to provide a structural member on which to fasten the sleeve (see Figure 1). All of the dimensions are referenced from the finished floor height.

Once the opening is framed, the sheeting can be installed, the sheeting material must not extend into the opening.

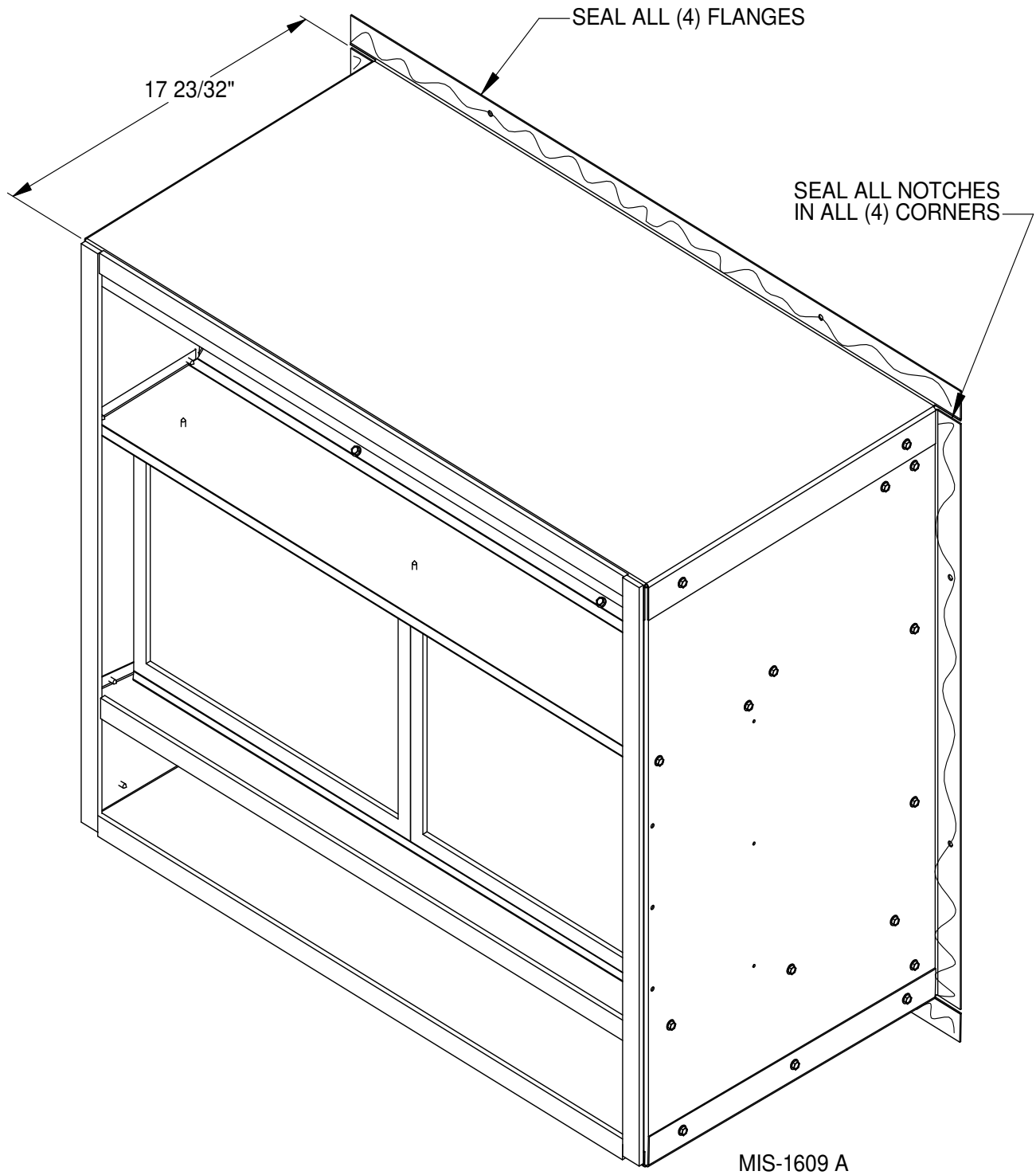
The sleeve should be test fit into the opening to make sure of the dimensions. The sleeve must be inserted into the opening from the outside of the building. The bottom of the sleeve must be level from side-to-side and the sleeve must be square in the opening. A slope is built into the bottom of the sleeve from the inside to the outside. This will allow any water that gets into the sleeve to drain out. Once the test fit is completed, the sleeve must be removed from the opening and a 1/4" bead of sealant must be applied to the mounting flanges of the sleeve (see Figure 2).

**FIGURE 1**  
**Wood Framed Installation**





**FIGURE 2**  
**Application of Sealant to Flanges**



The sleeve is then re-inserted into the prepared opening from the outside of the building. All of the mounting flanges must contact the exterior wall. Check to see that there is enough sealant to make this joint watertight. Additional sealant must be applied as necessary. The sleeve must be centered in the opening, and the bottom of the sleeve must be checked to make certain that it is level from side-to-side. The bottom flange should be secured to the wall by using two screws through the holes in the bottom mounting flange of the sleeve. The sleeve must be checked to make sure that it is square in the opening. Once the sleeve is square, the side and top mounting flanges of the sleeve must be secured to the wall with screws through the holes in the flanges. The gaps between the side, top and bottom flanges must be filled with additional sealant.

On the inside of the building, the gaps between the sleeve and the opening must be filled with insulation. This will help insulate the sleeve and prevent infiltration of any unwanted outdoor air (see Figure 4).

There are two brackets supplied with the sleeve for attachment to the unit. Position these brackets to the sleeve and attach with three screws per side. Roll

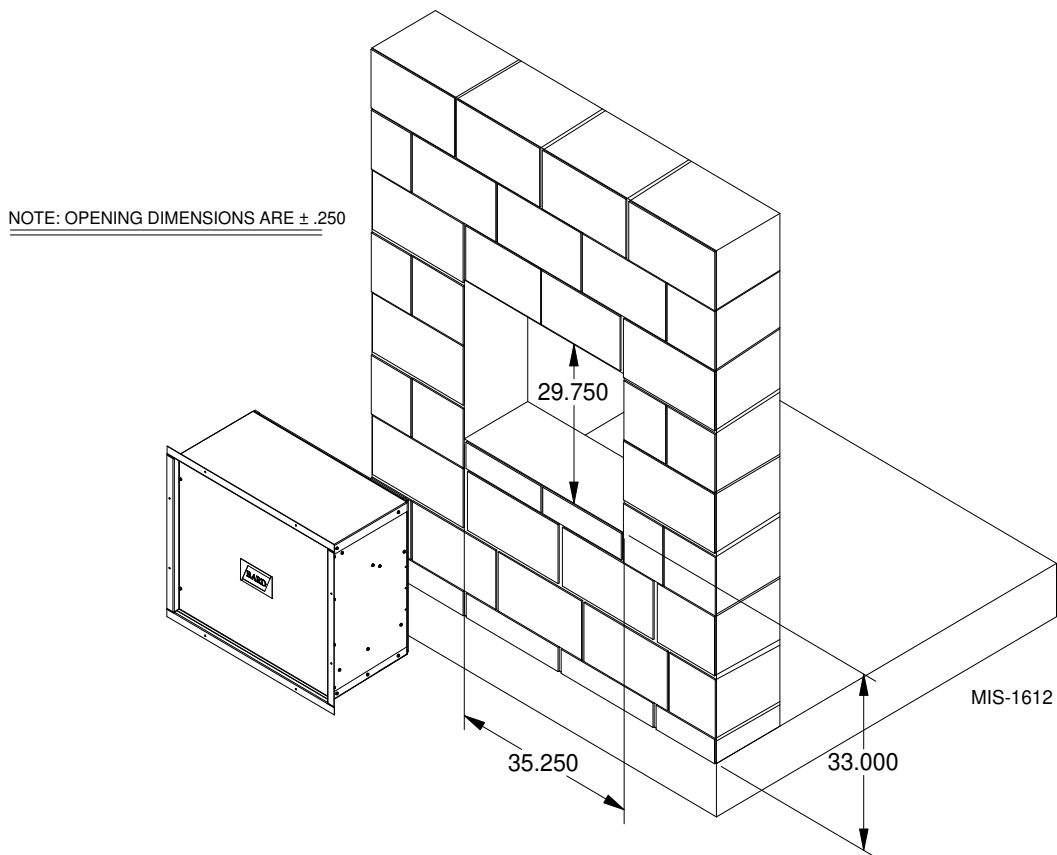
unit up to sleeve making sure the cabinet rear is tight against the gasket on the sleeve flange to provide an air tight seal. Drill 1/8" diameter holes through the brackets into the cabinet side and attach with screws provided. See Figure 5 on page 8 for more details.

### Installation – Masonry Construction Walls

For masonry construction walls, the dimensions for the opening will be 29.75" tall by 35.25" wide. These dimensions are +/- 1/4" and are measured from the finished floor height (see Figure 3). These will be the finish dimensions of the opening.

The sleeve should be test fit in the opening before final preparations are made. The sleeve will be installed into the opening from the outside of the building. The sleeve must be centered in the opening from side-to-side. The mounting flanges of the sleeve must contact the outside wall all around the opening. The side and top mounting flanges must have the mounting holes drilled into the outside wall for the concrete anchors which will hold the sleeve in the wall. The holes should be drilled through the holes in the sleeve with

**FIGURE 3**  
**Masonry Construction Installation**



the sleeve level and square in the opening. A slope is built into the bottom of the sleeve from the inside to the outside. This will allow any water that gets into the sleeve to drain out. Once the test fitting has been checked out, the sleeve should be removed from the wall.

With the sleeve removed, a 1/4" bead of sealant must be applied to the flanges that contact the outside wall (see Figure 2).

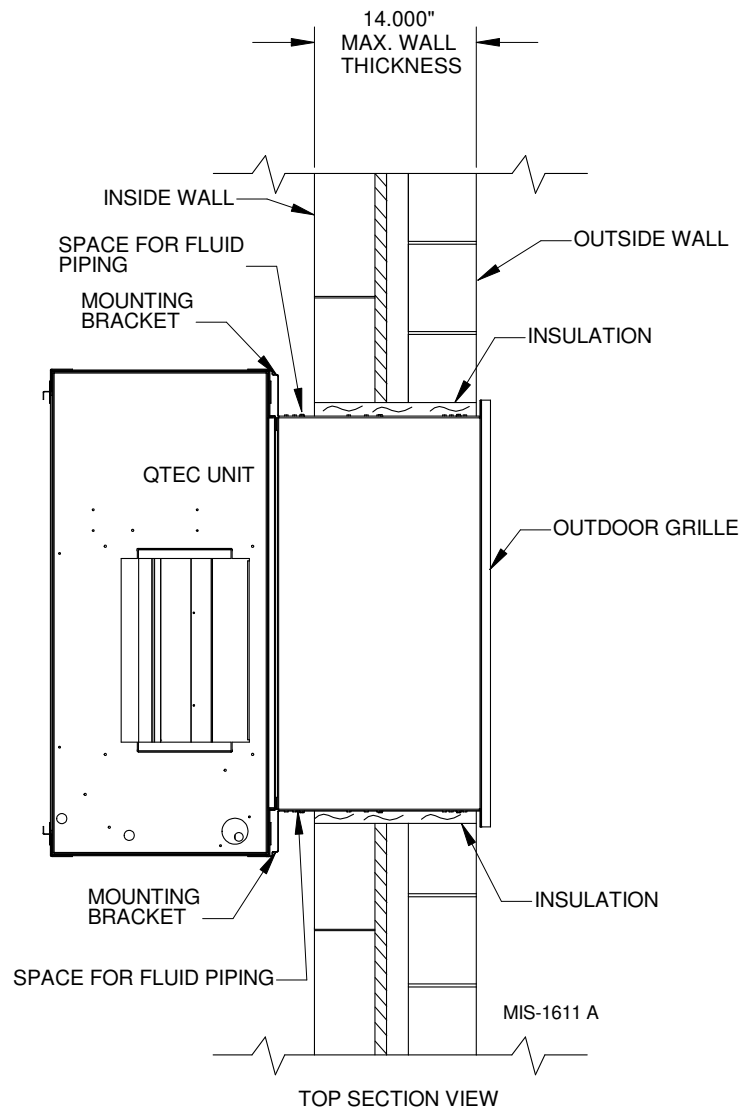
The sleeve must be installed back in the wall making sure that the predrilled holes in the wall line up with the holes in the mounting flanges of the sleeve. Check to make sure that there is enough sealant between the wall and the flanges to make the joint watertight. Additional sealant must be applied as required. The sleeve must be anchored to the wall. All four mounting flanges must be fastened with two fasteners each to

the outside wall. The gaps between the side, top and bottom flanges must be sealed to the wall.

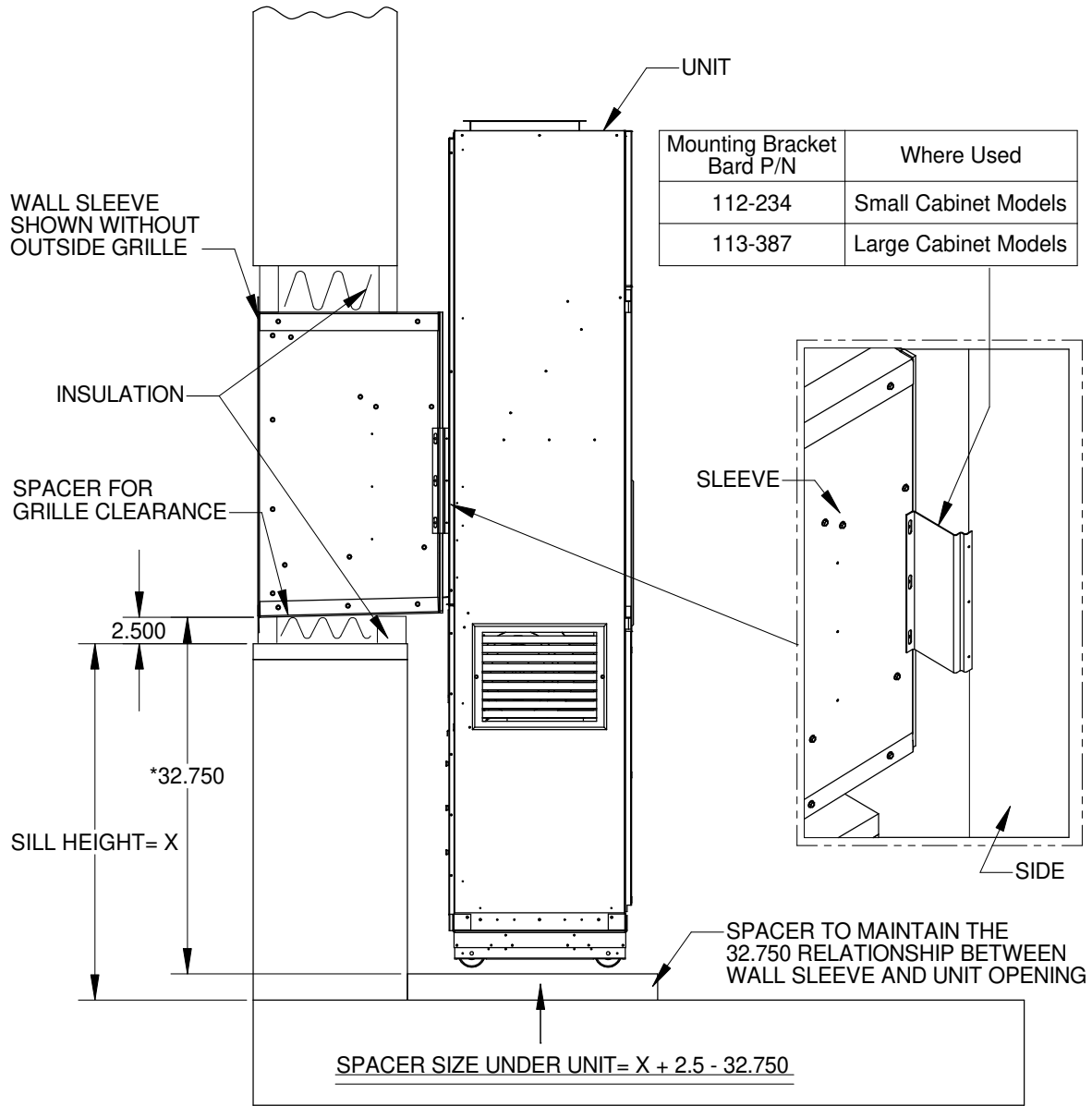
On the inside of the building, the gaps between the sleeve and the opening must be filled with insulation. This will help insulate the sleeve and prevent infiltration of any unwanted outdoor air (see Figure 4).

There are two brackets supplied with the unit for attachment to the sleeve. Position these brackets to the sleeve and attach with three screws per side. Roll unit up to sleeve making sure the cabinet rear is tight against the gasket on the sleeve flange to provide an air tight seal. Drill 1/8" diameter holes through the brackets into the cabinet side and attach with screws provided. See Figure 5 on page 8 for more details.

**FIGURE 4**  
**Typical Installation**



**FIGURE 5**  
**Installation of QW Wall Sleeve Through a Window Opening**



\*THIS DIMENSION MUST REMAIN CONSTANT  
 WHEN FABRICATING UNIT AND WALL SLEEVE  
 REGARDLESS OF THE WINDOW SILL DIMENSIONS

MIS-1614 A

## Installation Through a Window Opening

**NOTE:** Depending on the window sill height as measured from the inside finished floor, a spacer may be required under the unit wheels to ensure the proper relationship from the bottom of the sleeve and the window sill. To determine the height of this spacer, measure the window sill height from the finished floor, add 2.5" and subtract 32.75". Example: With a sill height of 33", add 2.5" and subtract 32.75". This equals a spacer height of 2.75". This spacer is to continue across the front of the unit to seal up the gap between the floor and the bottom trim piece. When the unit is placed on these spacers, the locking screws must be driven back into the wheel to secure the unit's position. Also, there are two brackets used for securing the sleeve to the unit. These brackets are shipped with the unit. Proper attachment at the proper location can be seen in Figure 5.

The QWVS42, QWVS42-19 and QWVS42-H may be used when the installation is through an existing window opening.

A 2.5" spacer is to be placed on the window sill. This spacer must be weather resistant and attached to the window sill. See Figure 5 for the location of this spacer.

The QWVS42, QWVS42-19 and QWVS42-H must extend through the window opening on the inside wall by 4" to allow clearance between the unit and the wall for the water pipes.

The window opening can be framed to provide an opening for the sleeve, 35" wide by 29.5" tall. The height of the opening is measured from the top surface of the 2.5" spacer. Once the opening is framed, the sheeting can be installed. The sheeting material must not extend into the opening.

The sleeve should be test fit into the opening to confirm the dimensions are correct. The sleeve must be inserted into the opening from the outside of the building. The bottom of the sleeve must be level from side-to-side and the sleeve must be square in the opening. A slope is built into the bottom of the sleeve from the inside to the outside. This will allow any water that gets into the sleeve to drain out. Once the test fit is completed, the sleeve must be removed from the opening and 1/4" bead of sealant must be applied to the mounting flanges of the sleeve (see Figure 2).

The sleeve is then re-inserted into the prepared opening from the outside of the building. All of the mounting flanges must contact the exterior wall. Check to see that there is enough sealant to make this joint watertight. Additional sealant must be applied as necessary. The sleeve must be centered in the opening and the bottom of the sleeve must be checked to make certain that it is level from side-to-side. The bottom flange should be secured to the wall by using two screws through the holes in the bottom mounting flange of the sleeve. The sleeve must be checked to make sure that it is square in the opening. **Once the sleeve is square, the side and top mounting flanges of the sleeve must be secured to the wall with screws through the holes in the flanges.\*** The gaps between the side, top and bottom flanges must be filled with additional sealant.

There are two brackets supplied with the unit for attachment to the sleeve. Position these brackets to the sleeve and attach with three screws per side. Roll unit up to sleeve making sure the rear of the cabinet is tight against the gasket on the sleeve flange to provide an air tight seal. Drill 1/8" diameter holes through the brackets in to the cabinet side and attach with screws provided. See Figure 5 for more detail.

*\* Model QWVS42-H is not secured to the wall by the flanges. Instead, it is secured along with the hurricane grille through the sides of the sleeve per requirements.*



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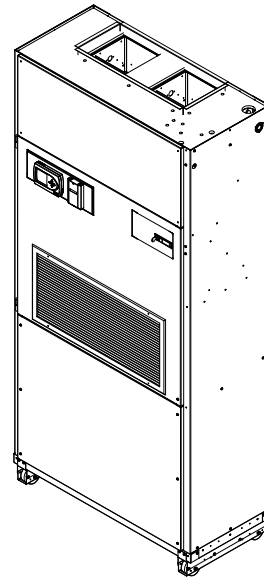
# INSTALLATION INSTRUCTIONS

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## QW Series Geothermal R-410A Staged Capacity Packaged Heat Pump

Models:

QW2S3DA	QW3S3DA	QW4S3DA	QW5S3DA
QW2S3DB	QW3S3DB	QW4S3DB	QW5S3DB
QW2S3DC	QW3S3DC	QW4S3DC	QW5S3DC



MIS-2736

Earth Loop Fluid  
Temperatures 25 – 110  
Ground Water Temperature 45 – 75



*Climate Control Solutions*

Bard Manufacturing Company, Inc.  
Bryan, Ohio 43506  
[www.bardhvac.com](http://www.bardhvac.com)

Manual No.: 2100-738F  
Supersedes: 2100-738E  
Date: 5-14-21

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## **GETTING OTHER INFORMATION AND PUBLICATIONS**

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These publications can help with installing the heat pump. They can usually be found at the local library or purchased directly from the publisher. Be sure to consult current edition of each standard.

National Electrical Code ..... ANSI/NFPA 70  
Standard for the Installation ..... ANSI/NFPA 90A  
of Air Conditioning and Ventilating Systems  
Standard for Warm Air..... ANSI/NFPA 90B  
Heating and Air Conditioning Systems  
Load Calculation for Residential ..... ACCA Manual J  
Winter and Summer Air Conditioning  
Duct Design for Residential ..... ACCA Manual D  
Winter and Summer Air Conditioning and Equipment  
Selection  
Closed-Loop/Ground Source Heat Pump..... IGSHPA  
Systems Installation Guide  
Grouting Procedures for Ground-Source ..... IGSHPA  
Heat Pump Systems  
Soil and Rock Classification for the Design..... IGSHPA  
of Ground-Coupled Heat Pump Systems  
Ground Source Installation Standards..... IGSHPA  
Closed-Loop Geothermal Systems – Slinky ..... IGSHPA  
Installation Guide

**For more information, contact these publishers:**

**ACCA Air Conditioning Contractors of America**  
1712 New Hampshire Avenue  
Washington, DC 20009  
Telephone: (202) 483-9370  
Fax: (202) 234-4721

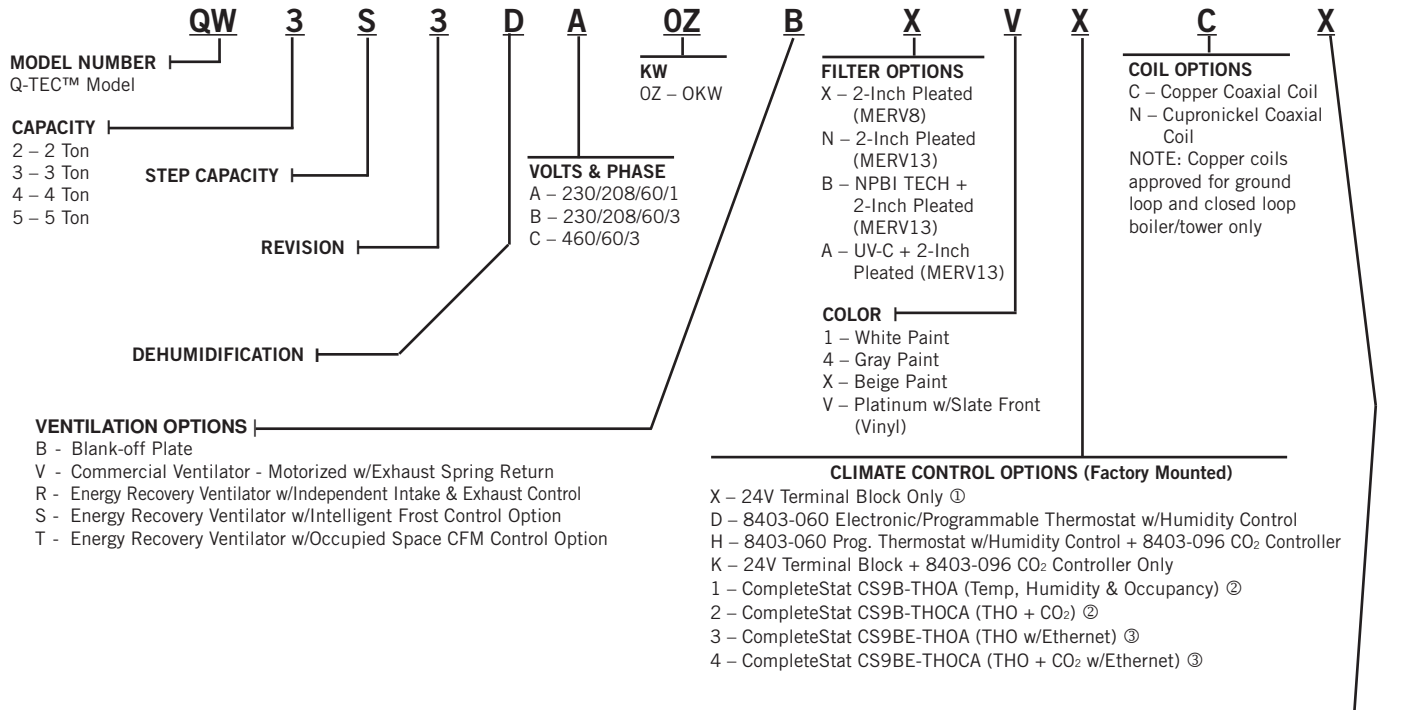
**ANSI American National Standards Institute**  
11 West Street, 13th Floor  
New York, NY 10036  
Telephone: (212) 642-4900  
Fax: (212) 302-1286

**ASHRAE American Society of Heating Refrigerating,  
and Air Conditioning Engineers, Inc.**  
1791 Tullie Circle, N.E.  
Atlanta, GA 30329-2305  
Telephone: (404) 636-8400  
Fax: (404) 321-5478

**NFPA National Fire Protection Association**  
Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9901  
Telephone: (800) 344-3555  
Fax: (617) 984-7057

**IGSHPA International Ground Source  
Heat Pump Association**  
490 Cordell South  
Stillwater, OK 74078-8018

# QW SERIES GEOTHERMAL R-410A STAGED CAPACITY GENERAL INFORMATION



## FACTORY-INSTALLED PUMP & PIPING OPTIONS

- X – NONE: All pump and water connections field installed, requires field piping to the coaxial water coil using double O-ring fittings, which must be ordered separately.
- P – NONE: All pump and water connections field installed, requires field piping to the coaxial water coil 1" female NPT wrought copper fittings.
- 3 – Single Grundfos UPS15-42F pump, isolation valves both ends, piped with copper to double O-ring fittings back corners of unit
- 4 – Single Grundfos UP26-64F pump, isolation valves both ends, piped with copper to double O-ring fittings back corners of unit
- 5 – Single Grundfos UPS26-99-FC pump, isolation valves both ends, piped with copper to double O-ring fittings back corners of unit

## NOTES

- ① If "X" control option is selected, then thermostat and humidistat, if applicable, or DDC control system must be field supplied.
- ② CS9B-THOA and -THOCA are BACnet w/shielded twisted pair wiring.
- ③ CS9BE-THOA and -THOCA are BACnet w/shielded twisted pair wiring and Ethernet port.

**TABLE 1A**  
**Electrical Specifications**

<i>Specifications - 2 and 3 Ton</i>						
MODELS	QW2S3-A	QW2S3-B	QW2S3-C	QW3S3-A	QW3S3-B	QW3S3-C
<b>Electrical Rating - 60 Hertz</b>	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	253-197 VAC		414-506 VAC	253-197 VAC		414-506 VAC
Minimum Circuit Ampacity	20	14	9	27	22	13
++ Delay Fuse or Circuit Breaker Max	30	20	15	40	30	15
<b>COMPRESSOR - CIRCUIT A</b>						
Voltage	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Rated Load Amps	11.7/13.0	6.5/7.2	3.9	15.6/17.4	11.6/12.9	6.4
Branch Circuit Selection Current	11.7	6.5	3.9	15.7	11.7	6.5
Locked Rotor Amps	58.3	55.4	28	83	73	38
<b>BLOWER MOTOR</b>						
Blower Motor HP/SPD	1/3/Variable			1/2/Variable		
Blower Motor - Amps	2.8			4.3		
Filter Sizes (inches) STD	1 - 16x20x2 & 1 - 16x16x2			1 - 16x20x2 & 1 - 16x16x2		
<b>ENERGY RECOVERY VENTILATOR</b>						
ERV Voltage	230/208-60-1			230/208-60-1		
ERV - Full Load Amps	2.2			2.2		
<b>SHIPPING WEIGHT - LBS</b>	475 lb.			475 lb.		

<i>Specifications - 4 and 5 Ton</i>						
MODELS	QW4S3-A	QW4S3-B	QW4S3-C	QW5S3-A	QW5S3-B	QW5S3-C
<b>Electrical Rating - 60 Hertz</b>	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	253-197 VAC		414-506 VAC	253-197 VAC		414-506 VAC
Minimum Circuit Ampacity	37	28	17	43	30	16
++ Delay Fuse or Circuit Breaker Max	50	40	20	60	45	20
<b>COMPRESSOR - CIRCUIT A</b>						
Voltage	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Rated Load Amps	21.2/23.6	14.0/15.6	7.1	26.9/30.0	16.5/18.4	8.1
Branch Circuit Selection Current	22.0	14.6	7.2	27.0	16.6	9.0
Locked Rotor Amps	104	83.1	41	139.9	110	52
<b>BLOWER MOTOR</b>						
Blower Motor HP/SPD	3/4/Variable			3/4/Variable		
Blower Motor - Amps	6.8			6.8		
Filter Sizes (inches) STD	1 - 16x25x2 & 1 - 16x16x2			1 - 16x25x2 & 1 - 16x16x2		
<b>ENERGY RECOVERY VENTILATOR</b>						
ERV Voltage	230/208-60-1			230/208-60-1		
ERV - Full Load Amps	2.2			2.2		
<b>SHIPPING WEIGHT - LBS</b>	505 lb.			505 lb.		

**TABLE 1B**  
**Electrical Specifications**

Model	RATED VOLTS, Hz & PHASE	NO. FIELD POWER CIRCUITS	① MINIMUM CIRCUIT AMPACITY	② MAXIMUM EXTERNAL FUSE OR CIRCUIT BREAKER	③ FIELD POWER WIRE SIZE	③ GROUND WIRE SIZE
QW2S3DA0Z	230/208-60-1	1	20	30	10	10
QW2S3DB0Z	230/208-60-3	1	14	20	12	12
QW2S3DC0Z	460-60-3	1	9	15	14	14
QW3S3DA0Z	230/208-60-1	1	27	40	8	10
QW3S3DB0Z	230/208-60-3	1	22	30	10	10
QW3S3DC0Z	460-60-3	1	13	15	14	14
QW4S3DA0Z	230/208-60-1	1	37	50	8	10
QW4S3DB0Z	230/208-60-3	1	28	35	8	10
QW4S3DC0Z	460-60-3	1	17	20	12	12
QW5S3DA0Z	230/208-60-1	1	43	60	8	10
QW5S3DB0Z	230/208-60-3	1	30	40	8	10
QW5S3DC0Z	460-60-3	1	15	20	10	10

① These "Minimum Circuit Ampacity" values are to be used for sizing the field power conductors. Refer to the National Electrical code (latest version), Article 310 for power conductor sizing. **CAUTION:** When more than one field power circuit is run through one conduit, the conductors must be derated. Pay special attention to note 8 of Table 310 regarding Ampacity Adjustment Factors when more than three (3) current carrying conductors are in a raceway.

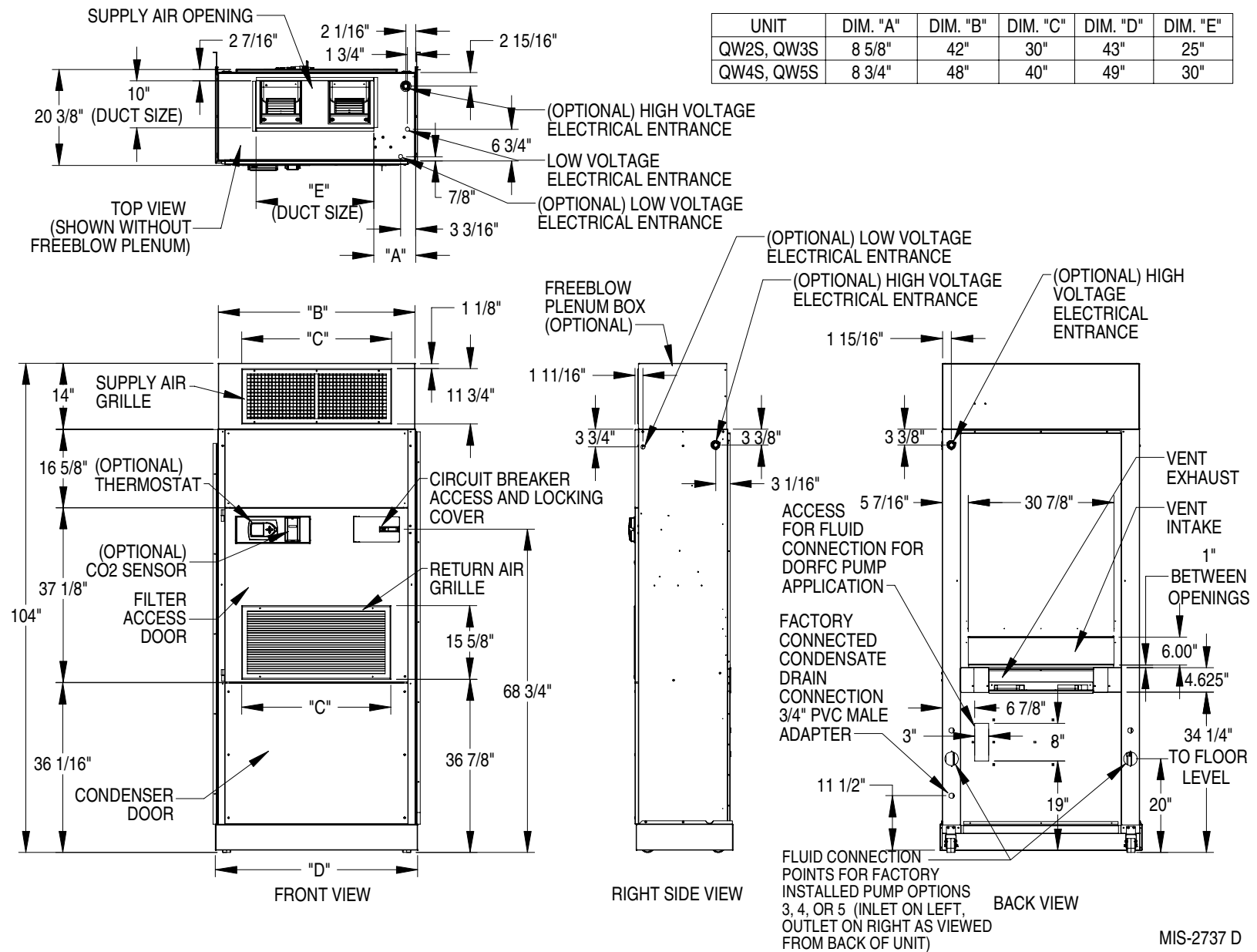
② Maximum size of the time delay fuse or circuit breaker for protection of field wiring conductors.

③ Based on 75°C copper wire. All wiring must conform to the National Electrical Code and all local codes.

**NOTE:** The Maximum Overcurrent Protection (MOCP) value listed is the maximum value as per UL 1995 calculations for MOCP (branch-circuit conductor sizes in this chart are based on this MOCP). The actual factory-installed overcurrent protective device (circuit breaker) in this model may be lower than the maximum UL 1995 allowable MOCP value, but still above the UL 1995 minimum calculated value or Minimum Circuit Ampacity (MCA) listed.

**IMPORTANT:** While this electrical data is presented as a guide, it is important to electrically connect properly sized fuses and conductor wires in accordance with the National Electrical Code and all local codes.

**FIGURE 1**  
**Unit Dimensions**



UNIT	DIM. "A"	DIM. "B"	DIM. "C"	DIM. "D"	DIM. "E"
QW2S, QW3S	8 5/8"	42"	30"	43"	25"
QW4S, QW5S	8 3/4"	48"	40"	49"	30"

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## Shipping Damage

Upon receipt of equipment, the carton should be checked for external signs of shipping damage. The skid must remain attached to the unit until the unit is ready for installation. If damage is found, the receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent.

## Unit Removal from Skid

### **WARNING**

This unit is heavy and requires more than one person to handle and remove from the skid. Check unit wheels to ensure that wheels are locked before removing from skid. Extreme caution must be taken to prevent injury to personnel and damage to the unit.

It is recommended that the unit not be removed from the skid with a forklift.

The shipping brackets on each side of the unit must be removed and discarded (see A in Figure 2). The return air grille panel can be removed to provide a place to hold the unit. The unit can be slid forward on the skid until the front wheels hang over the edge of the skid (see B in Figure 2). The unit can be tipped forward and slid down the edge of the skid until the front wheels touch the ground (see C in Figure 2). The wheels will not roll. They are shipped from the factory locked so they will not roll. The back of the skid will have to be held down to keep it from tipping up. The skid can be slid out from under the unit. The unit can then be set upright.

## Handling Unit after Removal from Skid

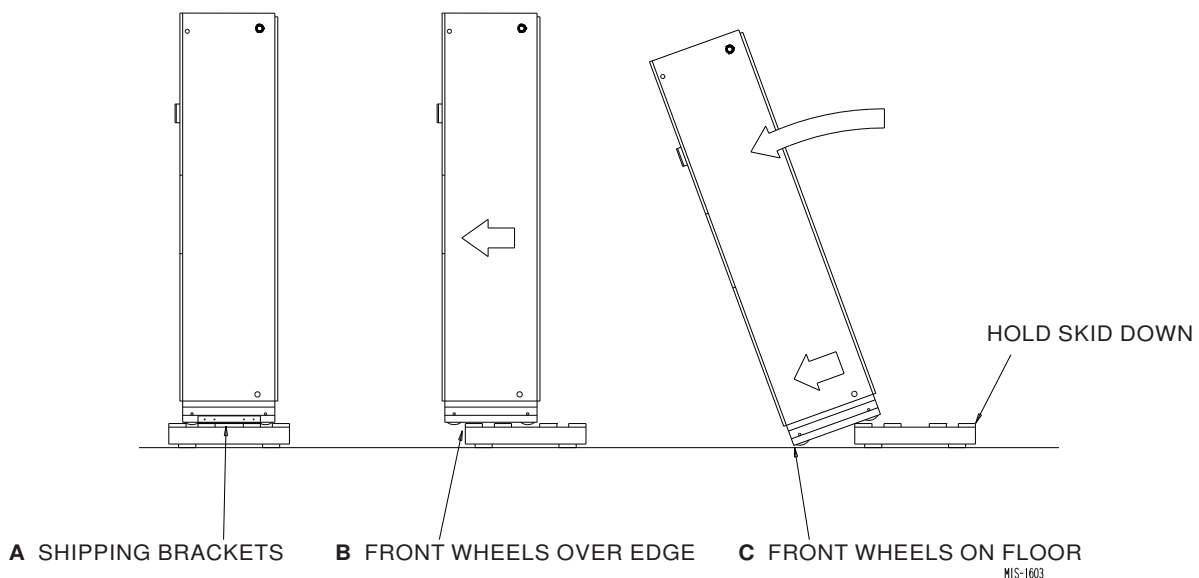
### **WARNING**

Exercise extreme caution when pushing the unit on the rollers. Handle and push from the lower 1/3 of the unit. Ensure that debris is not on the floor where the unit is to be moved on the rollers. Failure to do so could result in the unit tipping over and causing bodily injury and/or damage to the unit.

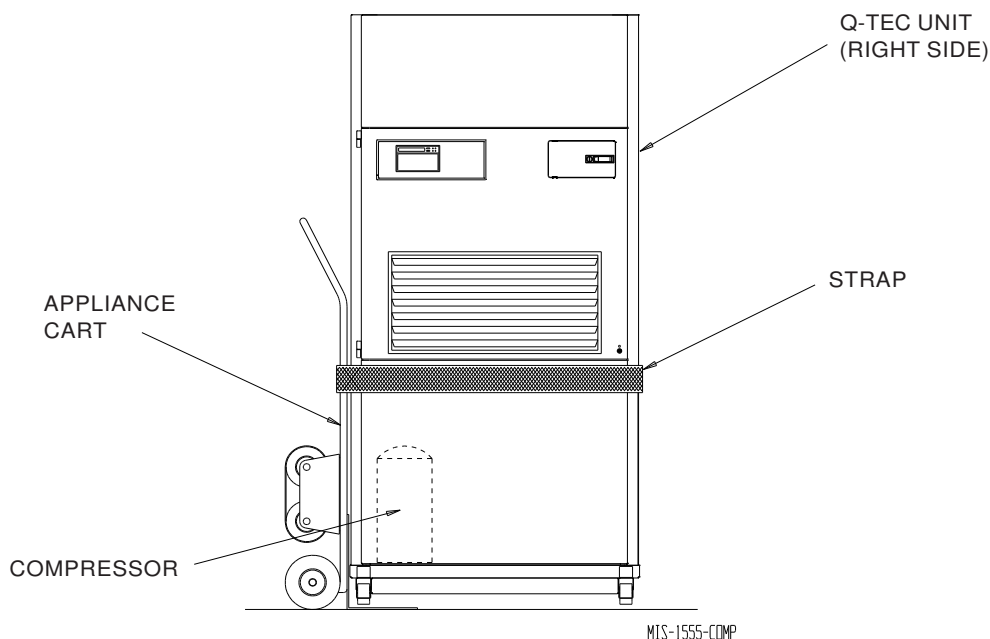
The unit will have to be turned sideways and removed from the skid to fit through a 36" doorway. If the door height allows, the unit can be slid sideways through the door.

If the unit can not be slid through the door, then the unit will have to be put on a cart and tipped down to roll through the door. It is recommended that an appliance cart be used with a strap to hold the unit on the cart. **The wheels of the unit must be locked.** If the wheels were allowed to roll, the unit could roll off the cart. **The unit should always be carted from the left side.** This is the side where the compressor is located. See Figure 3 on page 10. The blade of the appliance cart should be slid under the wheels of the unit. The strap of the appliance cart should be placed around the unit and strapped tightly. Help will be required to tip the unit back onto the cart. The unit can be leaned far enough back to be rolled through the door. Be careful when setting the unit back up to keep from damaging the unit.

**FIGURE 2**  
**Removal of Unit from Skid**



**FIGURE 3**  
**Proper Handling of Unit after Removal from Skid**



## **Removal of Wall Bracket from Shipping Location**

### **Units without Vent Options**

The wall brackets are attached to the back of the unit, as shown in the BACK VIEW in Figure 5 on page 12. Remove and retain the wall brackets for use when attaching the unit to the wall.

### **Units with Vent Options**

Units equipped with a vent option require a wall sleeve. Remove and retain the unit to sleeve brackets for use when attaching the unit to the sleeve. The brackets are attached to the shipping crate, as shown in FRONT VIEW in Figure 5 on page 12.

## **General**

The equipment covered in this manual is to be installed by trained, experienced service and installation technicians.

The unit is designed for use with or without duct work. For use without duct work, plenum box QPB\*\* is recommended.

These instructions explain the recommended method to install the water source self-contained unit and the electrical wiring connections to the unit.

These instructions and any instructions packaged with any separate equipment required to make up the entire

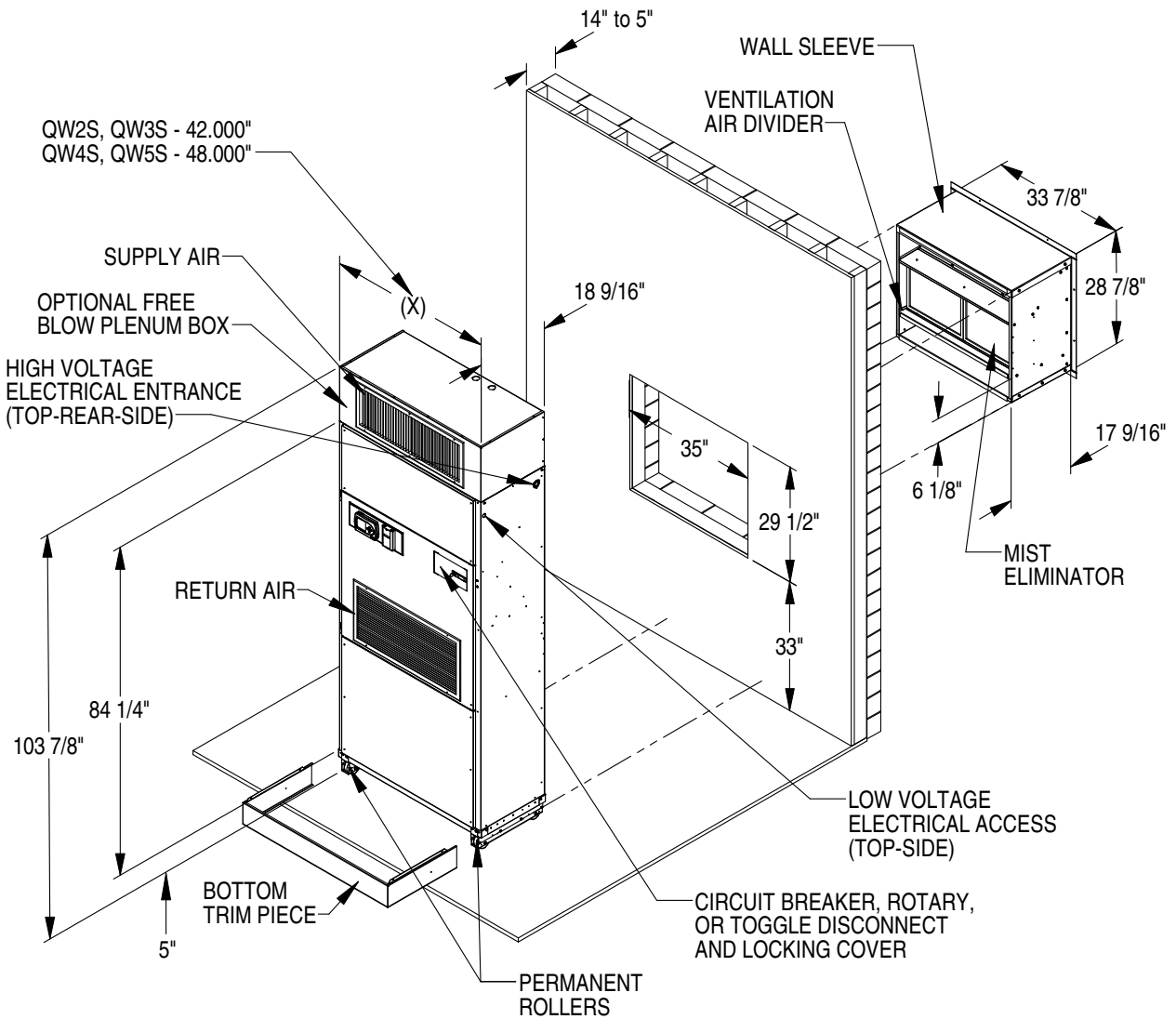
air conditioning system should be carefully read before beginning the installation. Note particularly "Start Procedure" and any tags and/or labels attached to the equipment.

While these instructions are intended as a general recommended guide, they do not supersede any national and/or local codes in any way. Authorities having jurisdiction should be consulted before the installation is made. See page 4 for information on codes and standards.

Size of unit for a proposed installation should be based on heat loss calculation made according to methods of Air Conditioning Contractors of America (ACCA). The air duct should be installed in accordance with the Standards of the National Fire Protection Systems of Other Than Residence Type, NFPA No. 90A and Residence Type Warm Air Heating and Air Conditioning Systems, NFPA No. 90B. Where local regulations are at a variance with instructions, installer should adhere to local codes.



**FIGURE 4**  
**Installation of Unit through Wall with Wall Sleeve**



MIS-2739 A

**Minimum Installation Height**

The minimum installation height of the unit with a free blow plenum is 8 ft. 9 in. This provides enough clearance for the plenum to be removed. See Figure 5 on page 12.

The minimum installation height for ducted applications is 8 ft. 9 in. This provides enough clearance to install the duct work. See Figure 6 on page 12.

**FIGURE 5**  
**Shipping Assembly – Bracket Locations**

*BACK VIEW*

Q-SERIES WALL BRACKETS(2)  
PART #112-289 ATTACHED  
TO BACK OF UNIT  
NOTE: FOR USE WITH  
BLANK-OFF PLATE OPTION ONLY

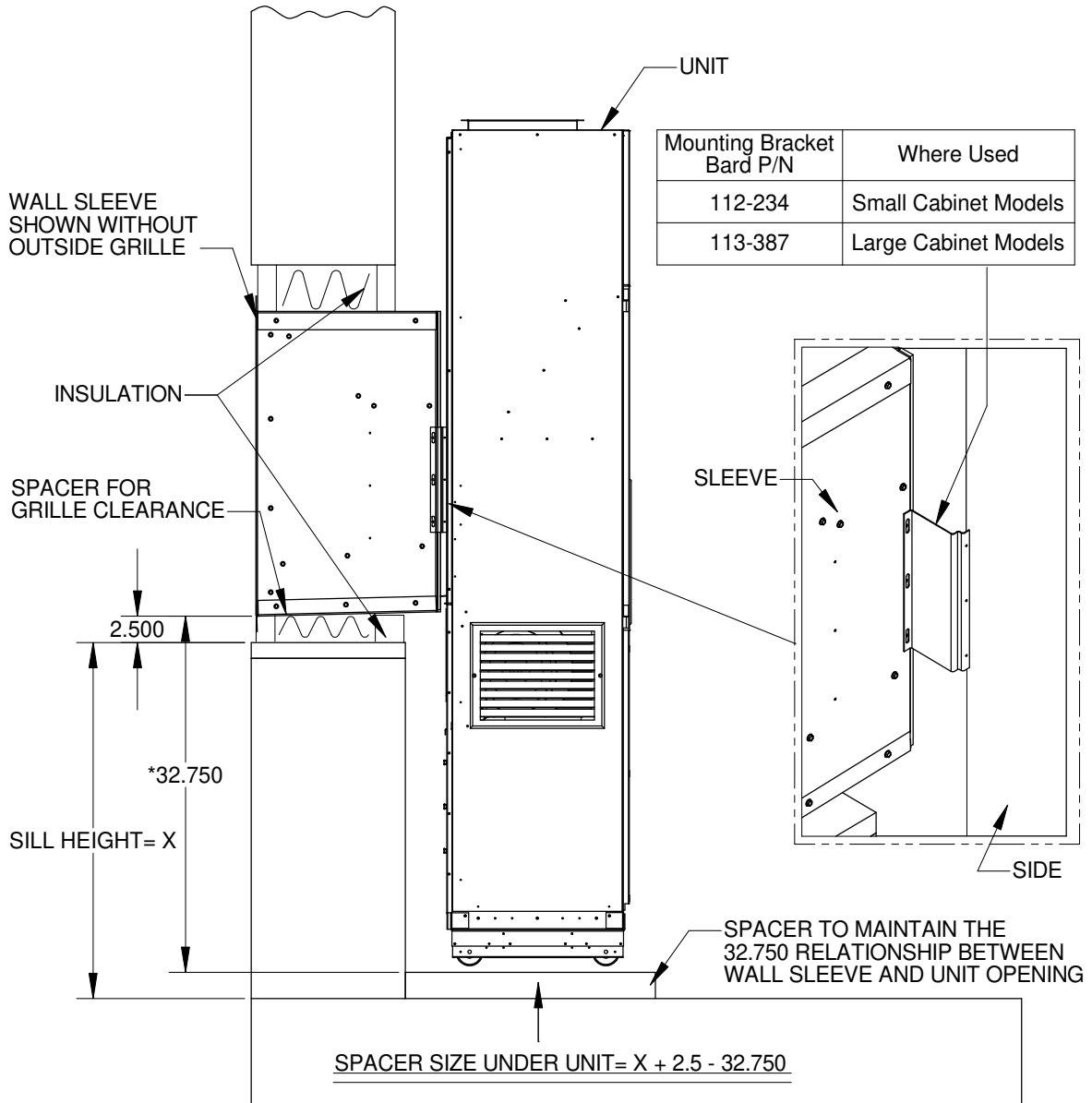
Q-SERIES SLEEVE MOUNTING BRACKETS (2).  
ATTACHED TO SHIPPING PALLET.  
SMALL CABINET  
PART #112-289 (2 PLACES)  
LARGE CABINET  
PART #113-387 (2 PLACES)  
NOTE: NOT A PICTORIAL REPRESENTATION  
OF THE ACTUAL SIZES

SIDE TRIM  
PART #134-178-7

*FRONT VIEW*

MIS-4162

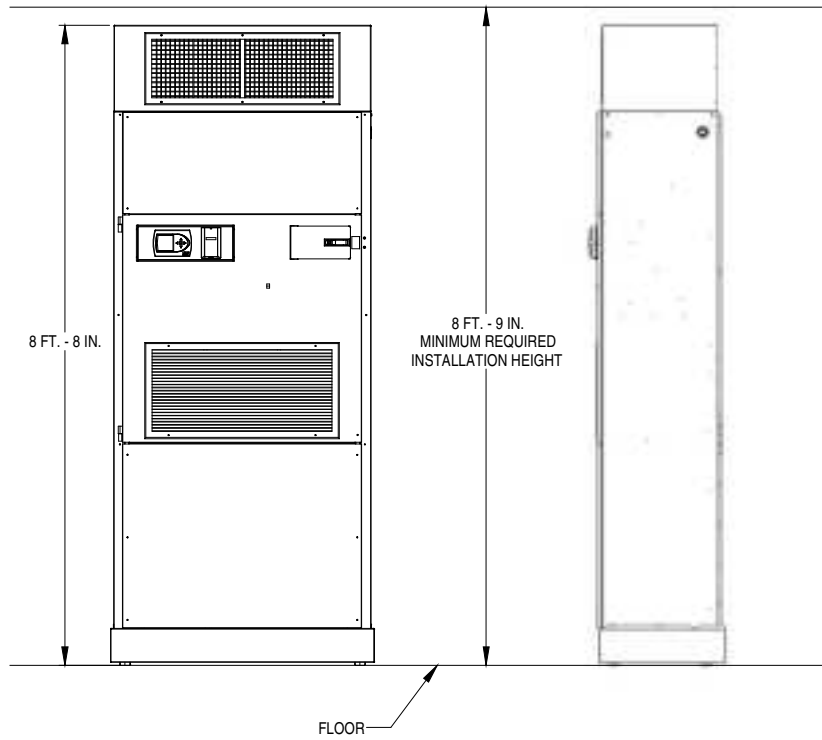
**FIGURE 6**  
**Installation of QW Wall Sleeve Through a Window Opening**



\*THIS DIMENSION MUST REMAIN CONSTANT  
 WHEN FABRICATING UNIT AND WALL SLEEVE  
 REGARDLESS OF THE WINDOW SILL DIMENSIONS

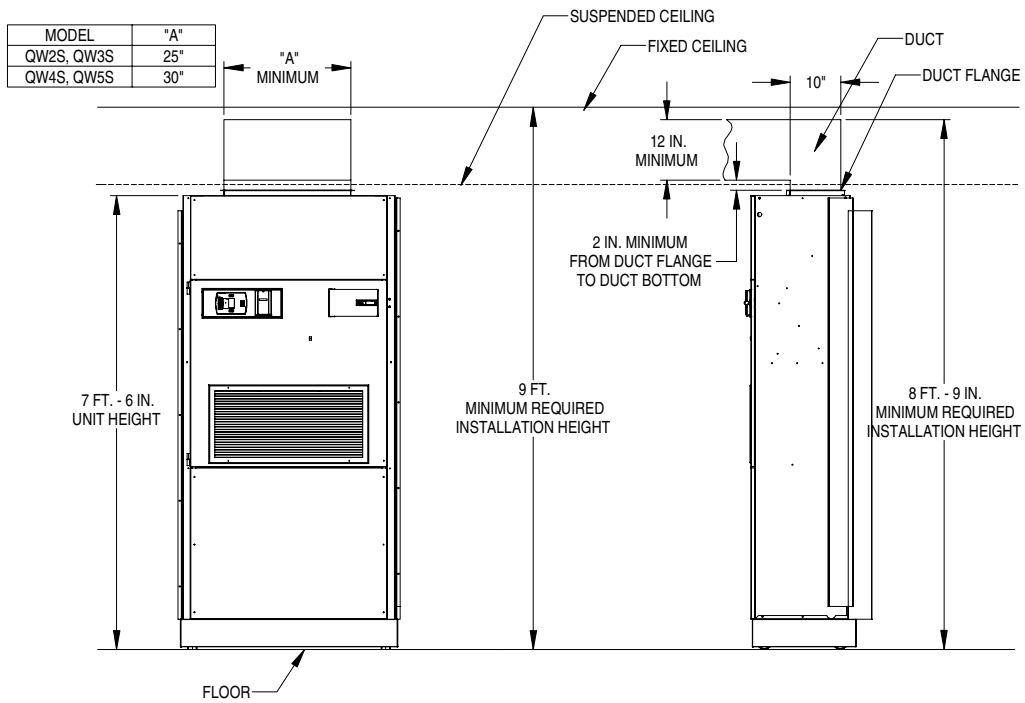
MIS-1614 A

**FIGURE 7**  
Installation with Free Blow Plenum



MIS-2740

**FIGURE 8**  
Ducted Application



MIS-2741 A

## Duct Work

Any heat pump is more critical of proper operating charge and an adequate duct system than a straight air conditioning unit. All duct work must be properly sized for the design airflow requirement of the equipment. Air Conditioning Contractors of America (ACCA) is an excellent guide to proper sizing. All duct work or portions thereof not in the conditioned space should be properly insulated in order to both conserve energy and prevent condensation or moisture damage. When duct runs through unheated spaces, it should be insulated with a minimum of 1" of insulation. Use insulation with a vapor barrier on the outside of the insulation. Flexible joints should be used to connect the duct work to the equipment in order to keep the noise transmission to a minimum.

The QW\*S Series heat pump has provisions to attach a supply air duct to the top of the unit. Duct connection size is 10" x 25" nominal for QW2S and QW3S models. Duct connection size is 10" x 30" nominal for QW4S and QW5S models. The duct work is field supplied and must be attached in a manner to allow for ease of removal when it becomes necessary to slide the unit out from the wall for service. See Figure 9 for suggested attachment method.

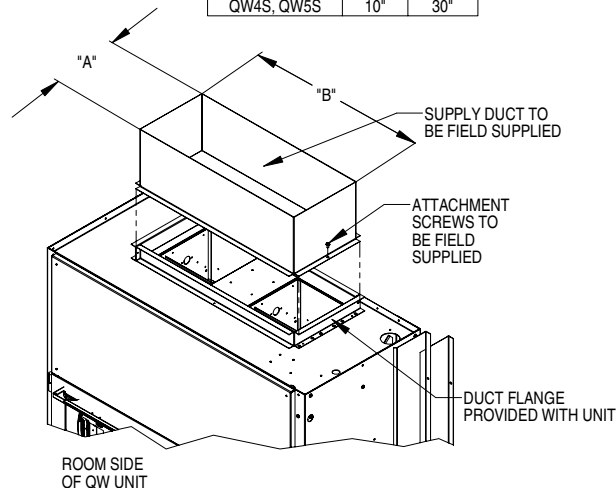
*NOTE: Unit cabinet, supply air duct and free blow plenum are approved for "0" clearance to combustible material.*

The Q-TEC Series heat pumps are designed for use with free return (non-ducted) and either free blow with the use of QPB Plenum Box or a duct supply air system.

The QPB plenum box mounts on top of the unit and has both vertically and horizontally adjustable louvers on the front discharge grille.

**FIGURE 9**  
Supply Duct Connections

MODEL	"A"	"B"
QW2S, QW3S	10"	25"
QW4S, QW5S	10"	30"



MIS-2742 A

When used with a ducted supply, a QCX cabinet extension can be used to conceal the duct work above the unit to the ceiling. This extends 20" above the unit for a total height above the floor of 10'-7/8". The unit is equipped with a variable speed indoor blower motor which increases in speed with an increase in duct static pressure. The unit will therefore deliver proper rated airflow up to the Maximum ESP shown in Table 4 on page 33. However, for quiet operation of the air system, the duct static should be kept as low as practical, within the guidelines of good duct design.

## Filters

Two 2" pleated filters are supplied with each unit. The filters fit into a fixed rack.

The filters are serviced from the inside of the building. To gain access to the filters release the latch on the circuit breaker door and one 1/4 turn fastener near the bottom of the door. This door is hinged on the left so it will swing open.

The internal filter brackets are adjustable to accommodate 1" filters. The tabs for the 1" filters must be bent up to allow the 1" filters to slide in place.

## Condensate Drain

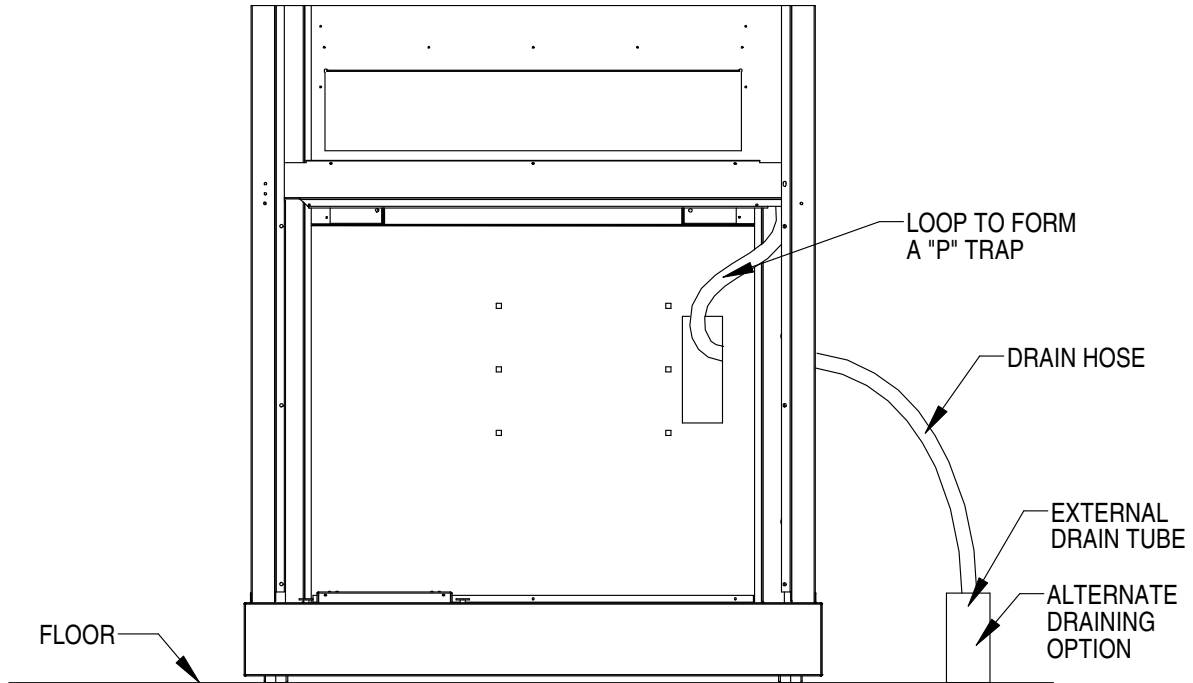
The condensate drain hose is routed down from the evaporator drain pan on the right side of the unit into the compressor compartment. There are three locations that the drain can exit the cabinet.

If the drain is to be hard plumbed, there is a 3/4" PVC female adapter located on the cabinet rear panel. In these installations, the drain tube is to be slipped over the pipe connection inside of the cabinet; this is how it is shipped from the factory (see Figure 10C on page 17).

For a stand pipe type of drain, the drain hose can exit the rear of the cabinet. There is adequate hose length to reach the floor on the right hand side of the unit (see Figure 10A on page 16).

*NOTE: Whichever type of drain connection is used, a "P" trap must be formed (see Figure 10A on page 16).*

**FIGURE 10A**  
**Condensate Drain**

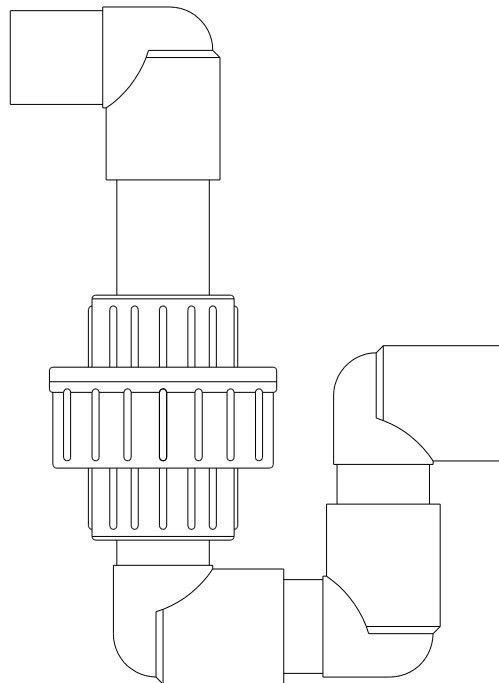


FRONT VIEW WITH CONDENSER DOOR REMOVED

MIS-2743

The drain can be routed through the floor or through the wall. ***If the drain is to be routed through an unconditioned space, it must be protected from freezing.*** The drain line must be able to be removed from the unit if it is necessary to remove the unit from the wall.

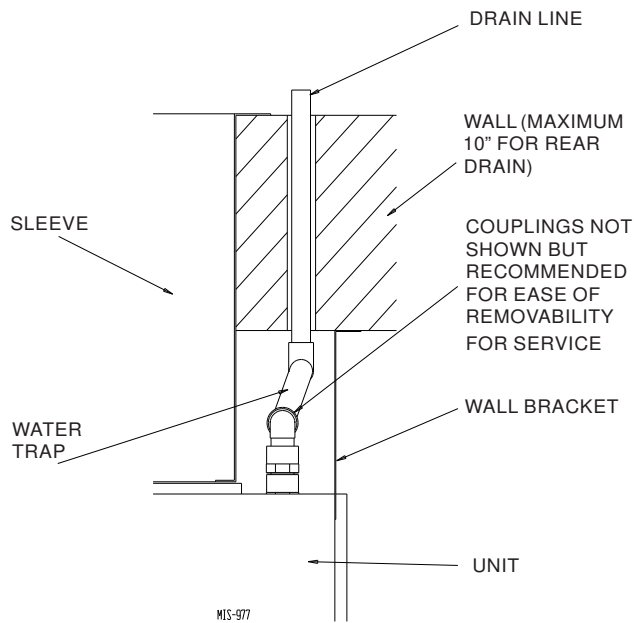
**Figure 10B**  
**Optional Rear Drain**



MIS-2754

The **rear drain** can be used with wall thickness of up to 10" where a water trap can be installed between the unit and the interior wall (see Figure 10B). The trap cannot extend beyond the edge of the unit or it will interfere with the wall mounting bracket. The drain can be routed through the floor or through the wall. If the drain is routed through the wall, the drain line must be positioned such that it will not interfere with the sleeve flange or the grille (see Figure 10C). ***If the drain is to be routed through an unconditioned space, it must be protected from freezing.***

**Figure 10C  
Rear Drain (Top View)**



## Mist Eliminator Service

### (Optional – only used with one of the vent options)

A mist eliminator is supplied with the wall sleeve. The mist eliminator is constructed of aluminum frame and mesh. The mist eliminator is located in the top section of the wall sleeve and can be removed from the inside of the building without removing the unit from the wall. This requires that the ventilation package must be removed.

The steps necessary to remove each of the vent options are listed following.

It is recommended that the mist eliminator be inspected annually and serviced as required. The mist eliminator can be inspected from the outside of the building by looking through the outdoor grille. The mist eliminator can be serviced from the outside. The outdoor grille must be removed to do so.

The mist eliminator can be cleaned by washing with soap and water. The excess water should be shaken off the mist eliminator before it is re-installed.

### Commercial Room Ventilator Option

Before starting the removal make sure the power has been turned off. The hinged return air grille panel must be opened. The commercial room ventilator (CRV) can be seen after the panel has been removed. The CRV must be removed to gain access to the mist eliminator.

1. The two mounting screws in the front of the CRV must be removed.
2. The power connectors for the CRV (located on the right side of the unit) must be disconnected. Squeeze the tabs on the sides of the connector and pull straight out. Unplug both of the connectors.
3. Slide the CRV straight out of the unit.

The mist eliminator can be seen through the opening in the back of the unit. The mist eliminator must be raised up and the bottom can be pulled toward the front of the unit and removed.

### Q-TEC Energy Recovery Ventilator Option

Before starting the removal make sure that the power has been turned off. The hinged return air grille panel must be opened. The Q-TEC energy recovery ventilator (QERV) can be seen after the panel is opened. To gain access to the mist eliminator, the QERV must be removed (see Figure 11).

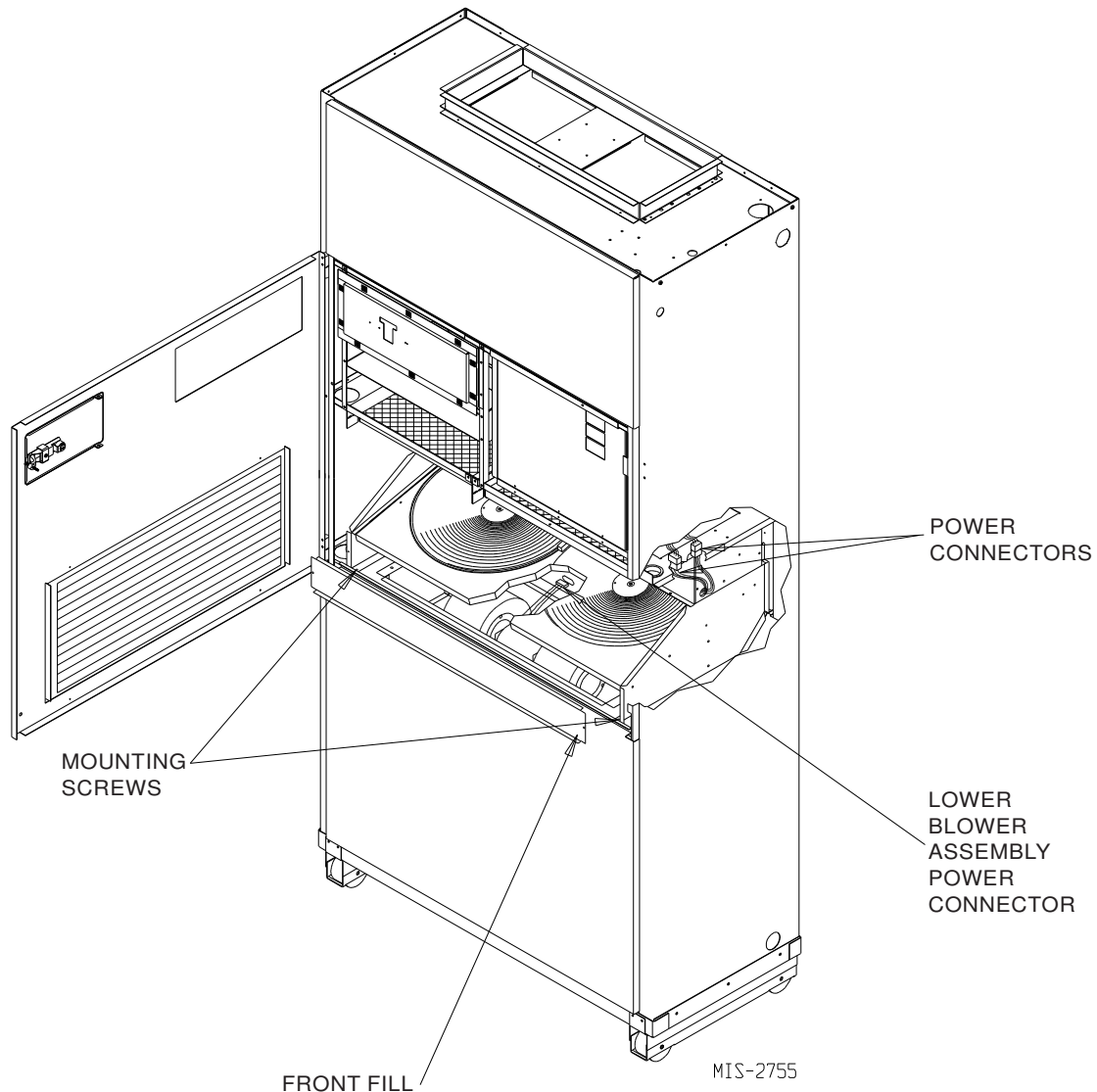
1. The front fill plate of the QERV must be removed. There is one screw on either side of the plate. Remove these screws and remove the plate.
2. On either side of the QERV there are mounting screws that hold the QERV in place. Remove both of these screws.
3. Underneath the heat recovery cassette there is a power connector for the lower blower assembly. To disconnect this plug, the tabs on both sides of the

plug must be squeezed to release the plug. While squeezing the tabs, pull the plug out of the socket.

4. The QERV is plugged into the unit on the right side of the unit. Both of these plugs must be disconnected to remove the QERV. Squeeze the tabs on the sides of the connector and pull straight out.
5. Slide the QERV assembly straight out of the unit being careful not to let the cassette slide out of the QERV.

The mist eliminator can be seen through the opening in the back of the unit. The mist eliminator must be raised up and the bottom can be pulled toward the front of the unit and removed.

**Figure 11**  
**Removal of the Q-TEC Energy Recovery Ventilator**





## Mounting the Unit

When installing a QW unit near an interior wall on the left side, a minimum of 8" is required; 12" is preferred.

When installing a QW unit near an interior wall on the right side, a minimum of 12" is required as additional space is required to connect the drain.

This clearance is required to allow for the attachment of the unit to the wall mounting brackets and the side trim pieces to the wall.

This unit is to be secured to the wall when there is not a vent sleeve used with the wall mounting brackets provided. (NOTE: See Figure 5 on page 12 for wall and sleeve bracket locations on shipping crate and for a pictorial representation of brackets.) The unit itself, the supply duct and the free blow plenum are suitable for "0" clearance to combustible material.

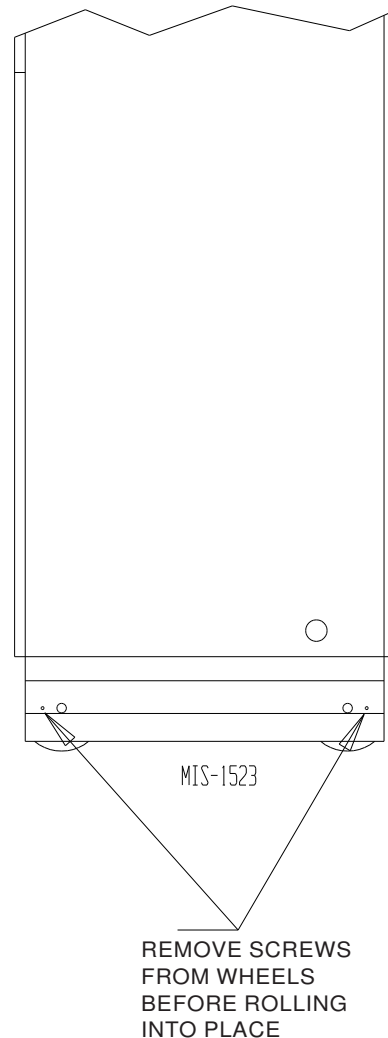
*NOTE: When a wall sleeve is to be used, attach the unit to the sleeve with bracket supplied with the wall sleeve. See Figure 5 for wall sleeve bracket.*

Following are the steps for mounting the QW units. For reference see Figure 13 on page 20.

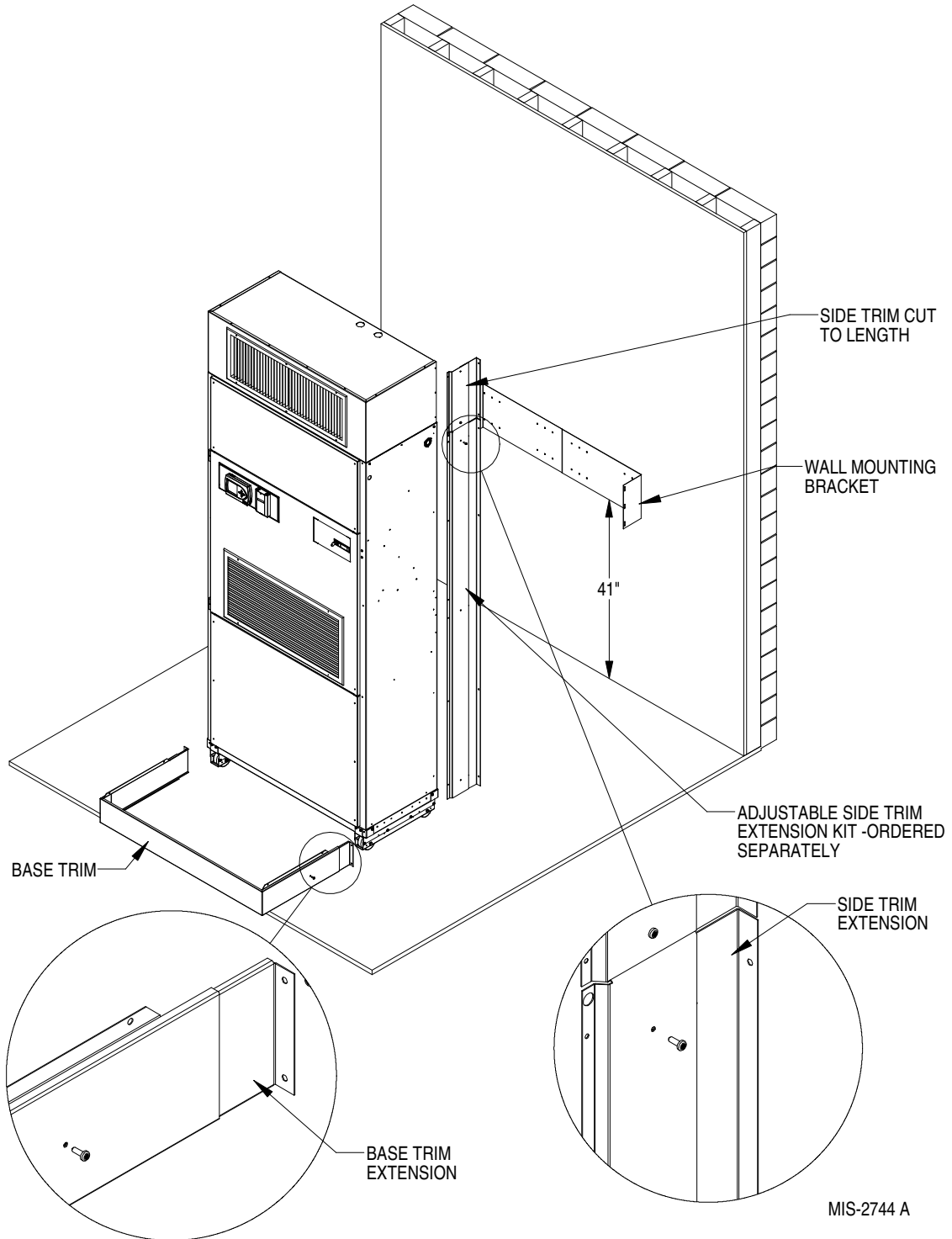
1. Attach wall mounting bracket to the structure wall with field-supplied lag bolts. The fluid piping connections are to be within the confines of this bracket. See Figure 1 on page 8 for cabinet openings and location of fluid coil connection points.
2. Position the unit in front of the wall mounting bracket.
3. Remove the locking screws from the wheels (see Figure 12).
4. Roll the unit up to the wall mounting bracket. The unit must be level from side to side. If any adjustments are necessary, shim up under the rollers with sheets of steel or any substance that is not affected by moisture.
5. Secure the unit to the wall bracket with provided #10 hex head sheet metal screws. There are prepunched holes in the cabinet sides and the bracket has slotted holes to allow for some misalignment.
6. Position the bottom trim piece to the unit and attach with provided screws (dark colored).
7. Position side trim pieces to the wall and attach with field-supplied screws. There are two long and two short pieces supplied. The long pieces are to

enclose the gap behind the unit. The short pieces are to fill the gap behind the cabinet extension or the free blow plenum box. They may be cut to suit the ceiling height or overlap the unit side trim. There is sufficient length to trim up to a 10'-2" ceiling.

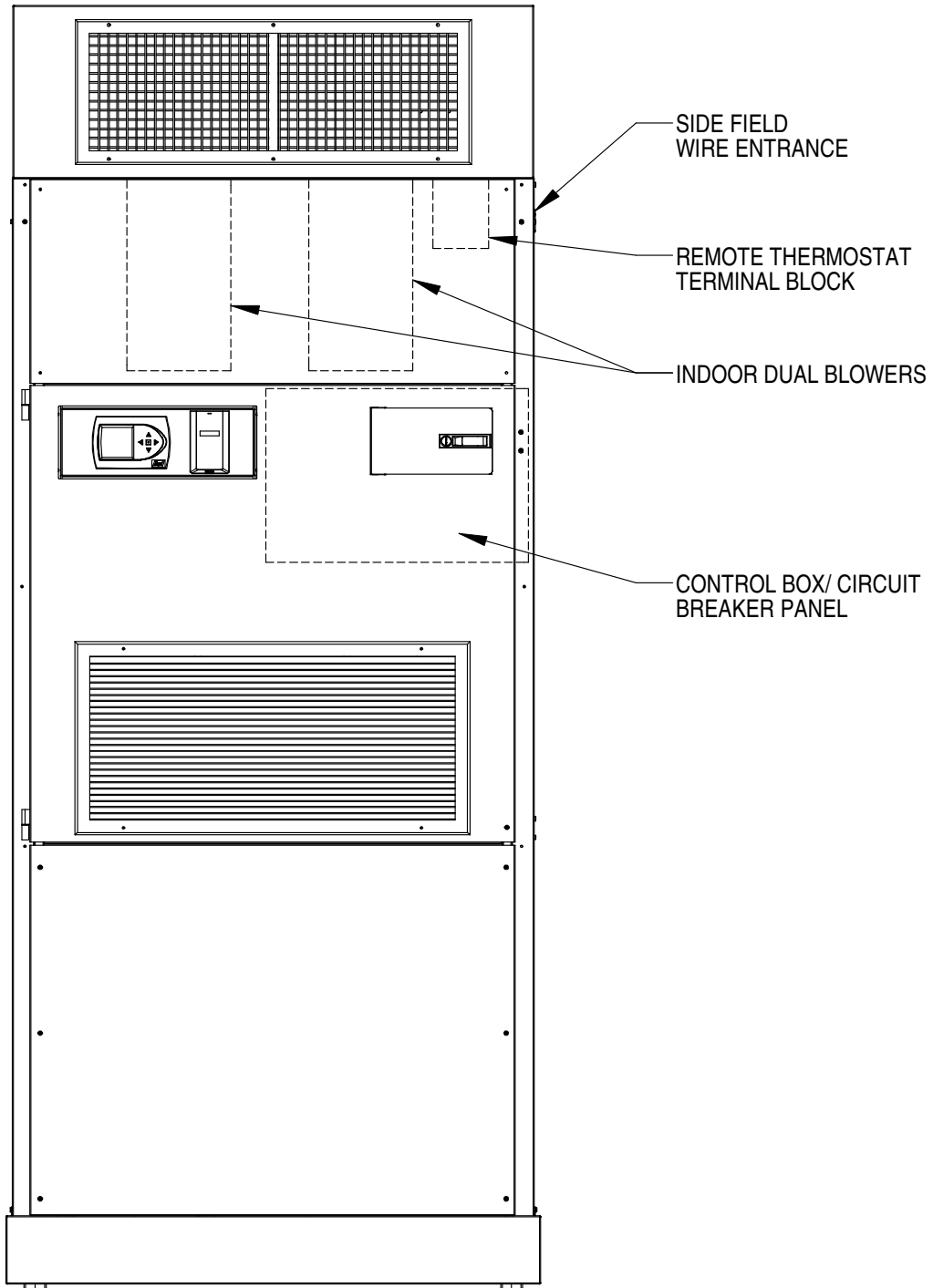
**FIGURE 12**  
**Removing Locking Screws from Wheels**



**FIGURE 13**  
**Unit Mounting without Ventilation Wall Sleeve**



**FIGURE 14**  
**Component Location**



MIS-2745

## Wiring – Main Power

Refer to the unit rating plate and/or Table 1B (page 7) for wire sizing information and maximum fuse or circuit breaker size. Each unit is marked with a “Minimum Circuit Ampacity”. This means that the field wiring used must be sized to carry that amount of current. Depending on the installed KW of electric heat, there may be two field power circuits required. If this is the case, the unit serial plate will so indicate. All models are suitable only for connection with copper wire. Each unit and/or wiring diagram will be marked “Use Copper Conductors Only”. These instructions **must be** adhered to. Refer to the National Electrical Code (NEC) for complete current carrying capacity data on the various insulation grades of wiring material. All wiring must conform to NEC and all local codes.

The electrical data lists fuse and wire sizes (75°C copper) for all models, including the most commonly used heater sizes. Also shown are the number of field power circuits required for the various models with heaters.

The unit rating plate lists a “Maximum Time Delay Relay Fuse” or circuit breaker that is to be used with the equipment. The correct size must be used for proper circuit protection and also to assure that there will be no nuisance tripping due to the momentary high starting current of the compressor motor.

The field wiring connections are located behind the top panel in the circuit breaker panel. The return air panel must be removed first. This panel is equipped with a door switch, which shuts the unit down when it is removed. The filter rack must be removed next.

## Wiring – Low Voltage

### 230/208V, 1 Phase and 3 Phase Equipment Dual Primary Voltage Transformers

All equipment leaves the factory wired on 240V tap. For 208V operation, reconnect from 240V to 208V tap. The acceptable operating voltage range for the 240 and 208V taps are as noted in Table 2.

**TABLE 2**  
**Operating Voltage Range**

TAP	RANGE
240V	253 - 216
208V	220 - 187

**NOTE:** *The voltage should be measured at the field power connection point in the unit and while the unit is operating at full load (maximum amperage operating condition).*


The standard Climate Control **Option X** is a remote thermostat connection terminal block. See Figure 16 on page 24 for wiring diagram. Compatible thermostats are listed in Table 3.

The Climate Control **Option D** is an electronic, programmable thermostat. The subbase of the thermostat is factory wired to the front panel of the unit. See Figure 17 on page 25 for wiring diagram. Compatible for use with Energy Recovery Ventilator or Economizer.

The Climate Control **Option H** is an electronic, programmable thermostat and CO<sub>2</sub> controller. The subbase of the thermostat and CO<sub>2</sub> controller are factory wired to the front panel of the unit. See Figure 16 on page 24 for wiring diagram.

## General

This unit is equipped with a variable speed ECM motor. The motor is designed to maintain rated airflow up to the maximum static allowed. ***It is important that the blower motor plugs are not plugged in or unplugged while the power is on. Failure to remove power prior to unplugging or plugging in the motor could result in motor failure.***

	<b>CAUTION</b>
Do not plug in or unplug blower motor connectors while the power is on. Failure to do so may result in motor failure.	

**TABLE 3**  
**Wall Thermostat**

Thermostat	Predominant Features
8403-060 (1120-445)	3 stage Cool; 3 stage Heat Programmable/Non-Programmable Electronic HP or Conventional Auto or Manual changeover
8403-081 (VT8650U5500B)	2 stage Cool; 2 stage Heat Programmable/Non-Programmable Electronic HP or Conventional, Auto or Manual changeover with Humidity and Occupancy Sensor, BACnet

## Low Voltage Connections

The “R” terminal is the 24 VAC *hot* terminal and is supplied through Pin #10 of Plug P2.

The “C” terminal is the 24 VAC *common/grounded* terminal and feeds through Pin #11 of Plug P2.

The “G” terminal is the *indoor blower input signal* and feeds through Pin #6 of Plug P2.

The “Y1” terminal is the *compressor starting signal* and feeds through Pin #7 of Plug P2.

The “Y2” terminal is the *compressor staging solenoid signal* and feeds through Pin #4 of Plug P2.

The “O” terminal is the *reversing valve signal* and feeds through Pin #8 of Plug P2.

The “A” terminal is the *ventilation demand signal* and outputs a signal for ventilation during occupied programming conditions, and feeds through Pin #5 of Plug P2.

The “W2” terminal is the *auxiliary heat signal* and feeds through Pin #9 of Plug P2.

The “W1/E” terminal is the *emergency heat signal* and feeds through Pin #3 of Plug P2.

The “L” terminal is used as an *input terminal* when a CS2000 infrared occupancy device is used. It feeds through Pin #12 of Plug P2.

The “D” terminal is used only of dehumidification models and feeds through Pin #1 of Plug P2.

### LOW VOLTAGE CONNECTIONS FOR DDC CONTROL

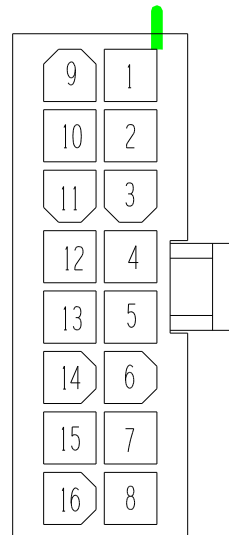
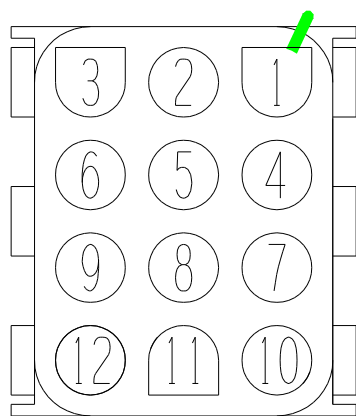
Fan Only	Energize G
Ventilation	Energize G, A (any mode of operation)
Part Load Cooling	Energize G, Y1, O
Full Load Cooling	Energize G, Y1, Y2, O
Part Load HP Heating	Energize G, Y1
Full Load HP Heating	Energize G, Y1, Y2
Auxiliary Heat	Energize G, W2
Dehumidification	Energize G, D, O

**IMPORTANT** When there is a demand for dehumidification and a demand for cooling occurs at the same time, do not drop the signal on "D" for dehumidification. Dropping an active "D" signal when a demand for cooling occurs will cause the compressor to go into an unnecessary time delay.

**FIGURE 15**  
Blower Motor Low Voltage Wire Harness Plug

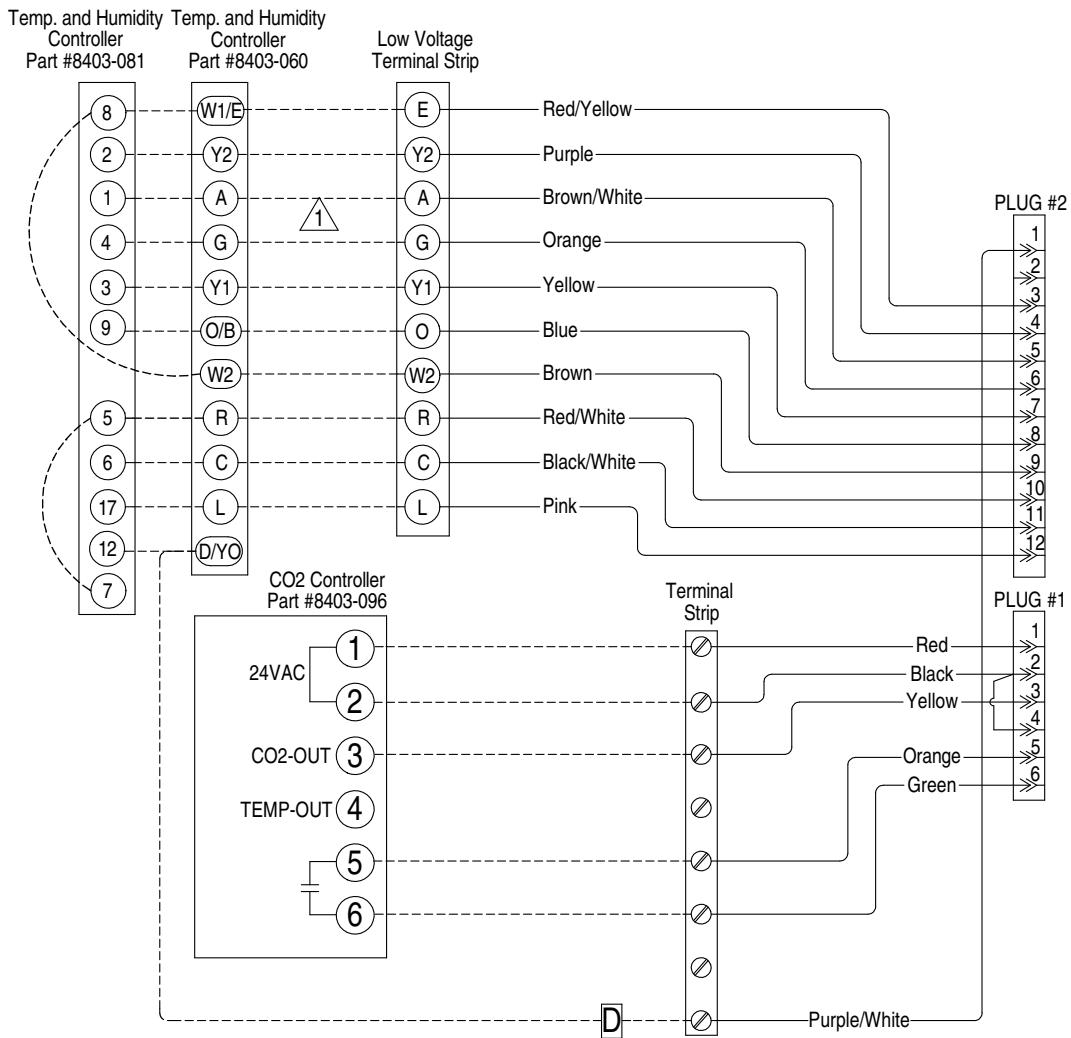
THERMOSTAT PLUG  
TERMINALS  
P2 AND P4  
(VIEWED FROM PIN END)

BLOWER MOTOR  
LOW VOLTAGE PLUG  
(VIEWED FROM PIN END)



MIS-1285

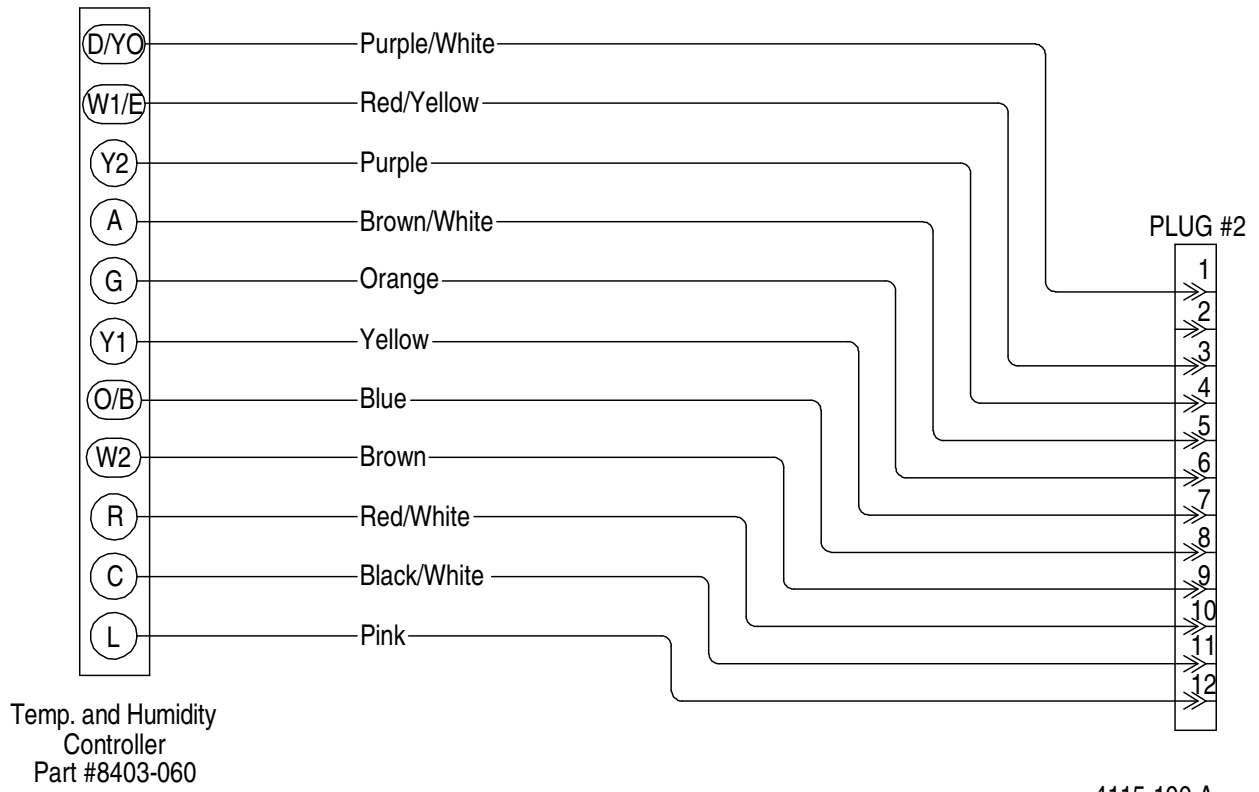
**FIGURE 16**  
**Remote Thermostat Wiring Diagram**  
**“X” Option**



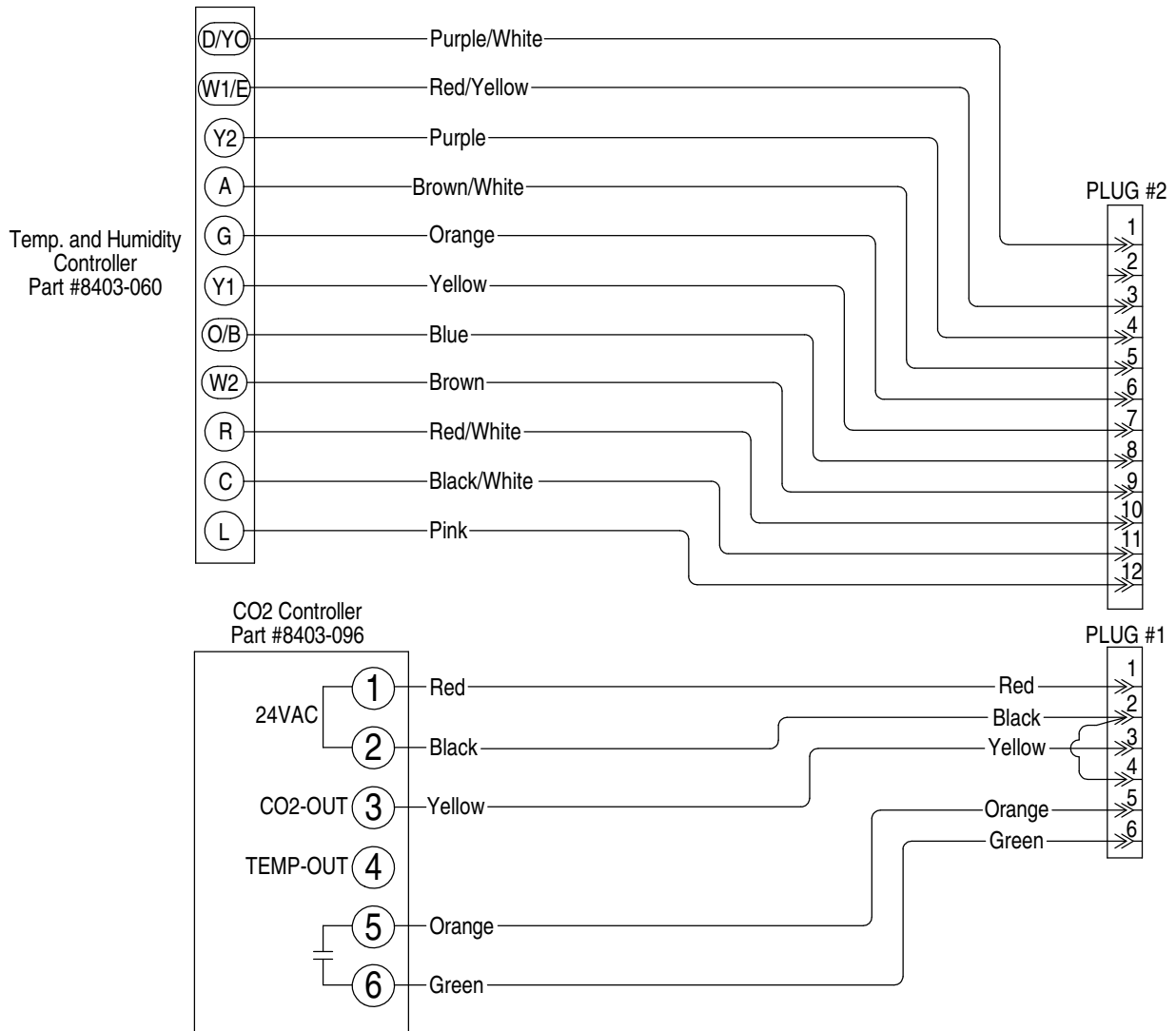
**⚠ FOR ENERGY RECOVERY VENTILATOR WITH CO2 CONTROL, DO NOT CONNECT "A" OCCUPANCY INPUT BETWEEN THERMOSTAT AND LOW VOLTAGE TERMINAL STRIP. DO MAKE THIS CONNECTION WHEN APPLYING A COMMERCIAL ROOM VENTILATOR WITH CO2 CONTROL.**

4115-102 F

**FIGURE 17**  
**Factory-Mounted Thermostat Wiring Diagram**  
**“D” Thermostat Option**



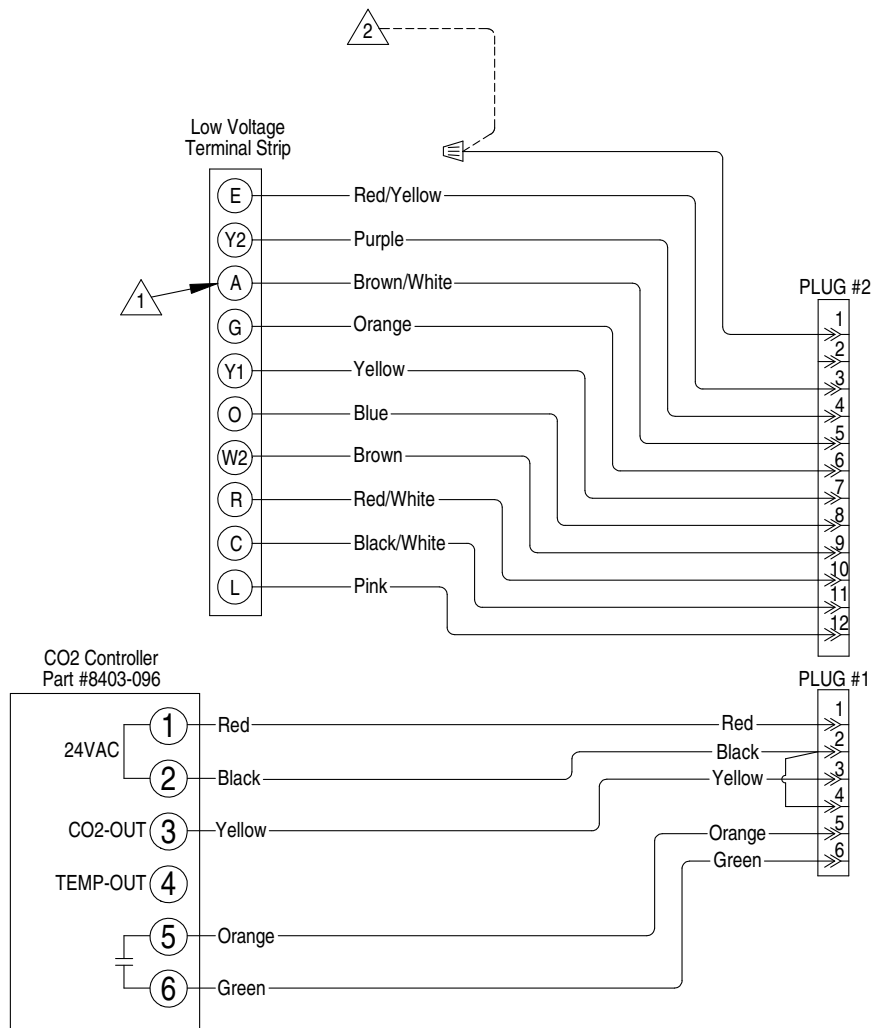
**FIGURE 18**  
**Factory-Mounted Thermostat and CO<sub>2</sub> Vent Control Wiring Diagram**  
**“H” Thermostat Option**



4115-101 F



**FIGURE 19**  
**Remote Thermostat with Mounted/Wired CO<sub>2</sub> Control Wiring Diagram**  
**“K” Thermostat Option**

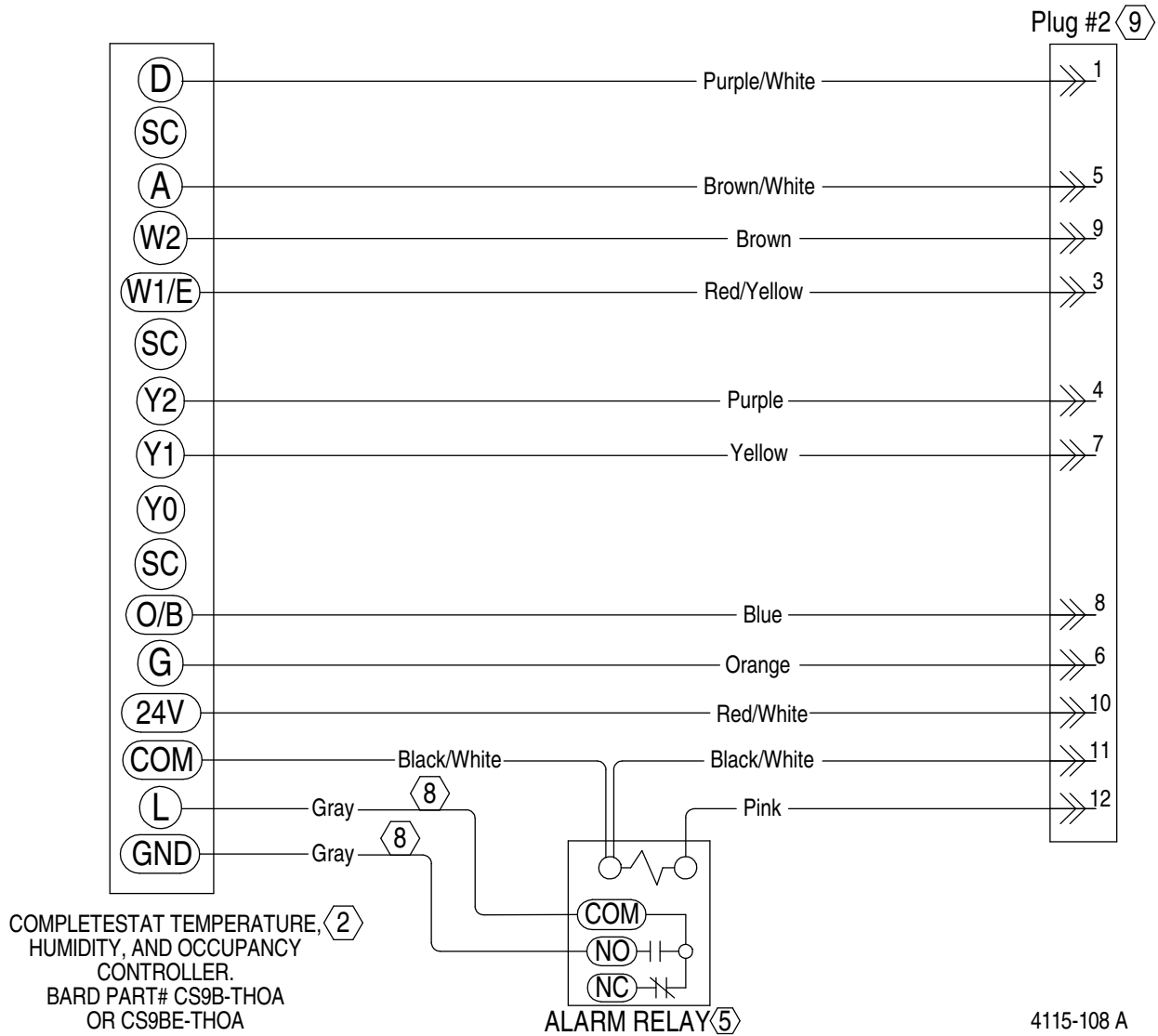


**1** FOR ENERGY RECOVERY VENTILATOR WITH CO<sub>2</sub> CONTROL, DO NOT CONNECT "A" OCCUPANCY INPUT BETWEEN THERMOSTAT AND LOW VOLTAGE TERMINAL STRIP. DO MAKE THIS CONNECTION WHEN APPLYING A COMMERCIAL ROOM VENTILATOR WITH CO<sub>2</sub> CONTROL.

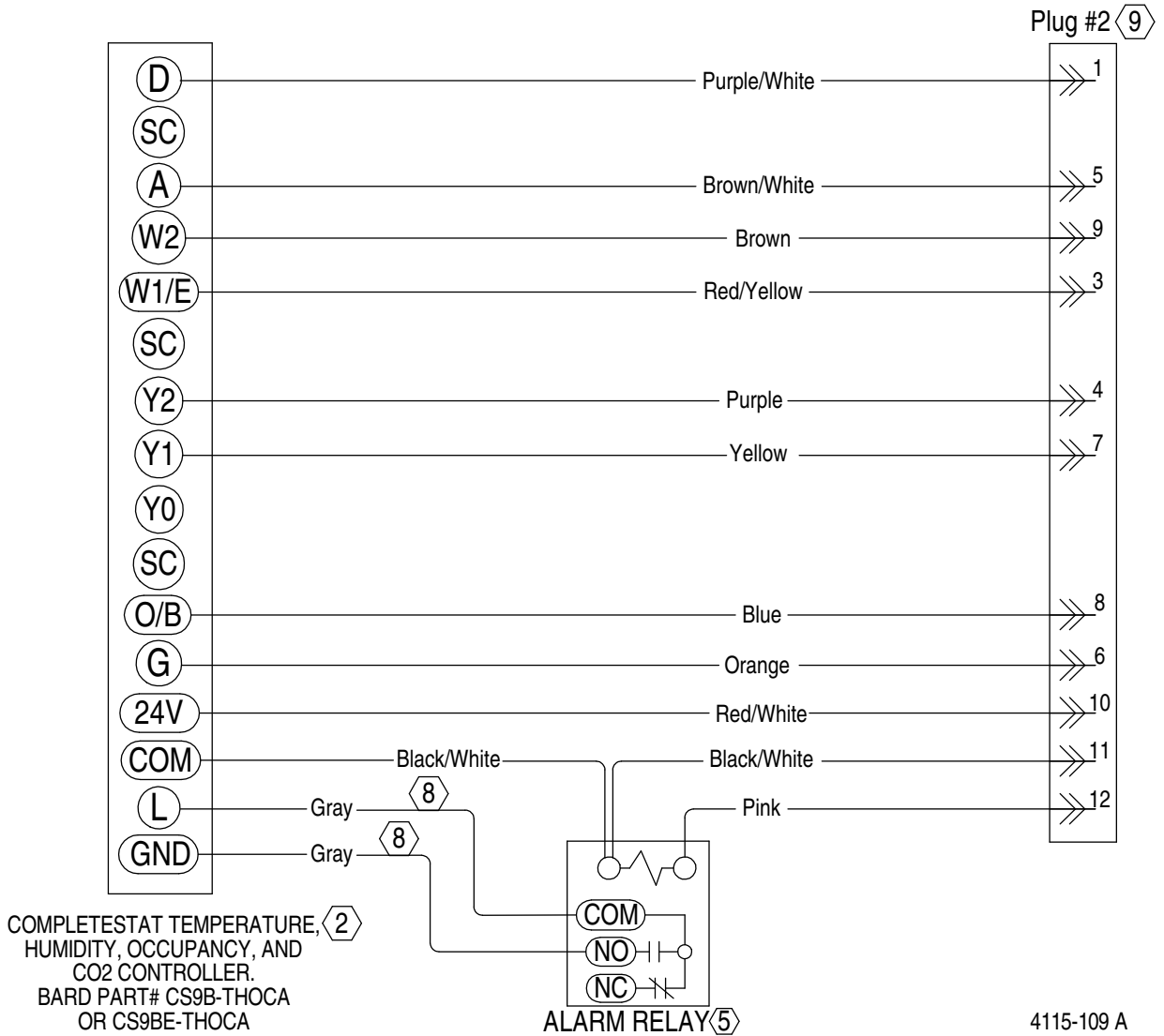
**2** FOR DEHUMIDIFICATION MODELS (EQUIPPED WITH FACTORY HOT GAS REHEAT) CONNECT SIGNAL FOR HUMIDISTAT TO PURPLE-WHITE WIRE.

4115-105 C

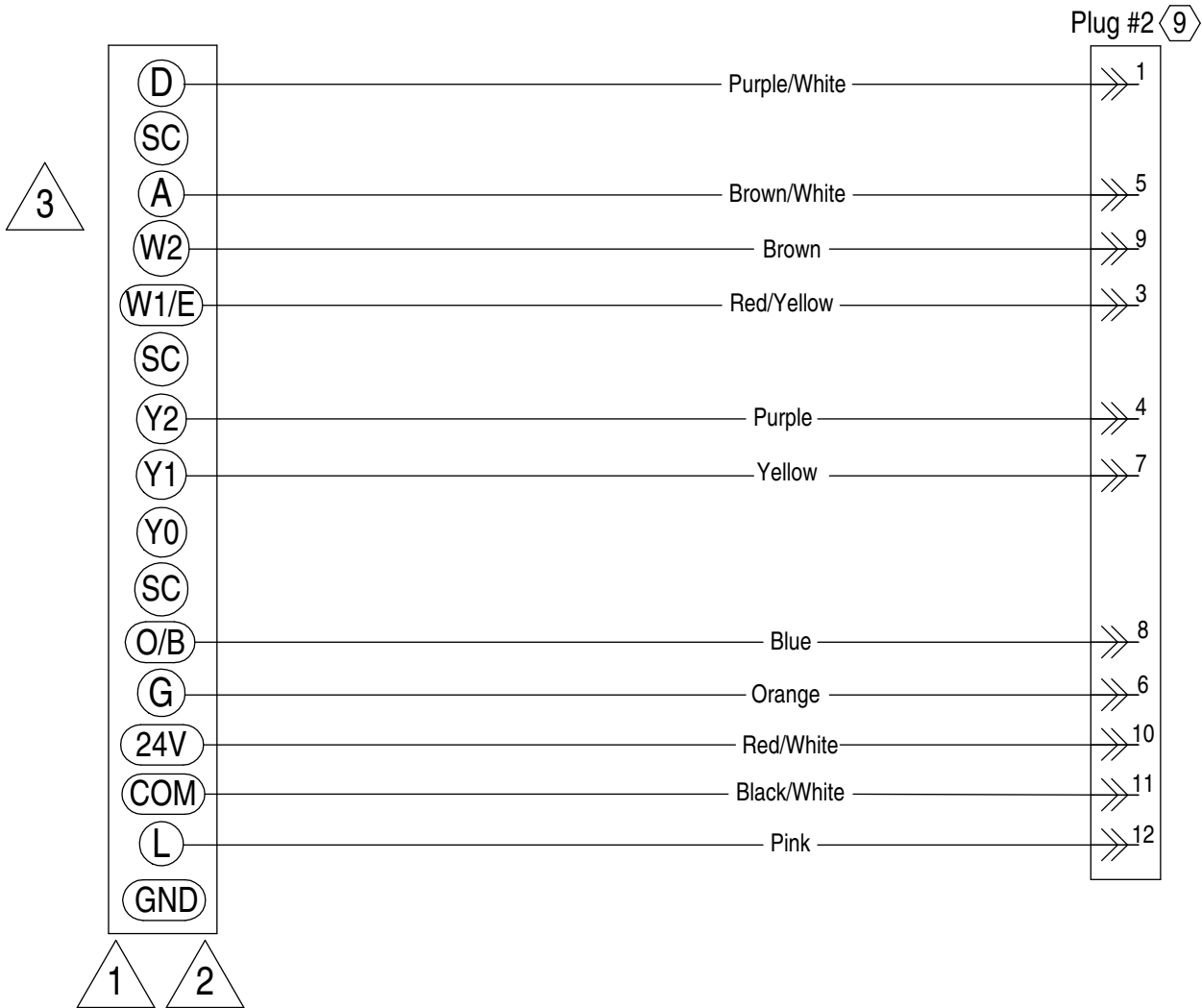
**FIGURE 20**  
**Factory-Mounted Completestat™ with Occupancy Sensing and**  
**Temperature/Humidity Control "1" & "3" Option Wiring Diagram**



**FIGURE 21**  
**Factory-Mounted Completestat™ with Occupancy Sensing and**  
**Temperature/Humidity/CO<sub>2</sub> Control "2" & "4" Option Wiring Diagram**



**FIGURE 22**  
**Factory-Mounted Completestat™ with Occupancy Sensing**  
**and Temperature/Humidity Control "1" & "3" Option Wiring Diagram**  
**and Temperature/Humidity/CO<sub>2</sub> Control "2" & "4" Option Wiring Diagram**



Notes:

1. COMPLETESTAT TEMPERATURE, HUMIDITY, AND OCCUPANCY CONTROLLER. BARD PART# CS9B-THOA OR CS9BE-THOA
2. COMPLETESTAT TEMPERATURE, HUMIDITY, OCCUPANCY, AND CO2 CONTROLLER. BARD PART# CS9B-THOCA OR CS9BE-THOCA
3. Either THOA or THOCA version can be used. For THOA, vent output "A" limits vent operation to occupied periods. For THOCA, vent output "A" operates vent based on CO2 level

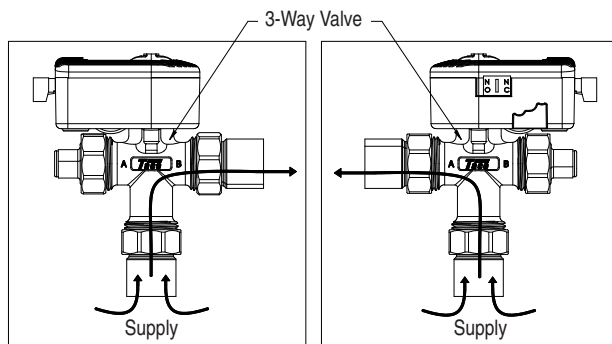
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# VALVE AND ACTUATOR INSTALLATION/REMOVAL

## Valve Installation

1. The valve body may be installed in any orientation, as shown in Figure 23. However, the 3-way actuator's power connections must be over the closed off port to ensure proper function and flow direction.
2. Before mounting body, verify there will be enough clearance for iSeries Smart Actuator to be installed. It is suggested that the iSeries Smart Actuator be installed onto valve before valve is installed. Also, please verify that the nylon washers are installed to avoid leaking.
3. Make sure the ball valve is in the FULL OPEN position. Rotate the manual operation button several times to verify the valve is opening and closing properly.

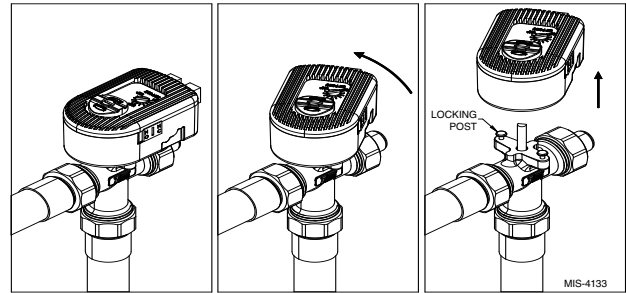
**FIGURE 23**  
Valve Actuator Orientation



## iSERIES SMART ACTUATOR REMOVAL AND INSTALLATION

1. iSeries Smart Actuator may be attached to the valve body in either direction (see Figure 23). The 3-way actuator's power connections must be over the closed off port to ensure proper function and flow direction.
2. Actuator removal: Remove iSeries Smart Actuator prior to soldering by rotating the actuator counterclockwise approximately 30 degrees and lifting upward approximately 3/4" (see Figure 24).
3. To re-assemble actuator to valve body: Position actuator such that the "D" shaped valve stem aligns properly with the "D" shaped actuator drive cavity (NOTE: The "D" shaped stem design allows for correct insertion every time). Next, slide valve stem into actuator cavity and rotate until the actuator slips over the valve's locking posts (see Figure 24). Once the actuator is flush with valve body, turn actuator clockwise and lock into position.

**FIGURE 24**  
iSeries Smart Actuator Removal



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4. To ensure the actuator will function correctly at start up, there are two checks to conduct.

First, verify the manual operation button (circular button on top of iSeries Smart Actuator) is in the upmost position. If the button has been manipulated/operated at any point during set-up, the button could be fixed in the manual operation position. To ensure proper operation, manual twist the actuator assembly as shown in Figure 24.

Secondly, make sure to re-install the terminal blocks/plugs into the back of the actuator after re-installing it. Once power is turned on, there should be a visual indication of power from the green LED, located on the back of the actuator. See **TROUBLESHOOTING WATER MODULATING ACTUATOR DIAGNOSTICS** on page 66 for further troubleshooting.

**NOTE** All terminals provided with the iSeries Smart Actuator are removable. In order to prevent damage to the electronics, disconnect all plugs before the power is turned on and check voltages and all affected wires. Once the circuits are tested, plug in the terminals. If there is any question about wiring, refer to the wiring diagram.

**CAUTION:** To prevent electrical shock, disconnect electric power to system at main fuse or circuit breaker box until installation is complete. When a service switch is installed, more than one disconnect switch may be required to de-energize this device for servicing.

# START UP

## Description of Standard Equipment

### Low Pressure Switch

*NOTE This unit is supplied with two low pressure switches installed, a 55 PSIG and a 75 PSIG.*

The 75 PSIG is wired into the system. This switch is suitable for water loop (boiler/tower applications).

To avoid nuisance lockouts for ground loop application with antifreeze, the 75 PSIG switch should be disconnected and connect the 55 PSIG switch.

The leads for both switches are located in the lower electrical connection panel. The switch bodies are marked with pressure settings. The 75 PSIG switch has blue leads. The 55 PSIG switch has yellow leads.

### Water Flow Switch

These models are equipped with a water flow switch. It is a magnetic (sealed) switch that closes electrical contacts above 3 gallons per minute. This enables the compressor to shut down in the event of low water flow conditions, thus preventing long-term mechanical issues.

During dehumidification, the water flow switch requirement of 3 gallons per minute is bypassed for purposes of water modulation.

### Water Modulating Actuator (iSeries Smart Actuator)

These models are equipped with an iSeries Smart Actuator. The iSeries Smart Actuator is a microprocessor-based valve designed to provide a setpoint (fixed) temperature to an HVAC system by modulating the position of a 3-way mixing valve.

The actuator has two electrical terminals and an illuminated LED status powered by 24VAC. All terminals provided with the iSeries Smart Actuator are removable. The terminals have a label with a description for each position, indicating their use. The slot intended for a boiler is not used.

During dehumidification, the iSeries Smart Actuator is activated. The actuator provides modulation of the valve, in order to control the water flow to help accommodate room comfort during dehumidification.

### High Pressure Switch

This unit is equipped with a high pressure switch that will stop the compressor in the event of abnormal high pressure occurrences.

The high and low pressure switches are included in a lockout circuit that is re-settable from the room. In the event of a high or low pressure switch lockout, a visual indication can be seen from the geothermal logic control board. See **Troubleshooting Geothermal Logic CCM** on page 64 for further explanation.

## Geothermal Compressor Control Module

When the green status light blinks, this indicates that 24 volt power is applied to the board and the controller is running in normal operation.

On initial power up and call for compressor, a 5-minute delay plus a random start delay of 0 to 60 seconds is applied. After the random delay, the compressor relay is energized (terminal CC). When the Y1 input opens, the compressor de-energizes.

The geothermal compressor control module is standard on all models covered by this manual. It is an anti-short cycle/lockout timer with high pressure, low pressure and flow switch monitoring and alarm output.

After compressor shutdown, or power disruption, a 5-minute timer is applied which prevents the compressor from operating.

### Over and Under Voltage Protection

When an under or over voltage condition exists, the controller locks out the unit. When condition clears, the controller automatically releases the unit to normal operation and the compressor restarts after the random start and anti-short cycle timings are met. The under and over voltage protection starts at plus or minus 20% from nominal voltage and returns to operation at plus or minus 10% from nominal voltage. All four LED fault lights will flash when an over or under voltage conditions occurs. The over voltage protection can be disabled by removing the O/V jumper on the logic control board (see Figure 25).

**FIGURE 25**  
**Geothermal Compressor Logic Control Board**



O/V Jumper      TEST Jumper

## Intelligent Reset

The compressor logic control board has an intelligent reset feature after a safety control is activated. The controller locks out the unit for 5 minutes; at the end of this period, the controller checks to verify that all faults have been cleared. If faults have been cleared, the controller restarts the unit. If a second fault occurs, the controller will lockout the unit until the control is reset by breaking Y signal from thermostat. The last fault will be kept in memory after a full lockout; this is only cleared by cycling the unit power.

## Alarm Output

The L terminal has 24 volts applied when a hard lockout occurs. This can be used to drive a fault light or a low voltage relay.

During routine operation of the unit with no power interruptions, the compressor will operate on demand with no delay.

## High Pressure Switch and Lockout Sequence

If the high pressure switch opens, the compressor contactor will de-energize immediately. The lockout timer will go into a *soft lockout* and stay in soft lockout until the high pressure switch closes **and** the delay on break time has expired. If the high pressure switch opens again in the same operating cycle, the unit will go into *manual lockout* condition and the alarm relay circuit will energize. Recycling the wall thermostat resets the manual lockout.

**NOTE** Both high and low pressure switch controls are inherently automatic reset devices. The high pressure switch and low pressure switch cut out and cut in settings are fixed by specific heat pump unit model. The lockout feature, both soft and manual, are a function of the compressor logic control board.

## Important Installer Note

For improved start up performance, wash the indoor coil with dishwashing detergent.

## Phase Monitor

All units with three phase scroll compressors are equipped with a three phase line monitor to prevent compressor damage due to phase reversal.

The phase monitor in this unit is equipped with two LEDs. If the Y signal is present at the phase monitor and phases are correct, the green LED will light and contactor will energize. If phases are reversed, the red fault LED will be lit and compressor operation is inhibited.

If a fault condition occurs, reverse two of the supply leads to the unit. Do not reverse any of the unit factory wires as damage may occur.

## Rated CFM

All models covered by this manual are factory set to operate at rated CFM levels as shown in Table 4. Rated CFM is required for ducted applications for maximum performance ratings.

## Service Hints

1. Caution user to maintain clean air filters at all times and to not needlessly close off supply air registers. This may reduce airflow through the system which shortens equipment service life as well as increasing operating costs and noise levels.
2. Check all power fuses or circuit breakers to be sure that they are the correct rating.
3. The heat pump wall thermostats perform multiple functions. Be sure that all function switches are correctly set for the desired operating mode before trying to diagnose any reported service problems.

**TABLE 4**  
**Indoor Blower Performance**

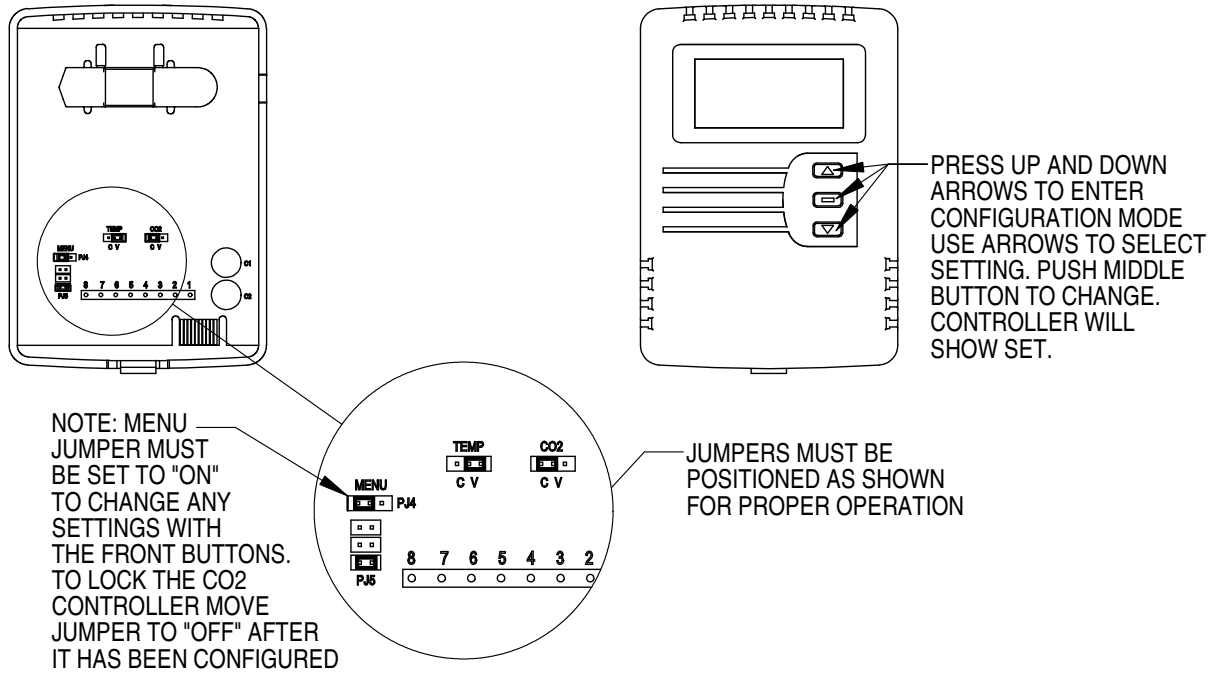
MODEL	RATED ESP	MAX. ESP ①	CONTINUOUS AIRFLOW ③	RATED 1st STAGE ②	RATED 2nd STAGE ②
QW2S3	0.10	0.5	800	800	950
QW3S3	0.15	0.5	800	900	1150
QW4S3	0.20	0.5	900	1200	1450
QW5S3	0.20	0.5	900	1400	1650

**NOTE:** These units are equipped with a variable speed (ECM) indoor motor that automatically adjusts itself to maintain approximately the same rate of indoor airflow in both heating and cooling, dry and wet coil conditions, and at both 230/208 or 460 volts.

- ① Maximum ESP (inches WC) shown is with 2" MERV 8 pleated filter.  
② Rated CFM for ducted applications – required for maximum performance rating.  
③ Continuous CFM the total airflow being circulated during continuous blower operation.

# Adjustments

**FIGURE 26**  
**CO<sub>2</sub> Control Configuration**



4-20mA	AN (ppm)	Damper (1)	Approx. Blade Position (2)
4	700	FULLY CLOSED	0
5	750		1
6	800		2
7	850		3
8	900		4
9	950		5
10	1000		6
11	1050		7
12	1100		8
13	1150		9
14	1200		10
15	1250		11
16	1300		12
17	1350		14
18	1400		15
19	1450		16
20	1500	FULLY OPEN	17

Settings	Recommended	Default
RON	Not Used	
ROF	Not Used	
DSP	C	CT
UNI	US	US
COL	700	0
COH	1500	2000
TOL	Not Used	
TOH	Not Used	
BAR	See Instrution with Controller For High Altitude Installations	
CAL	Used for Field Calibration	

(1) Damper should be fully closed at 700 ppm, if not Potentiometer R7 can be adjusted clockwise (CW) to close it. If it is fully closed at 700 ppm or lower no adjustments required.  
 (2) Blade as referenced to the Blade Position Label.

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## Pressure Service Ports

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressure charts are located on the backside of the units lower service door, as well as in Table 5 on page 38. It is imperative to match the correct pressure chart to the unit by model number. All upper service doors must be attached to obtain proper reading. The service ports are in the lower compressor section on the tubing adjacent to the compressor.

This unit employs high-flow Coremax valves instead of the typical Schrader-type valves.

***WARNING! Do NOT use a Schrader valve core removal tool with these valves. Use of such a tool could result in eye injuries or refrigerant burns!***

To change a Coremax valve without first removing the refrigerant, a special tool is required which can be obtained at [www.fastestinc.com/en/SCCA07H](http://www.fastestinc.com/en/SCCA07H). See the replacement parts manual for replacement core part numbers.

## Piping Access to Unit

Water piping to and from the coaxial water coil is intended to enter/exit the unit through the rectangular hole. See Figures 1 (page 8), 8A (page 14), 27 (page 36) and 28 (page 37). The connections on the water coil are a double O-ring with a retainer nut that secures it in place.

Various double O-ring fittings are available to make it possible to connect to the coaxial coil with various methods and materials. The methods include 1" barbed fittings (straight and 90°), 1" MPT (straight and 90°), and 1¼" hot fusion fitting with P/T fitting). (See Table 6 on page 39.)

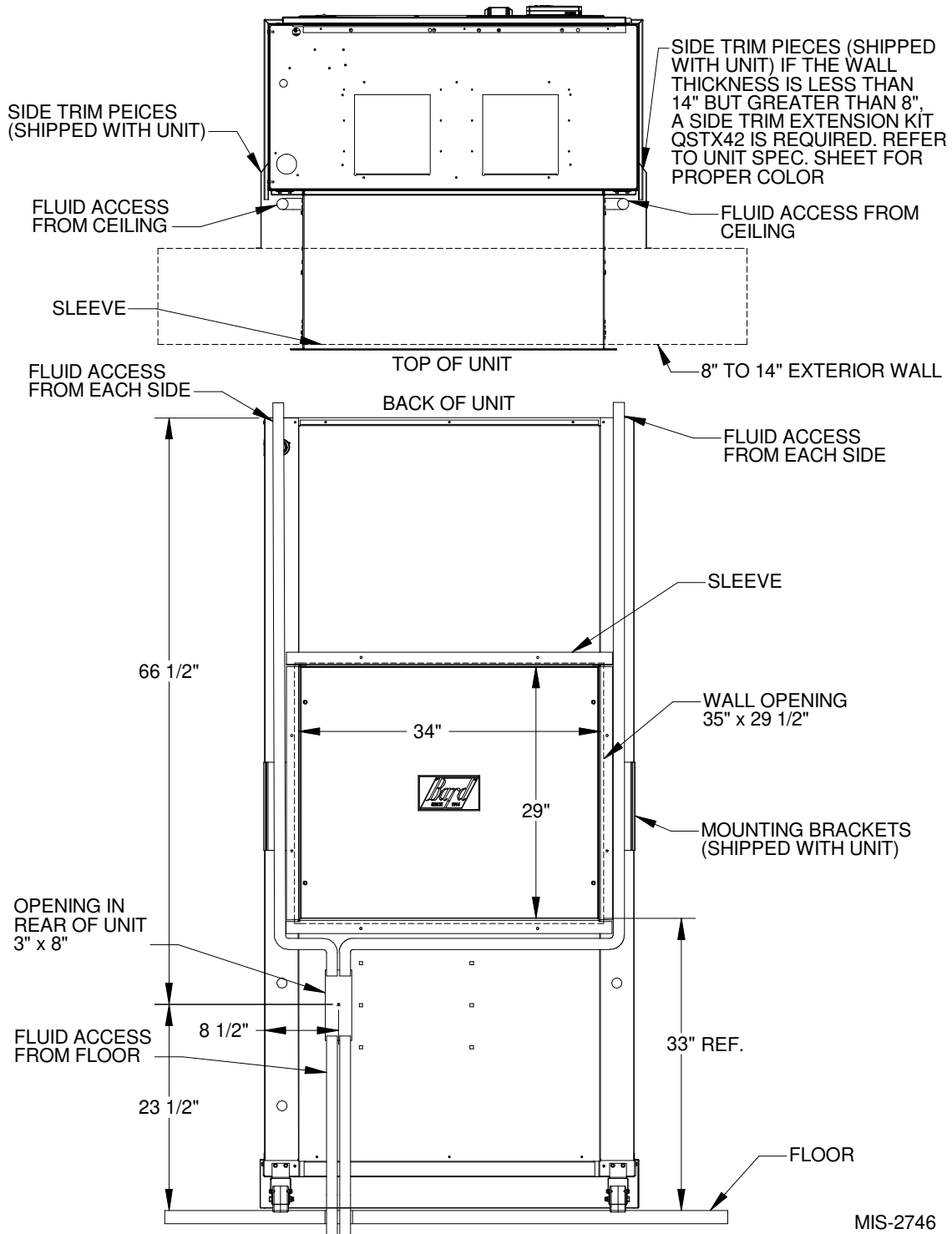
*NOTE All double O-ring fittings require "hand tightening only". Do not use a wrench or pliers as retainer nut can be damaged with excessive force. Avoid cross-threading the nut.*

*NOTE Apply petroleum jelly to O-rings to prevent damage and aid in insertion.*

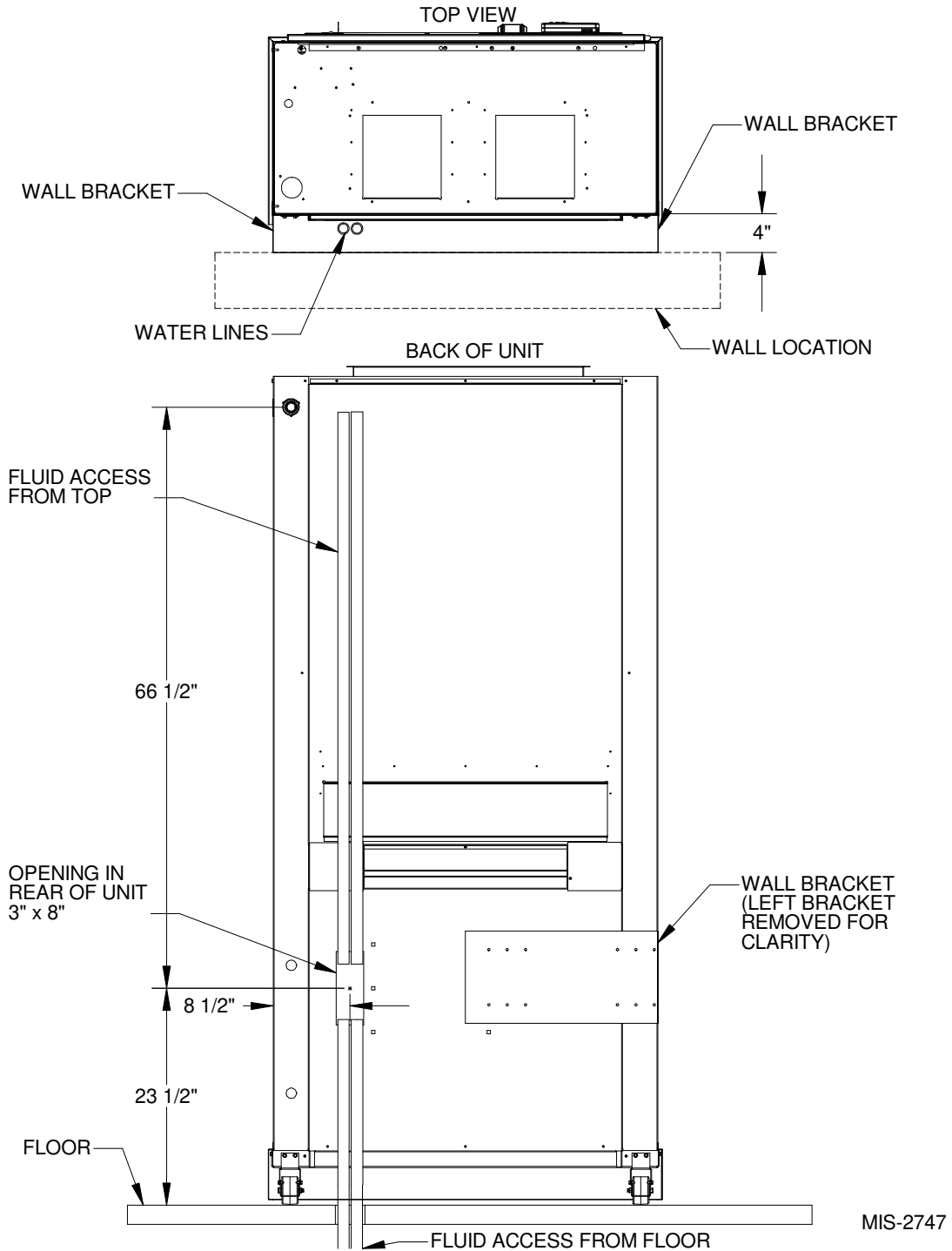
## System Start Up

- Step 1 – Close disconnect switch(es) and set the thermostat to cool and temperature to the highest setting.
- Step 2 – Check for proper airflow across the indoor coil.
- Step 3 – Connect the service gauges and allow the unit to run for at least 10 minutes or until pressures are stable. Check pressures to the system pressure table attached to the unit service panel.
- Step 4 – Fill out Ground Source Heat Pump Performance Report.

**FIGURE 27**  
**Fluid Connections on Unit with Ventilation Wall Sleeve**



**FIGURE 28**  
**Fluid Connections on Unit without Ventilation Wall Sleeve**



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**TABLE 5**  
**Pressure Table**

Model	Return Air Temperature	Pressure	FULL LOAD COOLING – Fluid Temperature Entering Water Coil °F																
			30°F	35°F	40°F	45°F	50°F	55°F	60°F	65°F	70°F	75°F	80°F	85°F	90°F	95°F	100°F	105°F	110°F
QW2S	75° DB	Low Side	105	107	110	112	114	117	119	122	124	127	129	131	134	136	139	141	144
	62° WB	High Side	131	145	160	175	187	206	220	239	259	278	298	317	337	356	376	396	415
	80° DB	Low Side	112	115	117	120	122	125	128	130	133	135	138	141	143	146	148	151	154
QW3S	67° WB	High Side	134	149	164	179	191	211	225	245	265	285	306	326	346	366	386	406	426
	85° DB	Low Side	120	123	126	129	132	134	137	140	143	146	148	151	154	157	160	162	165
	72° WB	High Side	139	154	170	186	198	219	233	254	275	295	316	337	358	378	399	420	441
QW4S	75° DB	Low Side	83	89	95	100	105	109	113	118	119	120	121	122	123	124	125	126	127
	62° WB	High Side	132	146	161	176	193	209	227	243	265	286	308	329	351	372	394	415	437
	80° DB	Low Side	89	96	102	107	112	117	121	126	127	128	129	130	131	132	133	134	136
QW5S	67° WB	High Side	135	150	165	181	197	215	233	249	271	293	316	338	360	382	404	426	448
	85° DB	Low Side	96	103	109	115	121	126	130	136	137	138	139	140	141	142	143	145	146
	72° WB	High Side	140	155	171	187	204	222	241	258	281	304	327	349	372	395	418	441	464

Model	Return Air Temperature	Pressure	FULL LOAD HEATING – Fluid Temperature Entering Water Coil °F																
			5°F	10°F	15°F	20°F	25°F	30°F	35°F	40°F	45°F	50°F	55°F	60°F	65°F	70°F	75°F	80°F	85°F
QW2S	70° DB	Low Side	39	48	56	64	73	81	89	97	106	114	123	131	140	149	158	167	175
		High Side	266	275	283	292	301	310	318	327	336	345	353	362	371	380	389	397	406
QW3S	70° DB	Low Side	34	43	51	60	68	77	85	94	102	110	121	131	142	152	162	173	183
		High Side	279	290	302	313	324	335	346	357	368	379	392	405	417	430	442	455	467
QW4S	70° DB	Low Side	30	38	46	54	63	71	79	87	95	103	114	124	134	144	154	165	175
		High Side	272	285	297	310	322	335	347	360	372	385	398	410	423	436	449	462	475
QW5S	70° DB	Low Side	36	44	51	59	67	75	82	90	98	106	115	125	134	143	153	162	172
		High Side	265	278	291	304	317	330	343	356	369	382	394	405	417	429	441	453	465

Model	Return Air Temperature	Pressure	PART LOAD COOLING – Fluid Temperature Entering Water Coil °F																
			30°F	35°F	40°F	45°F	50°F	55°F	60°F	65°F	70°F	75°F	80°F	85°F	90°F	95°F	100°F	105°F	110°F
QW2S	75° DB	Low Side	105	110	115	119	124	128	134	135	137	139	140	142	143	145	146	148	149
	62° WB	High Side	120	134	149	164	179	188	208	227	246	265	284	303	322	342	361	380	399
	80° DB	Low Side	112	118	123	128	132	136	143	145	146	148	150	152	153	155	157	158	160
QW3S	67° WB	High Side	123	137	152	168	184	193	213	233	252	272	291	311	331	350	370	390	409
	85° DB	Low Side	120	126	132	137	142	147	154	156	157	159	161	163	165	166	168	170	172
	72° WB	High Side	127	142	158	174	190	200	220	241	261	281	302	322	342	363	383	403	424
QW4S	75° DB	Low Side	98	104	109	113	117	121	124	129	130	131	132	133	133	134	135	135	135
	62° WB	High Side	124	137	150	164	179	195	211	226	246	266	287	307	328	348	369	389	409
	80° DB	Low Side	105	111	116	121	126	130	133	138	139	139	140	141	142	143	143	144	145
QW5S	67° WB	High Side	127	140	154	168	184	200	216	231	252	273	294	315	336	357	378	399	420
	85° DB	Low Side	113	119	125	130	135	139	143	148	149	150	151	151	152	153	154	155	156
	72° WB	High Side	131	145	159	174	190	207	224	239	261	283	304	326	348	370	391	413	435

Model	Return Air Temperature	Pressure	PART LOAD HEATING – Fluid Temperature Entering Water Coil °F																
			5°F	10°F	15°F	20°F	25°F	30°F	35°F	40°F	45°F	50°F	55°F	60°F	65°F	70°F	75°F	80°F	85°F
QW2S	70° DB	Low Side	22	33	44	54	65	76	87	97	108	119	128	137	146	154	163	172	181
		High Side	233	243	253	262	272	282	291	301	311	320	328	336	343	351	359	366	374
QW3S	70° DB	Low Side	38	47	56	65	74	83	92	101	110	119	130	141	152	163	174	185	196
		High Side	257	267	277	287	297	307	317	327	337	347	358	370	381	392	403	414	425
QW4S	70° DB	Low Side	34	43	51	60	69	77	86	94	103	112	123	134	145	155	166	177	188
		High Side	258	267	276	285	294	304	313	322	331	340	351	362	372	383	394	405	415
QW5S	70° DB	Low Side	38	47	55	64	72	81	89	98	107	115	125	135	145	155	165	176	186
		High Side	250	260	271	282	292	303	313	324	335	345	356	367	378	388	399	410	420

The data in the above pressure chart is based on the following flow rates:

FLOW RATE FOR VARIOUS FLUIDS	QW2S3	QW3S3	QW4S3	QW5S3
Flow rate required GPM for fresh water	6	8	9	10
Flow rate required GPM for 15% Methanol	7	8	9	9

**TABLE 6**  
**Optional Accessories**

*Optional Accessories – Must be Used for Each Installation with Ventilation Options*

**Ventilation Wall Sleeves:**

QWVS42 Ventilation wall sleeve for walls up to 14 inches thick. NOTE: Unless they are to be field-supplied, side trim kit must be ordered for all installations.

**Ventilation Louvers:**

QLG-11 Clear Anodized Aluminum for vent option  
 QLG-21 Medium Bronze Anodized for vent option  
 QLG-31 Dark Bronze Anodized Aluminum for vent option

*Side Trim Kits — Required for All Installations Unless Field-Supplied*

NOTE: The following accessory items must be selected so the finish (color) is matched to the QWS model that they will be used with.

**Side Trim Extension Kits:**

Model	Color	Model	Color	Model	Color	Space from back of unit to wall	Unit Compatibility
QSTX-V-6	Platinum Vinyl	QSTX-4-6	Gray Paint	QSTX-X-6	Beige Paint	4" to 6"	All
QSTX-V-8	Platinum Vinyl	QSTX-4-8	Gray Paint	QSTX-X-8	Beige Paint	6" to 8"	All
QSTX-V-10	Platinum Vinyl	QSTX-4-10	Gray Paint	QSTX-X-10	Beige Paint	8" to 10"	All
QSTX-V-12	Platinum Vinyl	QSTX-4-12	Gray Paint	QSTX-X-12	Beige Paint	10" to 12"	All

*Optional Accessories – Additional Items as Determined by Job Specifications*

**Free-Blow Plenum Boxes:**

Model	Color	Model	Color	Model	Color	Description	Unit Compatibility
QPB42-V	Platinum Vinyl	QPB42-4	Gray Paint	QPB42-X	Beige Paint	Front Supply, 4-way deflection grille	QW2S, QW3S
QPBS42-V	Platinum Vinyl	QPBS42-4	Gray Paint	QPBS42-X	Beige Paint	Same as QPB42, plus 2-way deflection grille on each side.	QW4S, QW5S
QPB48-V	Platinum Vinyl	QPB48-4	Gray Paint	QPB48-X	Beige Paint	Front Supply, 4-way deflection grille	QW2S, QW3S
QPBS48-V	Platinum Vinyl	QPBS48-4	Gray Paint	QPBS48-X	Beige Paint	Same as QPB48, plus 2-way deflection grille on each side.	QW4S, QW5S

**Top Fill Systems for Finishing Plenum Boxes to Ceilings:**

Model	Color	Model	Color	Model	Color	Description	Unit Compatibility
QPBX42-9-V	Platinum Vinyl	QPBX42-9-4	Gray Paint	QPBX42-9-X	Beige Paint	Use with QPB42 or QPBS42 (adjusts to ceilings up to 9'9"*)	QW2S, QW3S
QPBX42-10-V	Platinum Vinyl	QPBX42-10-4	Gray Paint	QPBX42-10-X	Beige Paint	Use with QPB42 or QPBS42 (adjusts to ceilings up to 10'5"*)	QW4S, QW5S
QPBX48-9-V	Platinum Vinyl	QPBX48-9-4	Gray Paint	QPBX48-9-X	Beige Paint	Use with QPB48 or QPBS48 (adjusts to ceilings up to 9'9"*)	QW2S, QW3S
QPBX48-10-V	Platinum Vinyl	QPBX48-10-4	Gray Paint	QPBX48-10-X	Beige Paint	Use with QPB48 or QPBS48 (adjusts to ceilings up to 10'5"*)	QW4S, QW5S

**Cabinet Extensions for Ducted Applications:**

Model	Color	Model	Color	Model	Color	Description	Unit Compatibility
QCX10A-V	Platinum Vinyl	QCX10A-4	Gray Paint	QCX10A-X	Beige Paint	20" height (adjusts for ceilings up to 9'7"; add QPBX42-9 for 9'7" to 10'3" finished ceiling heights)	QW2S, QW3S
QCX15A-V	Platinum Vinyl	QCX15A-4	Gray Paint	QCX15A-X	Beige Paint	20" height (adjusts for ceilings up to 9'7"; add QPBX48-9 for 9'7" to 10'3" finished ceiling heights)	QW4S, QW5S

**Hot Water Coils with Plenum Boxes:**

Model	Color	Model	Color	Model	Color	Description	Unit Compatibility
QPBHW42-F-V	Platinum Vinyl	QPBHW42-F-4	Gray Paint	QPBHW42-F-X	Beige Paint	Free blow plenum box	QW2S, QW3S
QPBHW48-F-V	Platinum Vinyl	QPBHW48-F-4	Gray Paint	QPBHW48-F-X	Beige Paint	Free blow plenum box	QW4S, QW5S
QPBHW42-D-V	Platinum Vinyl	QPBHW42-D-4	Gray Paint	QPBHW42-D-X	Beige Paint	Ducted plenum box	QW2S, QW3S
QPBHW48-D-V	Platinum Vinyl	QPBHW48-D-4	Gray Paint	QPBHW48-D-X	Beige Paint	Ducted plenum box	QW4S, QW5S

NOTE: The same top fill system and cabinet extensions can be used with hot water coil plenum boxes as with standard plenum boxes.

# SEQUENCE OF OPERATION

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## Cooling

A 24V solenoid coil on the reversing valve controls the cooling cycle operation. There are two different thermostat options: One allows for "Auto" changeover from cycle to cycle and the other is "Manual" changeover. The Auto changeover mode will cause the reversing valve solenoid to cycle with each cooling call and may cause a "swooshing sound" with refrigerant equalization at the end of each cycle.

### Part Load Cooling

On a call for Part Load Cooling by the thermostat, it completes a circuit from R to Y1, O and G for part load cooling. Y1 starts the compressor, O energizes the reversing valve and G starts the indoor blower.

### Full Load Cooling

On a call for Full Load Cooling by the thermostat, it completes the same as Part Load Cooling above, but also includes a signal to Y2. Signal Y2 energizes the staging solenoid on the side of the compressor and the signal also goes to the indoor blower to ramp-up the airflow.

## Heating

### Part Load Heating

On a call for Part Load Heating by the thermostat, it completes a circuit from R to Y1 and G. Y1 starts the compressor and G starts the indoor blower.

### Full Load Heating

On a call for Full Load Heating by the thermostat, it completes the same as Part Load Heating above, but also includes a signal to Y2. Signal Y2 energizes the staging solenoid on the side of the compressor and the signal also goes to the indoor blower to ramp-up the airflow.

## Geothermal Logic Control

When the green status light blinks, this indicates that 24 volt power is applied to the board and the controller is running in normal operation.

On initial power up and call for compressor, a 5-minute delay plus a random start delay of 0 to 60 seconds is applied. After the random delay, the compressor relay is energized (terminals CC and CCG). When the Y input opens, the compressor de-energizes.

*NOTE The time delay and random start can be disabled by removing the Test jumper on the geothermal logic control board. However, this is not recommended. This is only intended to be a function for factory run-in processes.*

## Alarm Output

The L terminal has 24 volts applied when a hard lockout occurs. This can be used to drive a fault light or low voltage relay.

*NOTE Both high and low pressure switch controls are inherently automatic reset devices. The high pressure switch and low pressure switch cut out and cut in settings are fixed by specific heat pump model. The lockout features, both soft and manual, are a function of the compressor logic control board.*

## Freeze Stat

When the Y signal is sent to the logic control board, the signal will travel from the dehum board through the freeze stat and give 24 volt power at the Y1 terminal of the compressor logic control board. Following that, the output will energize 10 seconds prior to CC output that starts the compressor.

## Anti-Short Cycle Timer

After compressor shutdown or power disruption, a 5-minute timer is applied which prevents the compressor from operating.

## High Pressure Switch

(Terminals HP1 and HP2) Circuit will be proved as "closed" prior to energizing A or CC terminals. If pressure switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; green fault light will be illuminated. Logic control will then go through 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, a hard lockout will be initiated and fault signal is sent to L terminal.

## Low Pressure Switch

(Terminals LP1 and LP2) Circuit will be proved as "closed" prior to energizing A or CC terminals. The conditions of the LP terminals will then be ignored for the first 90 seconds after a demand for compressor operation. Following this 90-second period, if pressure switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; orange fault light illuminated. The control board will then go through a 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccur, hard lockout occurs, and fault signal is sent to L terminal.

## Flow Switch

(Terminals FS and FS2) Circuit will be proved as "closed" prior to energizing CC terminal. If flow switch opens, compressor will go into soft lockout mode and

compressor operation will be terminated; red fault light illuminated. Logic control will then go through 5-minute delay on break plus random start sequence. If no fault occurs on next run cycle, compressor will continue operation. If fault reoccurs, hard lockout occurs and fault signal is sent to L terminal.

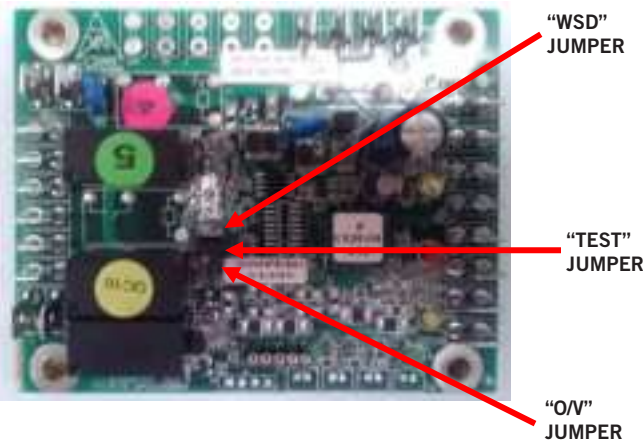
*NOTE Jumper wire is factory installed.*

### Over and Under Voltage Protection

When an under or over voltage condition exists, the controller locks out the unit. When condition clears, the controller automatically releases the unit to normal operation and the compressor restarts after the random start and anti-short cycle timings are met. The under and over voltage protection starts at plus or minus 20% from nominal voltage and returns to operation at plus or minus 10% from nominal voltage. All four LED fault lights will flash when an over or under voltage conditions occurs.

*NOTE The over voltage protection can be disabled by removing the O/V jumper on the geothermic logic control board (see Figure 29).*

**FIGURE 29**  
Geothermal Compressor Logic Control Board  
Jumper Designations



### Intelligent Reset

The geothermic logic control has an intelligent reset feature after a safety control is activated. The controller locks out the unit for 5 minutes; at the end of this period, the controller checks to verify that all faults have been cleared. If faults have been cleared, the controller restarts the unit. If a second fault occurs, the controller will lockout the unit until the control is reset by breaking Y signal from thermostat. The last fault will be kept in memory after a full lockout; this is only cleared by cycling the unit power.

## Modulating Water Line Control

On a call for cooling or heat pump (Y signal from thermostat), the Y terminal has 24 volts applied and YO output is energized. See Figure 30.

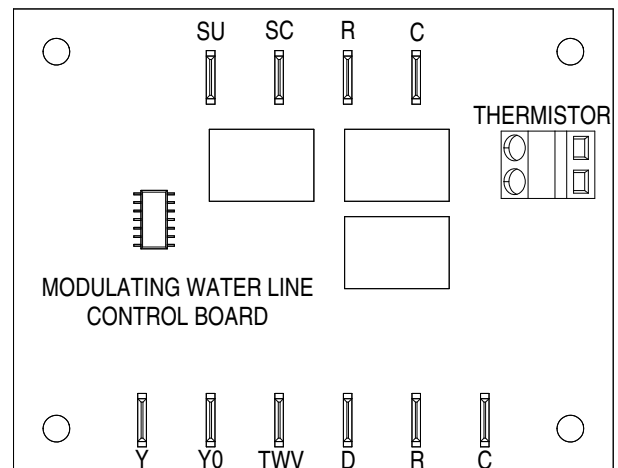
On a call for dehumidification (D signal from thermostat, with no Y signal from thermostat), the D terminal (input) is energized. Concurrently, the TWV (3-way valve) terminal is energized.

When D is energized with no Y signal, the thermistor connected to the board will start measuring the supply air temperature at the leaving side of the indoor blower. The board will modulate the water valve through a signal sent from the SU and SC terminals to the valve actuator.

When a cooling/heating call becomes active while the system is operating in dehumidification mode, the cooling/heating call becomes the default state. The modulating water line board will have 24VAC at the Y terminal starting a 75-second time delay. The time delay will have to expire before the YO cooling/heating signal becomes active. The purpose of the time delay is to ensure the modulating valve is "full open" before allowing the YO signal out of the board to initiate cooling/ heating.

See **TROUBLESHOOTING MODULATING WATER LINE CONTROL BOARD** on page 67 for further information on modulating water line control.

**FIGURE 30**  
Modulating Water Line Control Board



MIS-4140

## iSERIES Smart Actuator

### Power Up and Dehum Request

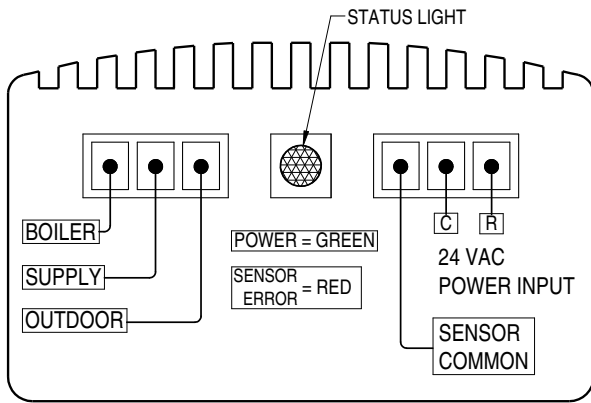
Whenever the iSeries-S is powered up, the LED turns green and the control starts operation (see Figure 31). The power to the iSeries Smart Actuator is being supplied through the sensor side of the R and C of the modulating water line board. The supply sensor (SU) and sensor common (SC) inputs are also being supplied by the modulating water line board when the unit is operating in dehumidification.

Based on the temperature, which is measured by the resistance being supplied by the thermistor/sensor, the SU and SC terminals of the modulating water line board will send a signal to the iSeries Smart Actuator. The iSeries Smart Actuator will then attempt to adjust the water flow to achieve a comfortable indoor/supply air temperature during dehumidification. *NOTE: The measurement bulb of the thermistor is located in the blower airstream and the leads of the thermistor are positioned on the modulating water line board thermistor terminals.*

For more information on the iSeries Smart Actuator setpoint, see the following **Setpoint** section.

**FIGURE 31**

**iSeries Smart Actuator Electrical Terminals**



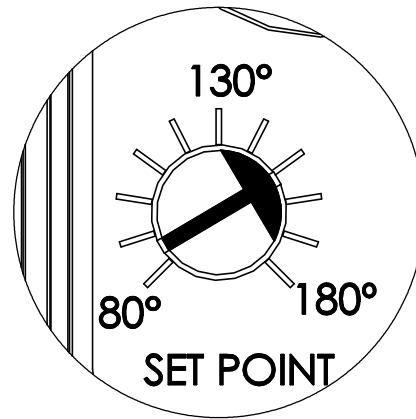
MIS-4135

### Setpoint

As previously mentioned, the iSeries Smart Actuator operates the valve to maintain a fixed setpoint. The setpoint temperature is set using the setpoint dial located on top of the actuator. The setpoint range available is from 80°F to 180°F. The factory set setpoint for the actuator is indicated in Figure 32. Please adjust this setting to maintain the desired dehumidification supply air temperature of 70°F during set-up.

**FIGURE 32**

**iSeries Smart Actuator Temperature Setpoint**



MIS-4136 A

### Sensor Warning

Do not apply power to the sensor terminals of the iSeries Smart Actuator. If voltage is applied to these terminals, the iSeries Smart Actuator SUPPLY, SETBACK and/or SENSOR COMMON, the actuator will be damaged.

### Dehumidification

For sequence of operation of dehumidification, refer to the **DEHUMIDIFICATION** beginning on page 43.



## Model Features

These models provide a unique dehumidification circuit for periods of high indoor humidity conditions. Additionally, an “energy recovery ventilator” may be provided to allow for outside ventilation air requirements by eliminating excessive sensible and latent loads as a result of the increased ventilation requirement.

Refer to Specification Sheet S3601 for the standard features of the QW\*S3D models. Electrical data for the QW dehumidification Q-TEC models is unique and cannot be directly compared to the electrical data for the standard Q-TEC models.

## Special Features

### Dehumidification Circuit

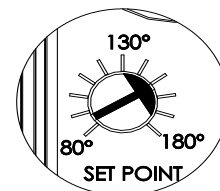
There are two events taking place to maximize the dehumidification performance while the unit is in dehumidification. The first event integrates a 3-way water valve with the iSeries Smart Actuator monitoring the supply air temperature. The second event incorporates a refrigeration dehumidification circuit, which includes an independent heat exchanger coil in the supply air stream in addition to the standard evaporator coil.

The first event, featuring the 3-way water valve with the iSeries Smart Actuator, monitors the supply air temperature with a thermistor. The iSeries Smart Actuator has a temperature setting adjustment located at the top of the actuator (see Figure 33). The temperature setting adjustment scans the temperature communicated to the modulating water line control from the thermistor located in the indoor blower supply air stream. The ohm reading is sent to the iSeries Smart Actuator, attached to the 3-way water valve, that will drive the valve closed or open depending on the requirement for heat exchange. To attain the required setting, an initial adjustment will be required by the service technician at set-up. The adjustment will allow for fine tuning the demand for latent extraction. The factory setting for the iSeries Smart Actuator should be just above the 80°F setting indicated on the setting control.

The second event incorporating the refrigeration dehumidification circuit uses a coil to reheat the supply air after it passes over the cooling coil, and is sized to nominally match the sensible cooling capacity of the evaporator coil. Extended run times in dehumidification mode can be achieved using waste heat from the refrigeration cycle to achieve the reheat process, while at the same time large amounts of moisture can be extracted from the passing air stream. See **Dehumidification Sequence of Operation** for specific operating sequences and review the tables for performance on sensible and latent capacities, water removal ratings and supply air delivery conditions.

The dehumidification refrigerant reheat circuit is controlled by a 3-way valve in the refrigeration circuit, directing the refrigerant gas to the normal water condenser during periods when standard air conditioning is required. During periods of time of low ambient temperature (approximately 65°F to 75°F outdoor) and high indoor humidity, a humidistat senses the need for mechanical dehumidification. It then energizes both the compressor circuit and the 3-way valve, thus directing the hot refrigerant discharge gas into a separate desuperheating condenser circuit which reheats the conditioned air before it is delivered to the room. The refrigerant gas is then routed from the desuperheating condenser to the water coil for further heat transfer. When the humidistat is satisfied, the system automatically switches back to normal A/C mode and either continues to operate or turns off based on the signal from the wall thermostat. The result is separate humidity control at minimum operating cost.

**FIGURE 33**  
**iSeries Smart Actuator Temperature Adjustment**



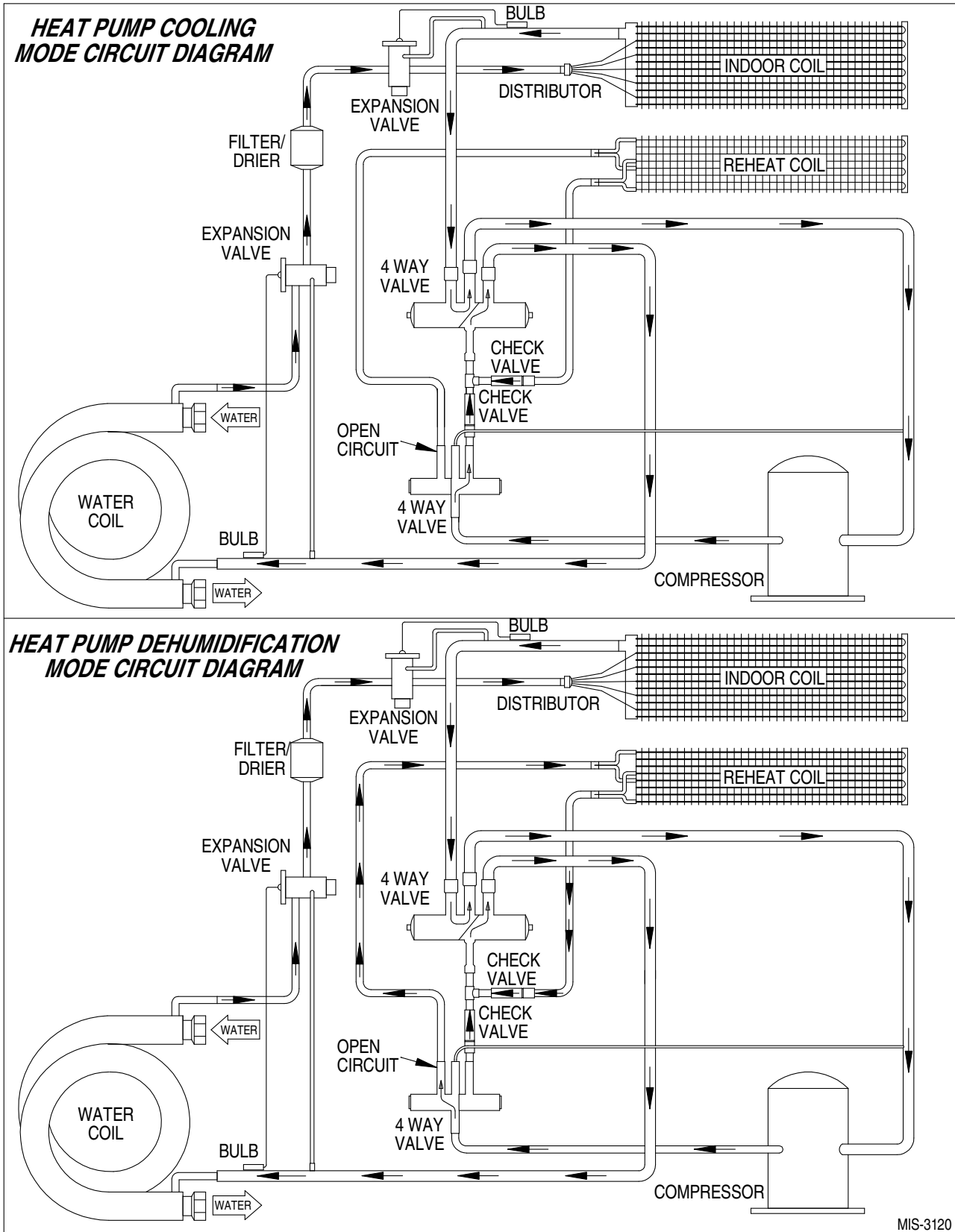
### Dehumidification Sequence of Operation

Dehumidification is controlled through a humidistat and is independent of the thermostat. On a call for dehumidification mode of operation, the compressor will operate at full load (capacity) and 3-way valve that feeds the reheat coil is energized through D terminal. Dehumidification will continue until the humidistat is satisfied.

Anytime there is a R-Y call for cooling or heat pump during an active D call, the system will undergo a time delay sequence. The sequence will incorporate a 75-second time delay before the YO signal will become active and a 55-second time OFF delay on the D call. After the time delays have been satisfied, dehumidification is canceled.

The time delay allows the modulating water valve to open, allowing full capacity water flow to be achieved before cooling is initialized. The unit will then operate in the cooling mode at part load for Stage 1 cooling (can shift to full load if 2nd Stage cooling is required) until thermostat is satisfied. If dehumidification call is still present when cooling call is satisfied, the unit will continue to operate and immediately revert to dehumidification mode, with compressor at full level.

**FIGURE 34**  
**Cooling Mode and Dehumidification Mode Circuit Diagrams**



MIS-3120

**TABLE 7A**  
**QW2S3D Dehumidification Performance – Cooling Full Load**  
(Full Load Capacities Based Upon Rated Flow of 7 GPM of 15% Methanol/Mass at 950 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Sensible to Total Ratio	Approximate Supply Air	
							DB	WB
65°	75° DB 62.5° WB	24.0	18.4	5.6	5.3	76.67%	57.6	54.2
70°		24.0	18.6	5.4	5.1	77.50%	57.4	54.1
75°		23.8	18.7	5.1	4.8	78.57%	57.1	54.1
80°		23.7	18.8	4.9	4.6	79.32%	57.1	54.1
85°		23.6	18.9	4.7	4.4	80.08%	57.2	54.4
90°		23.3	19.0	4.3	4.1	81.55%	57.3	54.7
95°		23.0	19.2	3.8	3.6	83.48%	57.5	55.2
100°		22.7	19.2	3.5	3.3	84.58%	57.8	55.7
65°	75° DB 64.1° WB	24.3	17.2	7.1	6.7	70.78%	58.8	55.7
70°		24.4	17.4	7.0	6.6	71.31%	58.5	55.6
75°		24.3	17.5	6.8	6.4	72.02%	58.4	55.5
80°		24.2	17.6	6.6	6.2	72.73%	58.3	55.6
85°		24.0	17.7	6.3	5.9	73.75%	58.3	55.9
90°		23.8	17.8	6.0	5.7	74.79%	58.4	56.2
95°		23.5	17.9	5.6	5.3	76.17%	58.6	56.6
100°		23.2	18.0	5.2	4.9	77.59%	58.9	57.2
65°	75° DB 65.5° WB	25.0	16.0	9.0	8.5	64.00%	59.9	57.2
70°		25.0	16.2	8.8	8.3	64.80%	59.7	57.1
75°		24.8	16.3	8.5	8.0	65.73%	59.4	57.0
80°		24.7	16.4	8.3	7.8	66.40%	59.4	57.1
85°		24.5	16.5	8.0	7.5	67.35%	59.5	57.3
90°		24.3	16.6	7.7	7.3	68.31%	59.6	57.7
95°		24.0	16.7	7.3	6.9	69.58%	59.8	58.1
100°		23.6	16.8	6.8	6.4	71.19%	60.1	58.7
65°	75° DB 66.7° WB	25.5	14.8	10.7	10.1	58.04%	61.1	58.7
70°		25.4	14.9	10.5	9.9	58.66%	60.8	58.5
75°		25.3	15.1	10.2	9.6	59.68%	60.6	58.5
80°		25.2	15.2	10.0	9.4	60.32%	60.6	58.6
85°		25.0	15.3	9.7	9.2	61.20%	60.6	58.8
90°		24.8	15.4	9.4	8.9	62.10%	60.7	59.2
95°		24.5	15.5	9.0	8.5	63.27%	60.9	59.6
100°		24.1	15.6	8.5	8.0	64.73%	61.2	60.2
65°	75° DB 68° WB	26.0	13.6	12.4	11.7	52.31%	62.2	60.2
70°		25.9	13.7	12.2	11.5	52.90%	62.0	60.0
75°		25.8	13.9	11.9	11.2	53.88%	61.7	60.0
80°		25.7	14.0	11.7	11.0	54.47%	61.7	60.1
85°		25.5	14.1	11.4	10.8	55.29%	61.8	60.3
90°		25.3	14.2	11.1	10.5	56.13%	61.9	60.7
95°		25.0	14.3	10.7	10.1	57.20%	62.1	61.1
100°		24.6	14.4	10.2	9.6	58.54%	62.4	61.7
65°	80° DB 68.3° WB	25.9	17.8	8.1	7.6	68.73%	63.4	60.7
70°		25.9	17.9	8.0	7.5	69.11%	63.2	60.6
75°		25.8	18.0	7.8	7.4	69.77%	63.0	60.5
80°		25.7	18.2	7.5	7.1	70.82%	63.0	60.6
85°		25.5	18.3	7.2	6.8	71.76%	63.0	60.8
90°		25.3	18.4	6.9	6.5	72.73%	63.1	61.2
95°		25.0	18.5	6.5	6.1	74.00%	63.3	61.6
100°		24.6	18.6	6.0	5.7	75.61%	63.6	62.2

**TABLE 7B**  
**QW2S3D Dehumidification Performance – Dehumidification Full Load**  
(Full Load Capacities Based Upon Rated Flow of 7 GPM of 15% Methanol/Mass at 950 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Approximate Supply Air	
						DB	WB
65°	75° DB 62.5° WB	10.0	5.5	4.5	4.2	68.3	58.3
70°		8.5	4.3	4.2	4.0	69.7	58.9
75°		7.0	3.2	3.8	3.6	71.0	59.4
80°		5.5	2.1	3.4	3.2	72.4	60.2
85°		4.1	1.1	3.0	2.8	73.7	60.9
90°		2.8	0.1	2.7	2.5	74.9	61.4
95°		1.5	-0.9	2.4	2.3	76.0	62.0
100°		0.3	-1.8	2.1	2.0	77.2	62.5
65°	75° DB 64.1° WB	10.6	4.9	5.7	5.4	69.0	59.5
70°		9.0	3.8	5.2	4.9	70.4	60.2
75°		7.5	2.7	4.8	4.5	71.8	60.9
80°		6.1	1.6	4.5	4.2	73.1	61.5
85°		4.7	0.6	4.1	3.9	74.4	62.1
90°		3.4	-0.4	3.8	3.6	75.6	62.7
95°		2.1	-1.4	3.5	3.3	76.7	63.3
100°		0.9	-2.3	3.2	3.0	77.8	63.8
65°	75° DB 65.5° WB	11.2	4.3	6.9	6.5	69.7	60.8
70°		9.6	3.2	6.4	6.0	71.1	61.5
75°		8.1	2.1	6.0	5.7	72.4	61.9
80°		6.7	1.0	5.7	5.4	73.8	62.8
85°		5.3	0.0	5.3	5.0	75.0	63.4
90°		4.0	-1.0	5.0	4.7	76.3	64.0
95°		2.7	-2.0	4.7	4.4	77.4	64.5
100°		1.5	-2.9	4.4	4.2	78.5	65.1
65°	75° DB 66.7° WB	11.7	3.8	7.9	7.5	70.4	62.0
70°		10.2	2.6	7.6	7.2	71.8	62.7
75°		8.7	1.5	7.2	6.8	73.1	63.2
80°		7.2	0.5	6.7	6.3	74.5	64.0
85°		5.9	-0.6	6.5	6.1	75.7	64.6
90°		4.5	-1.6	6.1	5.8	76.9	65.2
95°		3.3	-2.5	5.8	5.5	78.1	65.8
100°		2.0	-3.5	5.5	5.2	79.2	66.3
65°	75° DB 68° WB	12.3	3.2	9.1	8.6	71.1	63.3
70°		10.8	2.1	8.7	8.2	72.5	64.0
75°		9.3	1.0	8.3	7.8	73.7	64.5
80°		7.8	-0.1	7.9	7.5	75.2	65.3
85°		6.4	-1.1	7.5	7.1	76.4	65.9
90°		5.1	-2.1	7.2	6.8	77.6	66.5
95°		3.8	-3.1	6.9	6.5	78.8	67.0
100°		2.6	-4.0	6.6	6.2	79.9	67.6
65°	80° DB 68.3° WB	12.7	5.7	7.0	6.6	71.7	63.2
70°		11.1	4.6	6.5	6.1	73.1	63.9
75°		9.6	3.5	6.1	5.8	74.4	64.4
80°		8.2	2.4	5.8	5.5	75.8	65.2
85°		6.8	1.4	5.4	5.1	77.0	65.8
90°		5.5	0.4	5.1	4.8	78.3	66.4
95°		4.2	-0.6	4.8	4.5	79.4	66.9
100°		3.0	-1.5	4.5	4.2	80.5	67.5

**TABLE 8A**  
**QW3S3D Dehumidification Performance – Cooling Full Load**  
(Full Load Capacities Based Upon Rated Flow of 8 GPM of 15% Methanol/Mass at 1150 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Sensible to Total Ratio	Approximate Supply Air	
							DB	WB
65°	75° DB 62.5° WB	36.0	26.7	9.3	8.8	74.17%	54.4	52.1
70°		35.2	26.3	8.9	8.4	74.72%	54.5	52.3
75°		33.8	25.7	8.1	7.6	76.04%	54.8	52.4
80°		33.1	25.4	7.7	7.3	76.74%	55.2	52.9
85°		31.9	24.9	7.0	6.6	78.06%	55.6	53.2
90°		30.6	24.3	6.3	5.9	79.41%	56.2	53.6
95°		29.1	23.7	5.4	5.1	81.44%	57.0	54.1
100°		27.6	23.0	4.6	4.3	83.33%	57.8	54.6
65°	75° DB 64.1° WB	37.1	25.2	11.9	11.2	67.92%	55.6	53.5
70°		36.2	24.9	11.3	10.7	68.78%	55.7	53.7
75°		35.3	24.4	10.9	10.3	69.12%	56.0	54.0
80°		34.2	24.0	10.2	9.6	70.18%	56.3	54.3
85°		33.0	23.4	9.6	9.1	70.91%	56.8	54.7
90°		31.7	22.8	8.9	8.4	71.92%	57.4	55.0
95°		30.2	22.2	8.0	7.5	73.51%	58.1	55.5
100°		28.6	21.5	7.1	6.7	75.17%	59.0	56.0
65°	75° DB 65.5° WB	38.1	23.8	14.3	13.5	62.47%	56.7	54.9
70°		37.3	23.4	13.9	13.1	62.73%	56.9	55.1
75°		35.9	22.8	13.1	12.4	63.51%	57.1	55.2
80°		35.3	22.5	12.8	12.1	63.74%	57.5	55.7
85°		34.1	22.0	12.1	11.4	64.52%	58.0	56.1
90°		32.8	21.4	11.4	10.8	65.24%	58.6	56.4
95°		31.3	20.7	10.6	10.0	66.13%	59.3	56.9
100°		29.7	20.1	9.6	9.1	67.68%	60.1	57.4
65°	75° DB 66.7° WB	39.2	22.3	16.9	15.9	56.89%	57.9	56.3
70°		38.4	21.9	16.5	15.6	57.03%	58.0	56.5
75°		37.0	21.3	15.7	14.8	57.57%	58.3	56.6
80°		36.4	21.0	15.4	14.5	57.69%	58.7	57.1
85°		35.2	20.5	14.7	13.9	58.24%	59.2	57.5
90°		33.9	19.9	14.0	13.2	58.70%	59.8	57.8
95°		32.4	19.3	13.1	12.4	59.57%	60.5	58.3
100°		30.8	18.6	12.2	11.5	60.39%	61.3	58.8
65°	75° DB 68° WB	40.3	20.8	19.5	18.4	51.61%	59.1	57.7
70°		39.5	20.5	19.0	17.9	51.90%	59.2	57.9
75°		38.1	19.8	18.3	17.3	51.97%	59.5	58.0
80°		37.5	19.6	17.9	16.9	52.27%	59.9	58.5
85°		36.3	19.0	17.3	16.3	52.34%	60.3	58.9
90°		34.9	18.4	16.5	15.6	52.72%	60.9	59.2
95°		33.5	17.8	15.7	14.8	53.13%	61.6	59.7
100°		31.9	17.1	14.8	14.0	53.61%	62.5	60.2
65°	80° DB 68.3° WB	40.9	26.3	14.6	13.8	64.30%	60.1	58.0
70°		40.1	25.9	14.2	13.4	64.59%	60.3	58.2
75°		38.7	25.3	13.4	12.6	65.37%	60.5	58.3
80°		38.1	25.0	13.1	12.4	65.62%	60.9	58.8
85°		36.9	24.5	12.4	11.7	66.40%	61.4	59.1
90°		35.6	23.9	11.7	11.0	67.13%	62.0	59.5
95°		34.1	23.3	10.8	10.2	68.33%	62.7	60.0
100°		32.5	22.6	9.9	9.3	69.54%	63.5	60.4

**TABLE 8B**  
**QW3S3D Dehumidification Performance – Dehumidification Full Load**  
(Full Load Capacities Based Upon Rated Flow of 8 GPM of 15% Methanol/Mass at 1150 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Approximate Supply Air	
						DB	WB
65°	75° DB 62.5° WB	14.1	5.1	9.0	8.5	69.3	57.1
70°		14.3	5.6	8.7	8.2	68.8	57.0
75°		13.7	5.4	8.3	7.8	68.9	57.0
80°		12.7	4.6	8.1	7.6	70.0	57.7
85°		10.9	3.1	7.8	7.4	71.6	58.4
90°		8.3	1.0	7.3	6.9	73.9	59.5
95°		5.0	-1.7	6.7	6.3	76.9	60.8
100°		1.1	-5.1	6.2	5.8	80.6	62.4
65°	75° DB 64.1° WB	15.1	4.1	11.0	10.4	70.5	58.3
70°		15.3	4.6	10.7	10.1	70.0	58.2
75°		14.9	4.4	10.5	9.9	70.2	58.4
80°		13.7	3.6	10.1	9.5	71.1	58.8
85°		11.9	2.1	9.8	9.2	72.7	59.6
90°		9.3	0.0	9.3	8.8	75.0	60.6
95°		6.0	-2.8	8.8	8.3	78.0	62.0
100°		2.0	-6.2	8.2	7.7	81.7	63.6
65°	75° DB 65.5° WB	16.0	3.1	12.9	12.2	71.6	59.5
70°		16.3	3.6	12.7	12.0	71.1	59.4
75°		15.7	3.4	12.3	11.6	71.2	59.4
80°		14.7	2.6	12.1	11.4	72.2	60.0
85°		12.8	1.1	11.7	11.0	73.8	60.8
90°		10.3	-1.0	11.3	10.7	76.1	61.8
95°		7.0	-3.8	10.8	10.2	79.1	63.2
100°		3.0	-7.2	10.2	9.6	82.9	64.8
65°	75° DB 66.7° WB	17.0	2.1	14.9	14.1	72.7	60.7
70°		17.3	2.5	14.8	14.0	72.2	60.6
75°		16.7	2.4	14.3	13.5	72.3	60.6
80°		15.7	1.5	14.2	13.4	73.3	61.2
85°		13.8	0.1	13.7	12.9	74.9	62.0
90°		11.2	-2.0	13.2	12.5	77.2	63.0
95°		8.0	-4.8	12.8	12.1	80.3	64.3
100°		4.0	-8.2	12.2	11.5	84.0	66.0
65°	75° DB 68° WB	18.0	1.1	16.9	15.9	73.8	61.8
70°		18.2	1.5	16.7	15.8	73.3	61.8
75°		17.6	1.3	16.3	15.4	73.4	61.8
80°		16.7	0.5	16.2	15.3	74.4	62.4
85°		14.8	-0.9	15.7	14.8	76.1	63.2
90°		12.2	-3.1	15.3	14.4	78.4	64.2
95°		8.9	-5.8	14.7	13.9	81.4	65.5
100°		5.0	-9.2	14.2	13.4	85.1	67.2
65°	80° DB 68.3° WB	20.1	6.4	13.7	12.9	73.0	61.3
70°		20.3	6.9	13.4	12.6	72.5	61.3
75°		19.7	6.7	13.0	12.3	72.6	61.3
80°		18.8	5.9	12.9	12.2	73.6	61.9
85°		16.9	4.4	12.5	11.8	75.2	62.7
90°		14.3	2.3	12.0	11.3	77.5	63.7
95°		11.0	-0.5	11.5	10.8	80.6	65.0
100°		7.1	-3.9	11.0	10.4	84.3	66.6

**TABLE 9A**  
**QW4S3D Dehumidification Performance – Cooling Full Load**  
(Full Load Capacities Based Upon Rated Flow of 9 GPM of 15% Methanol/Mass at 1650 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Sensible to Total Ratio	Approximate Supply Air	
							DB	WB
65°	75° DB 62.5° WB	48.7	34.0	14.7	13.9	69.82%	52.4	50.2
70°		47.8	33.6	14.2	13.4	70.29%	53.0	50.8
75°		46.3	33.2	13.1	12.4	71.71%	52.9	50.6
80°		46.0	32.9	13.1	12.4	71.52%	53.6	51.4
85°		45.3	32.6	12.7	12.0	71.96%	53.6	51.3
90°		44.5	32.5	12.0	11.3	73.03%	53.4	50.7
95°		43.8	32.3	11.5	10.8	73.74%	53.0	50.8
100°		43.2	32.3	10.9	10.3	74.77%	52.4	50.2
65°	75° DB 64.1° WB	50.2	32.2	18.0	17.0	64.14%	53.5	51.6
70°		49.3	31.8	17.5	16.5	64.50%	54.1	52.2
75°		48.4	31.4	17.0	16.0	64.88%	54.6	52.5
80°		47.6	31.1	16.5	15.6	65.34%	54.8	52.7
85°		46.8	30.9	15.9	15.0	66.03%	54.8	52.7
90°		46.1	30.7	15.4	14.5	66.59%	54.6	52.5
95°		45.4	30.6	14.8	14.0	67.40%	54.2	52.1
100°		44.8	30.5	14.3	13.5	68.08%	53.5	51.5
65°	75° DB 65.5° WB	51.8	30.5	21.3	20.1	58.88%	54.6	53.0
70°		50.8	30.1	20.7	19.5	59.25%	55.3	53.5
75°		49.4	29.7	19.7	18.6	60.12%	55.2	53.3
80°		49.1	29.4	19.7	18.6	59.88%	55.9	54.1
85°		48.3	29.1	19.2	18.1	60.25%	55.9	54.1
90°		47.6	29.0	18.6	17.5	60.92%	55.7	53.4
95°		46.9	28.8	18.1	17.1	61.41%	55.3	53.5
100°		46.3	28.8	17.5	16.5	62.20%	54.7	52.9
65°	75° DB 66.7° WB	53.3	28.7	24.6	23.2	53.85%	55.8	54.3
70°		52.4	28.3	24.1	22.7	54.01%	56.4	54.9
75°		51.0	27.9	23.1	21.8	54.71%	56.3	54.7
80°		50.7	27.6	23.1	21.8	54.44%	57.0	55.4
85°		49.9	27.4	22.5	21.2	54.91%	57.0	55.4
90°		49.2	27.2	22.0	20.8	55.28%	56.8	54.7
95°		48.5	27.1	21.4	20.2	55.88%	56.4	54.8
100°		47.8	27.0	20.8	19.6	56.49%	55.8	54.2
65°	75° DB 68° WB	54.9	27.0	27.9	26.3	49.18%	56.9	55.7
70°		53.9	26.6	27.3	25.8	49.35%	57.5	56.2
75°		52.5	26.2	26.3	24.8	49.90%	57.4	56.1
80°		52.2	25.9	26.3	24.8	49.62%	58.2	56.8
85°		51.4	25.6	25.8	24.3	49.81%	58.2	56.8
90°		50.7	25.5	25.2	23.8	50.30%	57.9	56.1
95°		50.0	25.3	24.7	23.3	50.60%	57.5	56.2
100°		49.4	25.3	24.1	22.7	51.21%	56.9	55.6
65°	80° DB 68.3° WB	54.8	33.0	21.8	20.6	60.22%	58.1	56.2
70°		53.9	32.6	21.3	20.1	60.48%	58.7	56.7
75°		52.4	32.2	20.2	19.1	61.45%	58.6	56.5
80°		52.1	31.9	20.2	19.1	61.23%	59.4	57.3
85°		51.4	31.7	19.7	18.6	61.67%	59.4	57.3
90°		50.6	31.5	19.1	18.0	62.25%	59.2	56.6
95°		49.9	31.4	18.5	17.5	62.93%	58.7	56.7
100°		49.3	31.3	18.0	17.0	63.49%	58.1	56.1

**TABLE 9B**  
**QW4S3D Dehumidification Performance – Dehumidification Full Load**  
(Full Load Capacities Based Upon Rated Flow of 9 GPM of 15% Methanol/Mass at 1650 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Approximate Supply Air	
						DB	WB
65°	75° DB 62.5° WB	23.8	9.3	14.5	13.7	66.6	54.9
70°		21.5	7.3	14.2	13.4	68.3	55.7
75°		18.3	5.2	13.1	12.4	70.2	56.6
80°		15.6	2.9	12.7	12.0	72.4	57.8
85°		11.9	0.4	11.5	10.8	74.7	59.0
90°		7.8	-2.3	10.1	9.5	77.2	60.3
95°		3.2	-5.2	8.4	7.9	79.9	61.7
100°		----	-8.3	6.4	6.0	82.8	63.2
65°	75° DB 64.1° WB	25.4	8.3	17.1	16.1	67.5	55.9
70°		23.2	6.4	16.8	15.8	69.2	56.8
75°		20.5	4.3	16.2	15.3	71.1	57.7
80°		17.3	2.0	15.3	14.4	73.2	58.8
85°		13.6	-0.6	14.2	13.4	75.5	60.0
90°		9.5	-3.3	12.8	12.1	78.0	61.3
95°		4.8	-6.2	11.0	10.4	80.7	62.7
100°		----	-9.3	9.0	8.5	83.6	64.2
65°	75° DB 65.5° WB	27.1	7.3	19.8	18.7	68.4	56.9
70°		24.8	5.4	19.4	18.3	70.1	57.8
75°		21.7	3.3	18.4	17.4	71.9	58.7
80°		18.9	1.0	17.9	16.9	74.1	59.8
85°		15.3	-1.5	16.8	15.8	76.4	61.0
90°		11.1	-4.2	15.3	14.4	78.9	62.3
95°		6.5	-7.1	13.6	12.8	81.6	63.7
100°		1.4	-10.2	11.6	10.9	84.5	65.2
65°	75° DB 66.7° WB	28.8	6.4	22.4	21.1	69.2	57.9
70°		26.5	4.5	22.0	20.8	70.9	58.8
75°		23.3	2.4	20.9	19.7	72.8	59.7
80°		20.6	0.0	20.6	19.4	74.9	60.9
85°		16.9	-2.5	19.4	18.3	77.2	62.1
90°		12.8	-5.2	18.0	17.0	79.7	63.4
95°		8.2	-8.1	16.3	15.4	82.4	64.8
100°		3.1	-11.2	14.3	13.5	85.3	66.3
65°	75° DB 68° WB	30.4	5.4	25.0	23.6	70.1	59.0
70°		28.2	3.5	24.7	23.3	71.8	59.8
75°		25.0	1.4	23.6	22.3	73.7	60.7
80°		22.3	-0.9	23.2	21.9	75.8	61.9
85°		18.6	-3.4	22.0	20.8	78.1	63.1
90°		14.4	-6.1	20.5	19.3	80.6	64.4
95°		9.8	-9.0	18.8	17.7	83.3	65.8
100°		4.7	-12.2	16.9	15.9	86.2	67.3
65°	80° DB 68.3° WB	31.5	9.7	21.8	20.6	70.9	58.9
70°		29.2	7.8	21.4	20.2	72.6	59.8
75°		26.1	5.7	20.4	19.2	74.4	60.6
80°		23.3	3.4	19.9	18.8	76.6	61.8
85°		19.7	0.9	18.8	17.7	78.9	63.0
90°		15.5	-1.8	17.3	16.3	81.4	64.3
95°		10.9	-4.7	15.6	14.7	84.1	65.7
100°		5.8	-7.9	13.7	12.9	87.0	67.2



**TABLE 10A**  
**QW5S3D Dehumidification Performance – Cooling Full Load**  
(Full Load Capacities Based Upon Rated Flow of 9 GPM of 15% Methanol/Mass at 1650 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Sensible to Total Ratio	Approximate Supply Air	
							DB	WB
65°	75° DB 62.5° WB	57.8	40.0	17.8	16.8	69.20%	52.9	50.5
70°		56.2	38.8	17.4	16.4	69.04%	53.6	50.9
75°		54.3	38.0	16.3	15.4	69.98%	53.8	51.1
80°		53.6	37.7	15.9	15.0	70.34%	54.3	51.5
85°		52.7	37.9	14.8	14.0	71.92%	54.3	51.7
90°		52.0	38.5	13.5	12.7	74.04%	54.1	51.8
95°		51.6	39.6	12.0	11.3	76.74%	53.8	51.9
100°		51.5	41.2	10.3	9.7	80.00%	53.2	51.8
65°	75° DB 64.1° WB	59.3	38.1	21.2	20.0	64.25%	54.0	51.9
70°		57.7	36.8	20.9	19.7	63.78%	54.7	52.3
75°		56.2	36.0	20.2	19.1	64.06%	55.1	52.6
80°		55.1	35.7	19.4	18.3	64.79%	55.3	52.9
85°		54.2	35.9	18.3	17.3	66.24%	55.4	53.1
90°		53.5	36.5	17.0	16.0	68.22%	55.2	53.2
95°		53.1	37.7	15.4	14.5	71.00%	54.9	53.3
100°		53.0	39.2	13.8	13.0	73.96%	54.3	53.3
65°	75° DB 65.5° WB	60.8	36.1	24.7	23.3	59.38%	55.1	53.3
70°		59.2	34.9	24.3	22.9	58.95%	55.7	53.7
75°		57.3	34.1	23.2	21.9	59.51%	56.0	53.9
80°		56.6	33.8	22.8	21.5	59.72%	56.4	54.3
85°		55.7	33.9	21.8	20.6	60.86%	56.5	54.5
90°		55.0	34.6	20.4	19.2	62.91%	56.3	54.6
95°		54.6	35.7	18.9	17.8	65.38%	55.9	54.7
100°		54.5	37.3	17.2	16.2	68.44%	55.4	54.7
65°	75° DB 66.7° WB	62.3	34.2	28.1	26.5	54.90%	56.2	54.7
70°		60.6	32.9	27.7	26.1	54.29%	56.8	55.1
75°		58.8	32.1	26.7	25.2	54.59%	57.1	55.3
80°		58.1	31.8	26.3	24.8	54.73%	57.5	55.7
85°		57.2	32.0	25.2	23.8	55.94%	57.5	55.9
90°		56.5	32.6	23.9	22.5	57.70%	57.4	56.0
95°		56.1	33.7	22.4	21.1	60.07%	57.0	56.1
100°		56.0	35.3	20.7	19.5	63.04%	56.5	56.1
65°	75° DB 68° WB	63.8	32.2	31.6	29.8	50.47%	57.3	56.1
70°		62.1	30.9	31.2	29.4	49.76%	57.9	56.5
75°		60.3	30.1	30.2	28.5	49.92%	58.1	56.7
80°		59.6	29.8	29.8	28.1	50.00%	58.6	57.1
85°		58.7	30.0	28.7	27.1	51.11%	58.6	57.3
90°		58.0	30.7	27.3	25.8	52.93%	58.5	57.5
95°		57.6	31.8	25.8	24.3	55.21%	58.1	57.5
100°		57.5	33.4	24.1	22.7	58.09%	57.5	57.5
65°	80° DB 68.3° WB	63.8	38.9	24.9	23.5	60.97%	58.4	56.6
70°		62.1	37.7	24.4	23.0	60.71%	59.0	57.0
75°		60.2	36.9	23.3	22.0	61.30%	59.3	57.3
80°		59.5	36.6	22.9	21.6	61.51%	59.7	57.6
85°		58.6	36.8	21.8	20.6	62.80%	59.8	57.8
90°		57.9	37.4	20.5	19.3	64.59%	59.6	58.0
95°		57.6	38.5	19.1	18.0	66.84%	59.2	58.0
100°		57.4	40.1	17.3	16.3	69.86%	58.7	58.0

**TABLE 10B**  
**QW5S3D Dehumidification Performance – Dehumidification Full Load**  
(Full Load Capacities Based Upon Rated Flow of 9 GPM of 15% Methanol/Mass at 1650 CFM Airflow)

Entering Fluid Temp. (°F)	Entering Air Temp. (°F)	Total Capacity (MBtuH)	Sensible Capacity (MBtuH)	Latent Capacity (MBtuH)	Pounds of Water per Hour Removal	Approximate Supply Air	
						DB	WB
65°	75° DB 62.5° WB	25.7	9.3	16.4	15.5	68.2	56.0
70°		23.1	7.3	15.8	14.9	69.6	56.6
75°		20.0	5.1	14.9	14.1	71.1	57.2
80°		17.0	2.7	14.3	13.5	73.0	58.2
85°		13.6	0.0	13.6	12.8	75.1	59.2
90°		9.9	-3.0	12.9	12.2	77.3	60.3
95°		5.9	-6.2	12.1	11.4	79.8	61.6
100°		1.6	-9.7	11.3	10.7	82.5	63.0
65°	75° DB 64.1° WB	27.0	7.9	19.1	18.0	69.2	57.2
70°		24.4	6.0	18.4	17.4	70.6	57.8
75°		21.5	3.8	17.7	16.7	72.2	58.6
80°		18.3	1.3	17.0	16.0	74.0	59.4
85°		14.9	-1.4	16.3	15.4	76.1	60.4
90°		11.2	-4.3	15.5	14.6	78.3	61.6
95°		7.2	-7.6	14.8	14.0	80.8	62.8
100°		2.9	-11.0	13.9	13.1	83.5	64.2
65°	75° DB 65.5° WB	28.3	6.6	21.7	20.5	70.2	58.4
70°		25.7	4.6	21.1	19.9	71.6	59.0
75°		22.6	2.4	20.2	19.1	73.1	59.6
80°		19.6	0.0	19.6	18.5	75.0	60.6
85°		16.2	-2.7	18.9	17.8	77.1	61.6
90°		12.5	-5.7	18.2	17.2	79.3	62.8
95°		8.5	-8.9	17.4	16.4	81.8	64.0
100°		4.3	-12.4	16.7	15.8	84.5	65.4
65°	75° DB 66.7° WB	29.7	5.2	24.5	23.1	71.2	59.6
70°		27.0	3.3	23.7	22.4	72.6	60.2
75°		23.9	1.1	22.8	21.5	74.1	60.8
80°		20.9	-1.3	22.2	20.9	76.0	61.9
85°		17.5	-4.1	21.6	20.4	78.1	62.9
90°		13.8	-7.0	20.8	19.6	80.3	64.0
95°		9.8	-10.2	20.0	18.9	82.8	65.2
100°		5.6	-13.7	19.3	18.2	85.5	66.6
65°	75° DB 68° WB	31.0	3.9	27.1	25.6	72.2	60.9
70°		28.3	2.0	26.3	24.8	73.6	61.5
75°		25.2	-0.2	25.4	24.0	75.1	62.0
80°		22.2	-2.7	24.9	23.5	77.0	63.1
85°		18.8	-5.4	24.2	22.8	79.1	64.1
90°		15.1	-8.4	23.5	22.2	81.3	65.2
95°		11.1	-11.6	22.7	21.4	83.8	66.5
100°		6.9	-15.1	22.0	20.8	86.5	67.9
65°	80° DB 68.3° WB	31.8	9.9	21.9	20.7	73.1	60.8
70°		29.2	8.0	21.2	20.0	74.5	61.4
75°		26.0	5.8	20.2	19.1	76.0	61.9
80°		23.1	3.3	19.8	18.7	77.9	63.0
85°		19.6	0.6	19.0	17.9	80.0	64.0
90°		15.9	-2.3	18.2	17.2	82.2	65.1
95°		12.0	-5.6	17.6	16.6	84.7	66.4
100°		7.7	-9.0	16.7	15.8	87.4	67.8

**Table 11  
Dehumidification Relay Logic Board**

Energize on Unit Terminal Strip	Mode	Occupied/Unoccupied	Inputs to the Board							Outputs from the Board													
			RAT	Y	B	W2	A1	D	G	G1	BK	RV	TWV	W	YO	A2							
G	Blower	Unoccupied							X	X	X												
G, A	Blower	Occupied					X		X	X	X						X						
Y1, O, G	Part Load Cooling	Unoccupied		X					X	X	X					X							
Y1, O, G, A	Part Load Cooling	Occupied		X			X		X	X	X					X	X						
Y1, O, G, D	Part Load Cooling/Dehum	Unoccupied		X				X	X	X						X							
Y1, O, G, D, A	Part Load Cooling/Dehum	Occupied		X			X	X	X	X						X	X						
Y1, Y2, O, G,	Full load Cooling	Unoccupied		X					X	X	X					X							
Y1, Y2, O, G, A	Full load Cooling	Occupied		X			X		X	X	X					X	X						
Y1, O, G, D	Full Load Cooling/Dehum	Unoccupied		X				X	X	X						X							
Y1,G, O, D, A	Full Load Cooling/Dehum	Occupied		X			X	X	X	X						X	X						
Y1, G	Part Load Heat Pump	Unoccupied		X					X	X	X					X							
Y1, G, A	Part Load Heat pump	Occupied		X			X		X	X	X					X	X						
Y1, G, D	Part Load Heat Pump/Dehum	Unoccupied		X				X	X	X						X							
Y1, G, D, A	Part Load Heat Pump/Dehum	Occupied		X			X	X	X	X						X	X						
Y1, Y2, G	Full Load Heat Pump	Unoccupied		X					X	X	X					X							
Y1, Y2, G, A	Full Load Heat Pump	Occupied		X			X		X	X	X					X	X						
Y1, Y2, G, D	Full Load Heat Pump/Dehum	Unoccupied		X				X	X	X						X							
Y1, Y2, G, D, A	Full Load Heat Pump/Dehum	Occupied		X			X	X	X	X						X	X						
Y1, Y2, G, W2	Part Load Heat Pump w/Aux. Heat	Unoccupied		X		X			X	X	X				X	X							
Y1, Y2, G, W2	Part Load Heat Pump w/Aux. Heat	Occupied		X		X	X		X	X	X				X	X	X						
Y1, Y2, G, W2, D	Part Load Heat Pump w/Aux. Heat/Dehum	Unoccupied		X		X		X	X	X					X	X							
Y1, Y2, G, W2 D, A	Part Load Heat Pump w/Aux. Heat/Dehum	Occupied		X		X	X	X	X	X					X	X	X						
G, W2	Aux. Heat	Unoccupied				X			X	X	X				X								
G, W2, A	Aux. Heat	Occupied				X			X	X	X				X		X						
G, W2, D	Aux. Heat/Dehum	Unoccupied				X		X	X	X			X		X								
G, W2, D, A	Aux. Heat/Dehum	Occupied				X	X	X	X	X			X		X	X	X						
D	Dehumidification	Unoccupied						X		X			X		X								
D, A	Dehumidification	Occupied					X	X		X			X		X	X	X						
Energize on Unit Terminal Strip	Mode	Occupied/Unoccupied	RAT	Y	B	W2	A1	D	G	G1	BK	RV	TWV	W	YO	A2							
										Inputs to the Board							Outputs from the Board						

**NOTES**

1. Cooling takes precedence over dehumidification. A cooling call cancels dehumidification.
2. For dehumidification, the "O" (reversing valve) is activated through the dehumidification cube relay.

# CLOSED LOOP

## (Earth Coupled Ground Loop Applications)

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### Circulation System Design

Equipment room piping design is based on years of experience with earth coupled heat pump systems. The design eliminates most causes of system failure.

Surprisingly, the heat pump itself is rarely the cause. Most problems occur because designers and installers forget that a closed loop earth coupled heat pump system is *not* like a household plumbing system.

Most household water systems have more than enough water pressure either from the well pump or the municipal water system to overcome the pressure of head loss in 1/2" or 3/4" household plumbing. A closed loop earth coupled heat pump system, however, is separated from the pressure of the household supply and relies on a small, low wattage pump to circulate the water and antifreeze solution through the earth coupling, heat pump and equipment room components.

The small circulator keeps the operating costs of the system to a minimum. However, the performance of the circulator *must* be closely matched with the pressure of head loss of the entire system in order to provide the required flow through the heat pump. Insufficient flow through the heat exchanger is one of the most common causes of system failure. Proper system piping design and circulator selection will eliminate this problem.

Bard supplies a work sheet to simplify head loss calculations and circulator selection. Refer to "Circulating Pump Work sheet" section in manual 2100-099.

### Copper Water Coil Application

Copper water coils are available as a factory-installed option. The unit model number will indicate the coil option as the next to last character; "C" represents a water coil constructed of copper material and "N" represents a water coil constructed of cupronickel.

The cupronickel coil is suitable for all applications. **The copper coil is suitable for applications using ground loop and cooling tower only and is not recommended for open well application.**

### Start Up Procedure for Closed Loop System

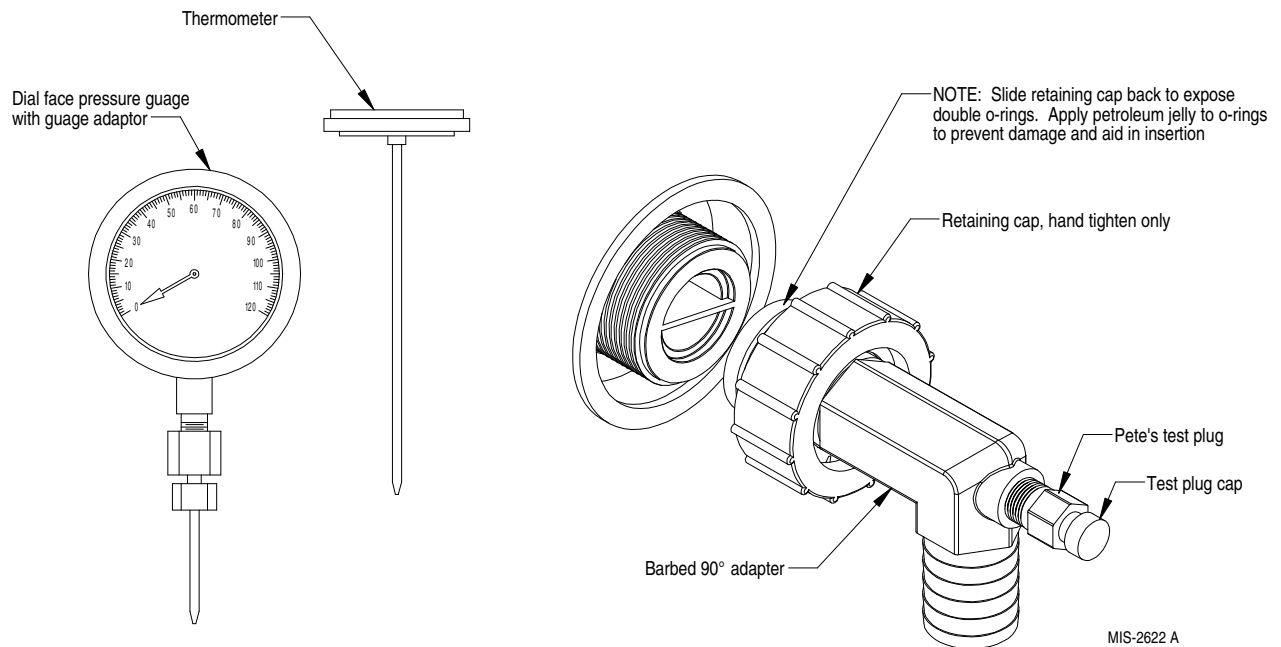
1. Be sure main power to the unit is OFF at disconnect.
2. Set thermostat system switch to OFF and fan switch to AUTO.
3. Move main power disconnect to ON. Except as required for safety while servicing, **do not open the unit disconnect switch.**
4. Check system air flow for obstructions.
  - A. Move thermostat fan switch to ON. Blower runs.
  - B. Be sure all registers and grilles are open.
  - C. Move thermostat fan switch to AUTO. Blowing should stop.
5. Flush, fill and pressurize the closed loop system as outlined in manual 2100-099.
6. Fully open the manual inlet and outlet valves. Start the loop pump module circulator(s) and check for proper operation. If circulator(s) are not operating, turn off power and diagnose the problem.
7. Check fluid flow using a direct reading flow meter or a single water pressure gauge; measure the pressure drop at the pressure/temperature plugs across the water coil. Compare the measurement with flow versus pressure drop table to determine the actual flow rate. If the flow rate is too low, recheck the selection of the loop pump module model for sufficient capacity. If the module selection is correct, there is probably trapped air or a restriction in the piping circuit.
8. Start the unit in cooling mode by moving the thermostat switch to cool. Fan should be set for AUTO.
9. Check the system refrigerant pressures against the cooling refrigerant pressure table in the installation manual for rated water flow and entering water temperatures. If the refrigerant pressures do not match, check for airflow problem then refrigeration system problem.
10. Switch the unit to the heating mode by moving the thermostat switch to heat. Fan should be set for AUTO.
11. Check the refrigerant system pressures against the heating refrigerant pressure table in installation manual. Once again, if they do not match, check for airflow problems and then refrigeration system problems.

**NOTE** If a charge problem is determined (high or low):

- A. Check for possible refrigerant leaks.
  - B. Recover all remaining refrigerant from unit and repair leak.
  - C. Evacuate unit down to 29" of vacuum
  - D. Recharge the unit with refrigerant by weight.  
This is the only way to ensure a proper charge.
12. For iSeries Smart Actuator and water valve installation, refer to the **Valve and Actuator Installation/Removal** section on page 31.
13. It is advised to rotate the manual operation button, located on the top of the iSeries Smart Actuator, several times to make sure the water valve is loose and not seized before operation. This simple step will provide assurance the 3-way water valve is free to move once power is applied.

**IMPORTANT** Operator must be removed from the valve body and ball valve must be in the full open position before soldering. Valve is shipped in the full closed position.

**FIGURE 35**  
**Water Temperature and Pressure Procedure**



# OPEN LOOP (Well System Applications)

**NOTE** It is highly recommended on ground water systems (pump & dump) that a cupronickel coaxial coil is utilized on the source side of the system. Not doing so may void the product warranty due to aggressive/corrosive/highly oxygenated water attacking a copper coaxial water coil.

## Water Connections

It is very important that an adequate supply of clean, noncorrosive water at the proper pressure be provided before the installation is made. Insufficient water, in the heating mode for example, will cause the low pressure switch to trip, shutting down the heat pump. In assessing the capacity of the water system, it is advisable that the complete water system be evaluated to prevent possible lack of water or water pressure at various household fixtures whenever the heat pump turns on. All plumbing to and from the unit is to be installed in accordance with local plumbing codes. The use of plastic pipe, where permissible, is recommended to prevent electrolytic corrosion of the water pipe. Because of the relatively cold temperatures encountered with well water, it is strongly recommended that the water lines connecting the unit be insulated to prevent water droplets from condensing on the pipe surface.

Refer to Figure 36. Slow closing **Solenoid Valve (6)** with a 24V coil provides on/off control of the water flow to the unit. Refer to the wiring diagram for correct hookup of the valve solenoid coil.

**Constant Flow Valve (7)** provides correct flow of water to the unit regardless of variations in water pressure. Observe the water flow direction indicated by the arrow on the side of the valve body. Table 12 shows the flow rate of each valve. Two constant flow rate valves may be installed in parallel to increase the flow. For example, when a 8603-007 (6 GPM) and 8603-011 (5 GPM) are installed in parallel the total flow will be 11 GPM.

**Strainer (5)** installed upstream of **constant flow valve (7)** to collect foreign material which would clog the flow valve orifice.

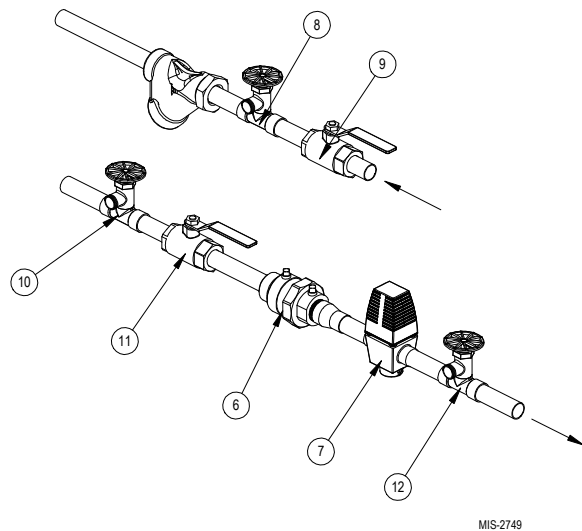
Figure 36 shows the use of **shutoff valves (9 and 11)**, on the in and out water lines to permit isolation of the unit from the plumbing system should future service work require this. Globe valves should not be used as shutoff valves because of the excessive pressure drop inherent in the valve design. Instead use gate or ball valves as shut-offs so as to minimize pressure drop.

**Drain cocks (8 and 10)** and tees have been included to permit acid cleaning the refrigerant-to-water coil should

such cleaning be required. See **Water Corrosion** section on page 58.

**Drain cock (12)** provides access to the system to check water flow through the constant flow valve to ensure adequate water flow through the unit. A water meter is used to check the water flow rate.

**Figure 36  
Piping Diagram**



**TABLE 12  
Constant Flow Valves**

Part No.	Min. Available Pressure PSIG	Flow Rate GPM
CFV-5	15 ①	5
CFV-6	15 ①	6
CFV-7	15 ①	7
CFV-9	15 ①	9

① The pressure drop through the constant flow valve will vary depending on the available pressure ahead of the valve. Unless minimum of 15 psig is available **immediately** ahead of the valve, no water will flow.

## Well Pump Sizing

Strictly speaking, sizing the well pump is the responsibility of the well drilling contractor. It is important, however, that the HVAC contractor be familiar with the factors that determine what size pump will be required. Rule of thumb estimates will invariably lead to under or oversized well pumps. Undersizing the pump will result in inadequate water to the whole plumbing system but with especially bad results to the heat pump—NO HEAT/NO COOL calls will result. Oversized pumps will short cycle and could cause premature pump motor or switch failures.

The well pump must be capable of supplying enough water and at an adequate pressure to meet competing demands of water fixtures. The well pump must be sized in such a way that three requirements are met:

1. Adequate flow rate in GPM.
2. Adequate pressure at the fixture.
3. Able to meet the above from the depth of the well-feet of lift.

The pressure requirements put on the pump are directly affected by the diameter of pipe being used, as well as by the water flow rate through the pipe. The work sheet included in manual 2100-078 should guarantee that the well pump has enough capacity. It should also ensure that the piping is not undersized which would create too much pressure due to friction loss. High pressure losses due to undersized pipe will reduce efficiency and require larger pumps and could also create water noise problems.

## System Start Up Procedure for Open Loop Applications

1. Be sure main power to the unit is OFF at disconnect.
2. Set thermostat system switch to OFF and fan switch to AUTO.
3. Move main power disconnect to ON. Except as required for safety while servicing, **do not open the unit disconnect switch.**
4. Check system airflow for obstructions.
  - A. Move thermostat fan switch to ON. Blower runs.
  - B. Be sure all registers and grilles are open.
  - C. Move thermostat fan switch to AUTO. Blower should stop.
5. Fully open the manual inlet and outlet valves.
6. Check water flow.
  - A. Connect a water flow meter to the drain cock between the constant flow valve and the solenoid valve. Run a hose from the flow meter to a drain or sink. Open the drain cock.

- B. Check the water flow rate through constant flow valve to be sure it is the same as the unit is rated for.
  - C. When water flow is okay, close drain cock and remove the water flow meter. The unit is now ready to start.
7. Start the unit in cooling mode by moving the thermostat switch to cool. Fan should be set for AUTO.
  - A. Check to see the solenoid valve opened.
8. Check the system refrigerant pressures against the cooling refrigerant pressure table in the installation manual for rated water flow and entering water temperatures. If the refrigerant pressures do not match, check for airflow problem that refrigeration system problem.
9. Switch the unit to the heat mode by moving the thermostat switch to heat. Fan should be set for AUTO.
  - A. Check to see the solenoid valve opened again.
10. Check the refrigerant system pressures against the heating refrigerant pressure table in installation manual. Once again, if they do not match, check for air flow problems and then refrigeration system problems.

*NOTE If a charge problem is determined (high or low):*

- A. Check for possible refrigerant loss.
  - B. Recover all remaining refrigerant from unit and repair leak.
  - C. Evacuate unit down to 29" of vacuum.
  - D. Recharge the unit with refrigerant by weight. This is the only way to ensure proper charge.
11. For iSeries Smart Actuator and water valve installation, refer to the **Valve and Actuator Installation/Removal** section on page 31.
12. It is advised to rotate the manual operation button, located on the top of the iSeries Smart Actuator, several times to make sure the water valve is loose and not seized before operation. This simple step will provide assurance the 3-way water valve is free to move once power is applied.

*IMPORTANT Operator must be removed from the valve body and ball valve must be in the full open position before soldering. Valve is shipped in the full closed position.*

## Water Corrosion

Two concerns will immediately come to light when considering a water source heat pump, whether for ground water or for a closed loop application: Will there be enough water? And, how will the water quality affect the system?

Water quantity is an important consideration and one which is easily determined. The well driller must perform a pump down test on the well according to methods described by the Nation Well Water Association. This test, if performed correctly, will provide information on the rate of flow and on the capacity of the well. It is important to consider the overall capacity of the well when thinking about a water source heat pump because the heat pump may be required to run for extended periods of time.

The second concern, about water quality, is equally important. Generally speaking, if the water is intended for drinking purposes, it should pose no problem for the heat pump. The well driller or local water softening company can perform tests which will determine the chemical properties of the well water.

Water quality problems will show up in the heat pump in one of more of the following ways:

1. Decrease in water flow through the unit.
2. Decreased heat transfer of the water coil (entering to leaving water temperature difference is less).

There are four main water quality problems associated with ground water. These are:

### 1. Biological Growth

This is the growth of microscopic organisms in the water and will show up as a slimy deposit throughout the water system. Shock treatment of the well is usually required and this is best left up to the well driller. The treatment consists of injecting chlorine into the well casing and flushing the system until all growth is removed.

### 2. Suspended Particles in the Water

Filtering will usually remove most suspended particles (fine sand, small gravel) from the water. The problem with suspended particles in the water is that it will erode metal parts, pumps, heat transfer coils, etc. So long as the filter is cleaned and periodically maintained, suspended particles should pose no serious problem. Consult with the well driller.

### 3. Corrosion of Metal

Corrosion of metal parts results from either highly corrosive water (acid water, generally not the case with ground water) or galvanic reaction between dissimilar metals in the presence of water. By using plastic plumbing or dielectric unions, galvanic reaction is eliminated. The use of corrosion resistant materials (such as the

Cupronickel coil) through the water system will reduce corrosion problems significantly.

### 4. Scale Formation

Of all the water problems, the formation of scale by ground water is by far the most common. Usually this scale is due to the formation of calcium carbonate, but magnesium carbonate or calcium sulfate may also be present. Carbon dioxide gas (CO<sub>2</sub>), the carbonate of calcium and magnesium carbonate, is very soluble in water. It will remain dissolved in the water until some outside factor upsets the balance. This outside influence may be a large change in water temperature or pressure. When this happens, enough carbon dioxide gas combines with dissolved calcium or magnesium in the water and falls out of solution until a new balance is reached. The change in temperature that this heat pump produces is usually not high enough to cause the dissolved gas to fall out of solution. Likewise, if pressure drops are kept to a reasonable level, no precipitation of carbon dioxide should occur.

## Remedies of Water Problems

### Water Treatment

Water treatment can usually be economically justified for close loop systems. However, because of the large amounts of water involved with a ground water heat pump, water treatment is generally too expensive.

### Acid Cleaning the Water Coil or Heat Pump Recovery Unit

If scaling of the coil is strongly suspected, the coil can be cleaned up with a solution of phosphoric acid (food grade acid). Follow the manufacturer's directions for mixing, use, etc. Refer to Figure 37. The acid solution can be introduced into the heat pump coil through the hose bib A. Be sure the isolation valves are closed to prevent contamination of the rest of the system by the coil. The acid should be pumped from a bucket into the hose bib and returned to the bucket through the other hose bib B. Follow the manufacturer's directions for the product used as to how long the solution is to be circulated, but it is usually circulated for a period of several hours.



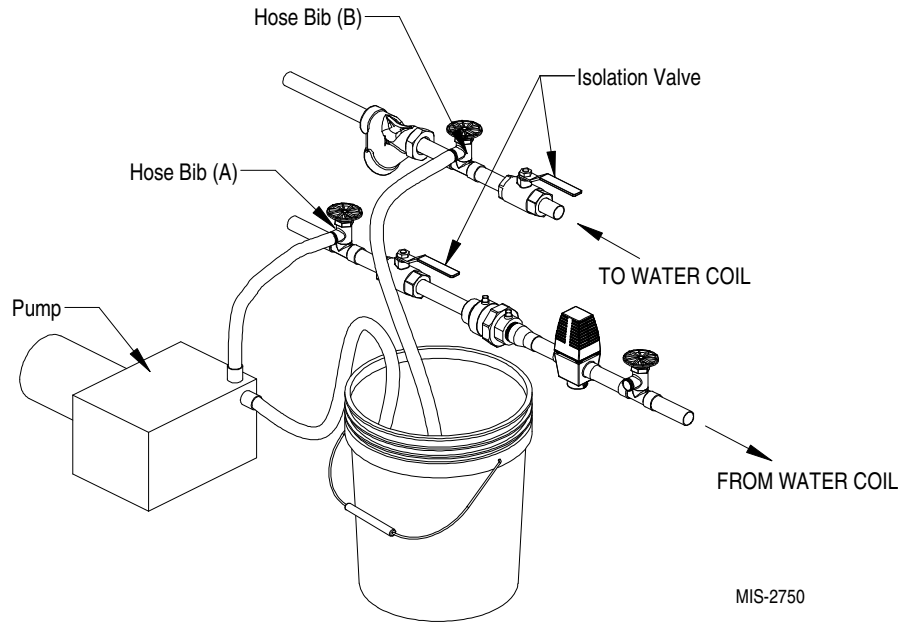
## WARNING

Thin ice may result in the vicinity of the discharge line.

For complete information on water well systems and lake and pond applications, refer to manual from distributor.



**FIGURE 37**  
**Cleaning Water Coil**



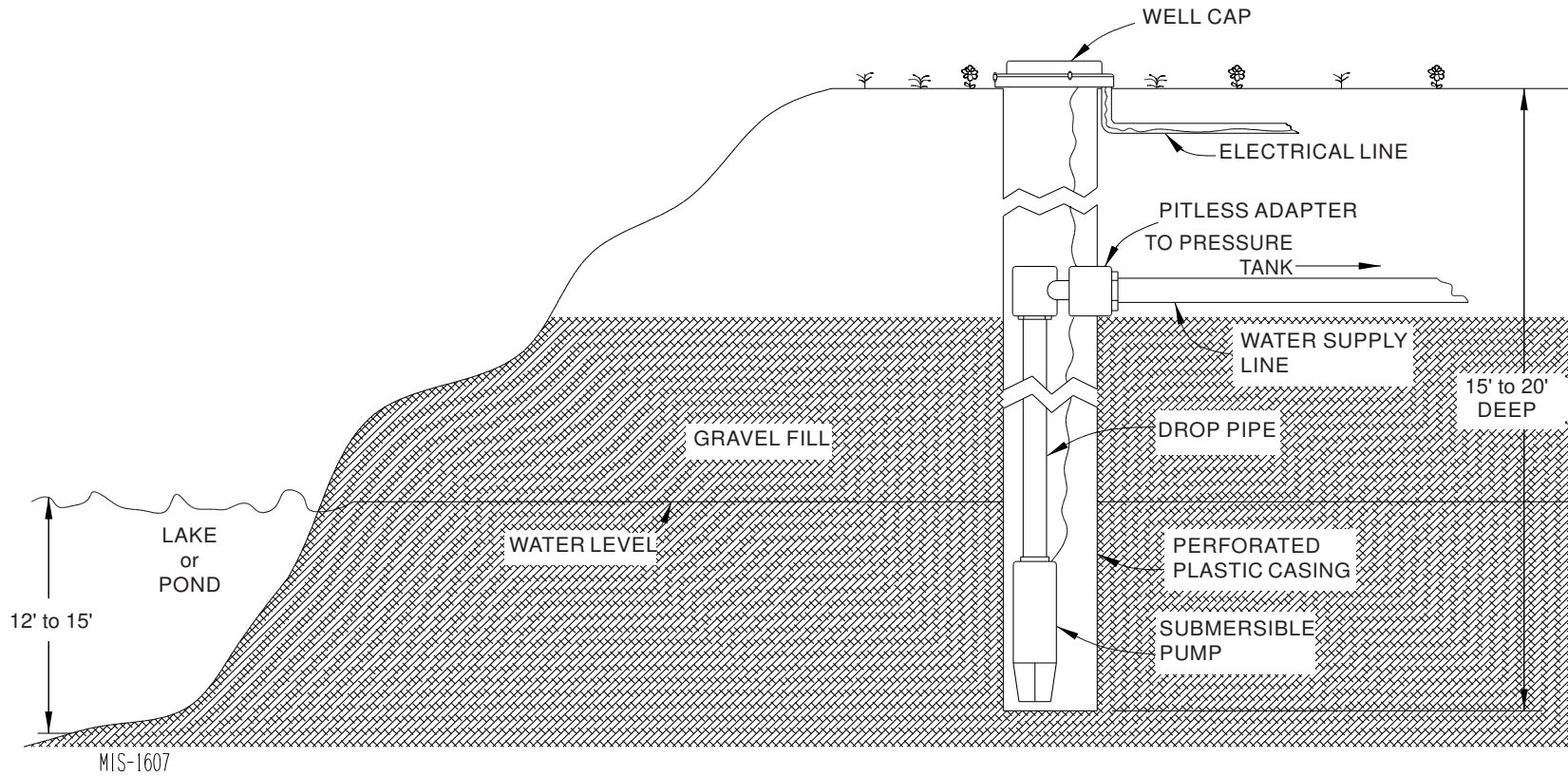
### Lake and Pond Installations

Lakes and ponds can provide a low cost source of water for heating and cooling with a ground water heat pump. Direct usage of the water without some filtration is not recommended as algae and turbid water can foul the water-to-freon heat exchanger. Instead, there have been very good results using a dry well dug next to the water line or edge. Normal procedure in installing a dry well is to backhoe a 15' to 20' hole adjacent to the body of water (set backhoe as close to the water's edge as possible). Once excavated, a perforated plastic casing should be installed with gravel backfill placed around the casing. The gravel bed should provide adequate filtration of the water to allow good performance of the ground water heat pump.

The following is a list of recommendations to follow when installing this type of system (Refer to Figure 38 on page 60):

- A. A lake or pond should be at least 1 acre (40,000 square feet) in surface area for each 50,000 BTUs of ground water heat pump capacity or have two times the cubic feet size of the dwelling being heated (includes basement if heated).
- B. The average water depth should be a least 4' and there should be an area where the water depth is at least 12' to 15' deep.
- C. If possible, use a submersible pump suspended in the dry well casing. Jet pumps and other types of suction pumps normally consume more electrical energy than similarly sized submersible pumps. Pipe the unit the same as a water well system.
- D. Size the pump to provide necessary GPM for the ground water heat pump. A 12 GPM or greater water flow rate is required on all modes when used on this type system.
- E. A pressure tank should be installed in dwelling to be heated adjacent to the ground water heat pump. A pressure switch should be installed at the tank for pump control.
- F. All plumbing should be carefully sized to compensate for friction losses, etc., particularly if the pond or lake is over 200' from the dwelling to be heated or cooled.
- G. Keep all water lines below low water level and below the frost line.
- H. Most installers use 4" field tile (rigid plastic or corrugated) for water return to the lake or pond.
- I. The drain line discharge should be located at least 100' from the dry well location.
- J. The drain line should be installed with a slope of 2" per 10' of run to provide complete drainage of the line when the ground water heat pump is not operating. This gradient should also help prevent freezing of the discharge where the pipe terminates above the frost line.
- K. Locate the discharge high enough above high water level so the water will not back up and freeze inside the drain pipe.
- L. Where the local conditions prevent the use of a gravity drainage system to a lake or pond, standard plastic piping can instead be run out into the pond below the frost and low water level.

**FIGURE 38**  
**Water Well System**





# WARNING

Thin ice may result in the vicinity of the discharge line.

For complete information on water well systems and lake and pond applications, refer to manual 2100-078 available from the distributor.

## Cooling Tower/Boiler Application

The cooling tower and boiler water loop temperature is usually maintained between 50°F to 100°F to ensure adequate cooling and heating performance.

In the cooling mode, heat is rejected from the unit into the source water loop. A cooling tower provides evaporative cooling to the loop water thus maintaining a constant supply temperature to the unit. When utilizing open cooling towers, chemical water treatment is mandatory to ensure the water is free from corrosive minerals.

It is imperative that all air be eliminated from the source closed loop side of the heat exchanger to ensure against fouling.

In the heating mode, heat is absorbed from the source water loop. A boiler can be utilized to maintain the loop at the desired temperature. In milder climates a “flooded tower” concept is often used. This concept involves adding makeup water to the cooling tower sump to maintain the desired loop temperature.



# CAUTION

Water piping exposed to extreme low ambient temperatures are subject to freezing.

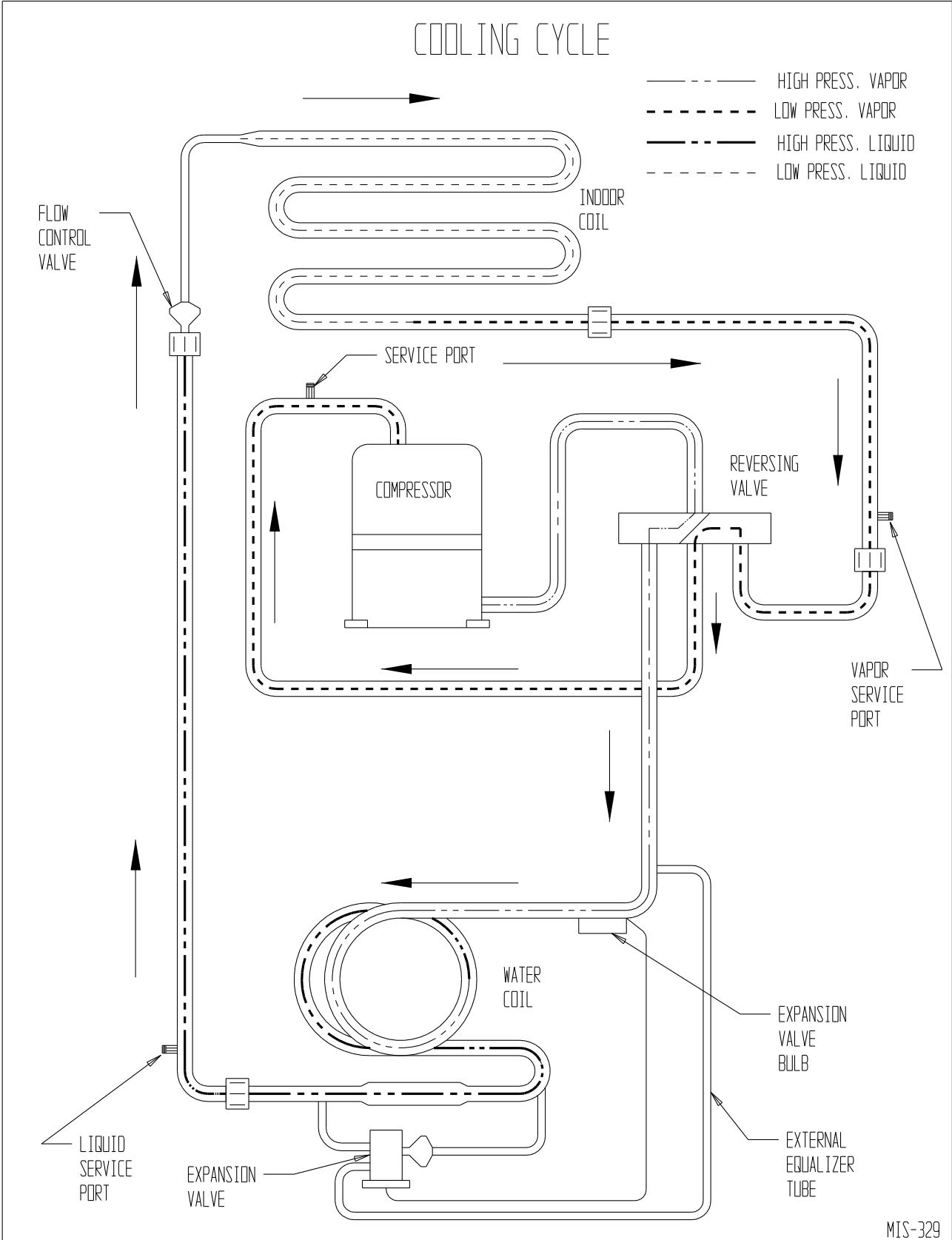
Units are equipped with double O-ring (female pipe thread) fittings. Consult the specification sheets for sizes. Teflon tape sealer should be used when connecting to the unit to ensure against leaks and possible condenser fouling. Do not overtighten the connections. Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow rate balancing.

Pressure/temperature ports are recommended in both supply and return lines for system flow balancing. Water flow can be accurately set by measuring the refrigerant to water heat exchangers water side pressure drop. See Table 13 for water flow and pressure drop information.

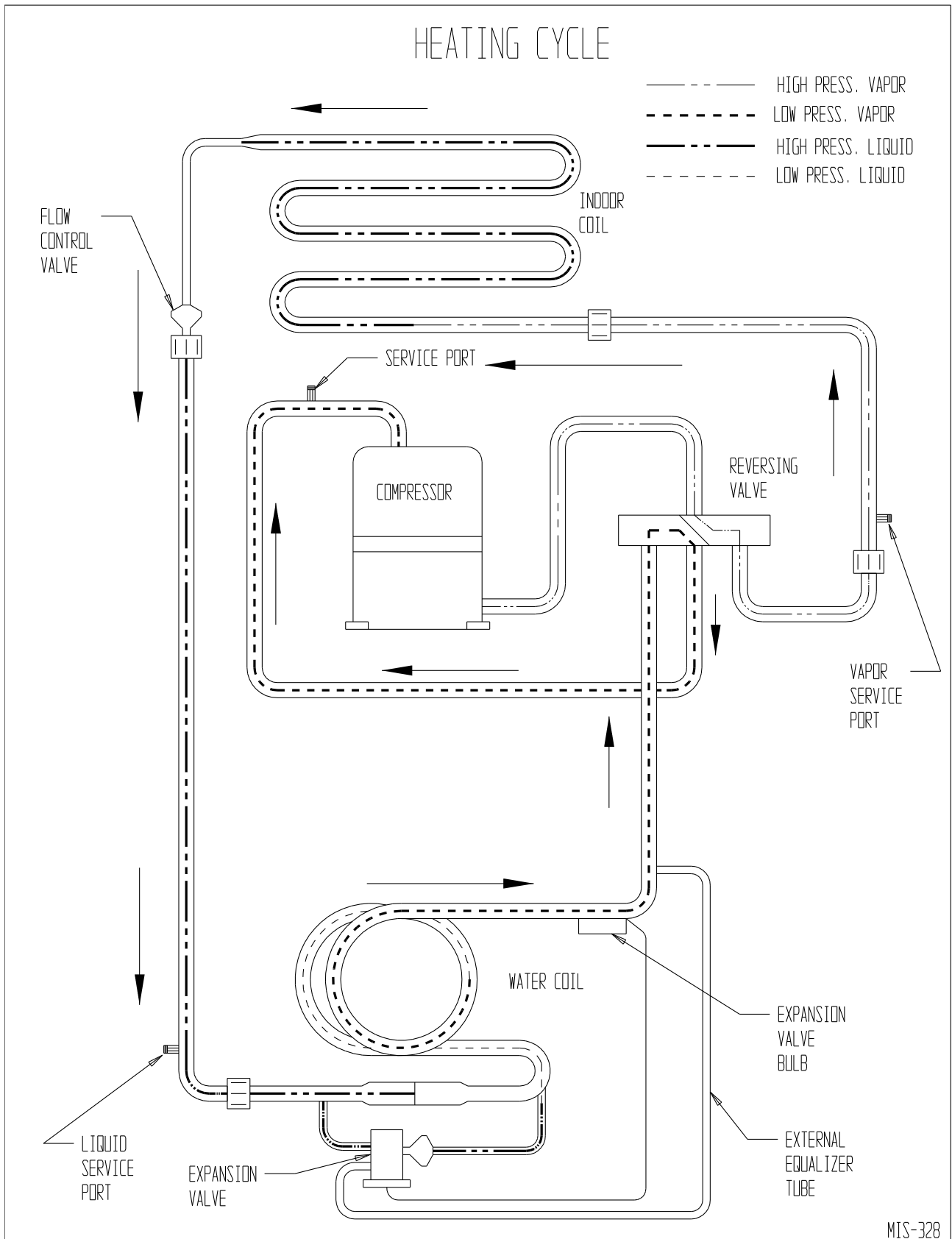
**TABLE 13**  
**Water Flow and Pressure Drop**

GPM	QW2S3 & QW3S3		QW4S3		QW5S3	
	PSID	Ft. Hd.	PSID	Ft. Hd.	PSID	Ft. Hd.
3	0.1	0.23				
4	0.6	1.38	0.9	2.08		
5	3.1	7.26	1.4	3.23		
6	5.7	13.19	3.6	8.39		
7	8.3	19.13	7.3	16.80	6.7	15.52
8	10.9	25.07	10.9	25.21	10.0	22.97
9	13.4	31.00	14.6	33.61	13.2	30.42
10			18.2	42.02	16.4	37.87
11			21.9	50.43	19.6	45.32
12			25.5	58.83	22.9	52.77
13			29.1	67.24	26.1	60.22
14			32.8	75.65	29.3	67.67
15					32.6	75.12
16					35.8	82.57
17					39.0	90.02
18						

**FIGURE 39**  
**Water Source Heat Pump Cooling Cycle**



**FIGURE 40**  
**Water Source Heat Pump Heating Cycle**



# SERVICE

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## Unbrazing System Components

If the refrigerant charge is removed from a scroll-equipped unit by bleeding the high side only, it is sometimes possible for the scrolls to seal, preventing pressure equalization through the compressor. This may leave low side shell and suction line tubing pressurized. If the brazing torch is then applied to the low side while the low side shell and suction line contains pressure, the pressurized refrigerant and oil mixture could ignite when it escapes and contacts the brazing flame. To prevent this occurrence, it is important to check both the high and low side with manifold gauges before unbrazing.



## WARNING

Both the high and low side of the scroll compressor must be checked with manifold gauges before unbrazing system components. Failure to do so could cause pressurized refrigerant and oil mixture to ignite if it escapes and contacts the brazing flame causing property damage, bodily harm or death.

## Troubleshooting Geothermal Logic CCM

The Bard QW\*S3D Series is equipped with a high pressure switch, low pressure switch and flow switch. The switches are all located in the condenser section of the unit. Each switch has its own illuminated diagnostic light, which provides the user an easy solution for basic troubleshooting.

### High Pressure Switch

(Terminals HP1 and HP2) Circuit will be proved as “closed” prior to energizing A or CC terminals. If pressure switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; green fault light will be illuminated. Logic control will then go through 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, a hard lockout will be initiated and fault signal is sent to L terminal.

### Low Pressure Switch

(Terminals LP1 and LP2) Circuit will be proved as “closed” prior to energizing A or CC terminals. The condition of the LP terminals will then be ignored for the first 90 seconds after a demand for compressor operation. Following this 90-second period, if pressure

switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; orange fault light will be illuminated. The compressor control board will then go through a 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, hard lockout will be initiated and the fault signal is sent to the L terminal.

### Flow Switch

(Terminals FS1 and FS2) Circuit will be proved as “closed” prior to energizing CC terminal. If flow switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; red fault light will be illuminated. Compressor logic control will then go through 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, hard lockout will be initiated and fault signal is sent to L terminal.

The flow type switch is located on the copper tube located at the condenser coil, water out. When there is a fault related to the flow switch, a red LED light will give notice by illumination, indicating a fault condition is present.

### Logic Control Board

Three of the four switches have normally closed contacts and one contact (CO = unused) has a normally open contact. If any of the four switches fault, their corresponding light will blink and initialize a soft lockout of the compressor circuit. If recurrence happens on the same cooling call cycle, a hard lockout of the compressor circuit will occur requiring a manual system reset (See **SEQUENCE OF OPERATION** on page 40.)

The compressor logic control board has five LED lights providing status updates of the system operation (see Figure 41). When the green status light is blinking, this is an indication that there is 24V power to the board. Upon an alarm detection from one of the four safety switches, there will be a blinking light indicating a fault. The faults are as follows:

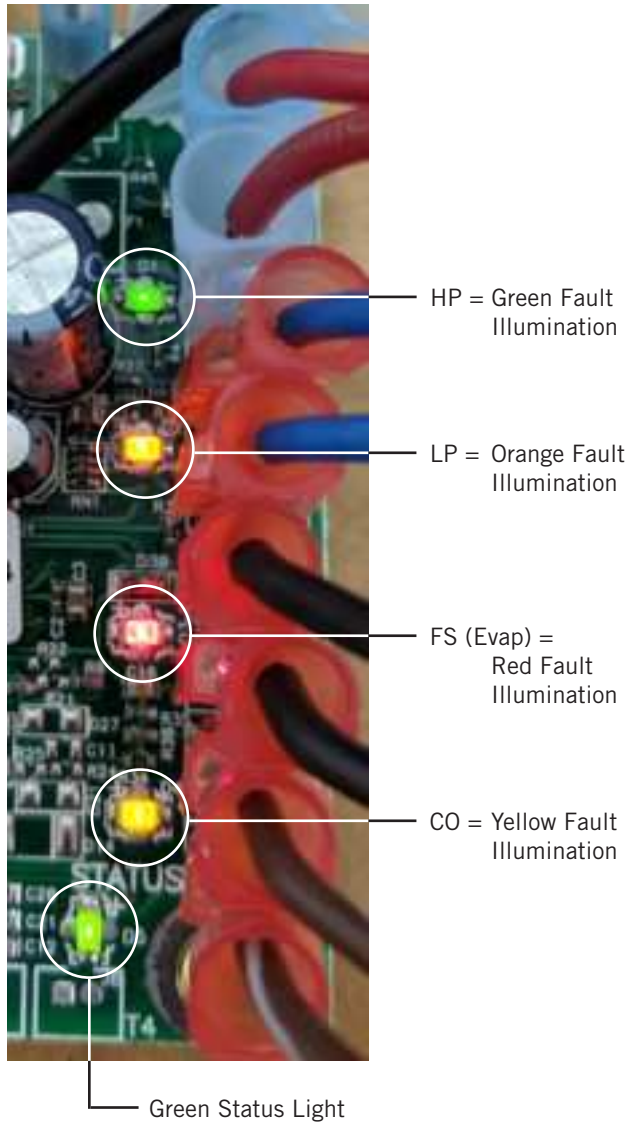
HP = Green fault illumination

LP = Orange fault illumination

FS = Red fault illumination

CO = Yellow fault illumination

**FIGURE 41**  
LED Fault Illumination

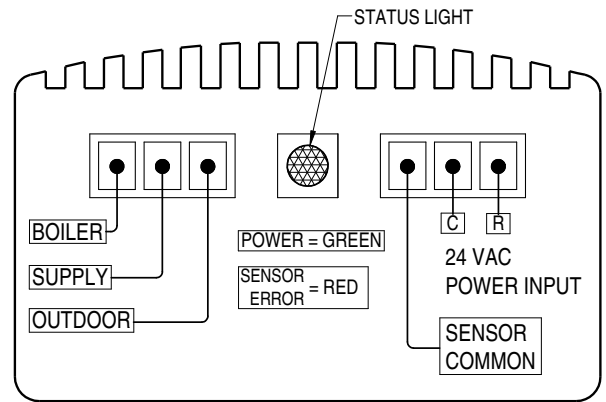


### Troubleshooting Water Modulating Actuator Diagnostics

The Bard QW\*S3D Series is equipped with a water modulating actuator. The water modulation is achieved through the operation of a TACO iSeries Smart Actuator, attached to a TACO 3-way valve.

The iSeries Smart Actuator is a microprocessor-based valve designed to provide a setpoint (fixed) temperature to a HVAC system by modulating the position of a mixing valve. The iSeries Smart Actuator is shown in Figure 42.

**FIGURE 42**  
iSeries Smart Actuator



MIS-4135

### Troubleshooting the iSeries Smart Actuator

As in any troubleshooting procedure, it is important to isolate a problem as much as possible before proceeding. The error message greatly simplifies troubleshooting of the iSeries-S. When the control flashes an error message, identify the fault by observing the LED status light code and follow standard testing procedures to confirm the problem. The LED status code and error can be diagnosed by following the light sequences in the multi-status LED table (Table 14).

If a wiring fault is suspected, return to the wiring diagram located on the unit door and carefully inspect all external wiring and wiring connections.

### Testing the Sensors

**TABLE 14**  
Multi-Status LED

LED	LED Status	iSeries Smart Actuator Status
Green	Solid	Power On
	Flash	Reduced Output (System Protection Activated)
Red	Flash, Pause, Flash, Pause, Flash, ...	System Supply Sensor Fault The iSeries-S operates at a fixed output

A good quality test meter capable of measuring up to 5,000 k $\Omega$  (1 k $\Omega$ = 1000  $\Omega$ ) is required to measure the sensor resistance. In addition to this, the actual temperature must be measured with a good quality digital thermometer.

First measure the temperature using the thermometer and then measure the resistance of the sensor at the iSeries Smart Actuator. The wires from the sensor must not be connected to the iSeries Smart Actuator while this test is performed. The wiring terminals are easily removed by pulling them from the iSeries Smart

Actuator. Using the information found in Table 15, estimate the temperature measured by the sensor. The sensor and thermometer readings should be close. If the test meter reads a very high resistance, there may be a broken wire, a poor wiring connection or a

defective sensor. If the resistance is very low, the wiring may be shorted, there may be moisture in the sensor or the sensor may be defective. To test for a defective sensor, measure the resistance directly at the sensor location.

**TABLE 15**  
**Temperature F vs. Resistance R of Temperature Sensor**

F	R	F	R	F	R	F	R
-25.0	196871	13.0	56985	53.0	19374	89.0	7507
-24.0	190099	14.0	55284	52.0	18867	90.0	7334
-23.0	183585	15.0	53640	53.0	18375	91.0	7165
-22.0	177318	16.0	52051	54.0	17989	92.0	7000
-21.0	171289	17.0	50514	55.0	17434	93.0	6840
-20.0	165487	18.0	49028	56.0	16984	94.0	6683
-19.0	159904	19.0	47590	57.0	16547	95.0	6531
-18.0	154529	20.0	46200	58.0	16122	96.0	6383
-17.0	149355	21.0	44855	59.0	15710	97.0	6239
-16.0	144374	22.0	43554	60.0	15310	98.0	6098
-15.0	139576	23.0	42295	61.0	14921	99.0	5961
-14.0	134956	24.0	41077	62.0	14544	100.0	5827
-13.0	130506	25.0	39898	63.0	14177	101.0	5697
-12.0	126219	26.0	38757	64.0	13820	102.0	5570
-11.0	122089	27.0	37652	65.0	13474	103.0	5446
-10.0	118108	28.0	36583	66.0	13137	104.0	5326
-9.0	114272	29.0	35548	67.0	12810	105.0	5208
-8.0	110575	30.0	34545	68.0	12492	106.0	5094
-7.0	107010	31.0	33574	69.0	12183	107.0	4982
-6.0	103574	32.0	32634	70.0	11883	108.0	4873
-5.0	100260	33.0	31723	71.0	11591	109.0	4767
-4.0	97064	34.0	30840	72.0	11307	110.0	4663
-3.0	93981	35.0	29986	73.0	11031	111.0	4562
-2.0	91008	36.0	29157	74.0	10762	112.0	4464
-1.0	88139	37.0	28355	75.0	10501	113.0	4367
0.0	85371	38.0	27577	76.0	10247	114.0	4274
1.0	82699	39.0	26823	77.0	10000	115.0	4182
2.0	80121	40.0	26092	78.0	9760	116.0	4093
3.0	77632	41.0	25383	79.0	9526	117.0	4006
4.0	75230	42.0	24696	80.0	9299	118.0	3921
5.0	72910	43.0	24030	81.0	9077	119.0	3838
6.0	70670	44.0	23384	82.0	8862	120.0	3757
7.0	68507	45.0	22758	83.0	8653	121.0	3678
8.0	66418	46.0	22150	84.0	8449	122.0	3601
9.0	64399	47.0	21561	85.0	8250	123.0	3526
10.0	62449	48.0	20989	86.0	8057	124.0	3452
11.0	60565	49.0	20435	87.0	7869		
12.0	58745	50.0	19896	88.0	7686		



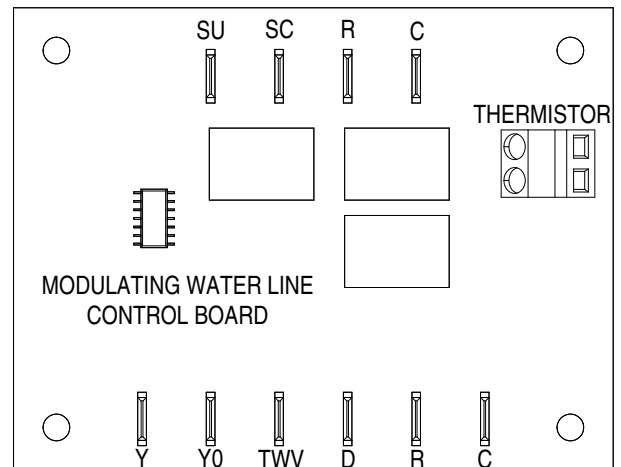
## Troubleshooting Modulating Water Line Control Board

The Bard QW\*S3D Series is equipped with a water line control board. The TACO 3-way valve adjustment, conducted by the TACO iSeries Smart Actuator, is generated through the water line control board. The temperature measurement from the sensor located in the blower outlet sends the resistance to the board. The board will forward the resistance reading through the SU and SC terminals when the unit is in dehumidification mode, allowing for the appropriate water flow adjustment to achieve the intended temperature.

For board troubleshooting, a truth table is supplied below (see Table 16).

See page 41 for the modulating water line control sequence of operation.

**FIGURE 43**  
Modulating Water Line Control Board



MIS-4140

**TABLE 16**  
Modulating Water Line Control Board Logic

	Inputs from Board				Output from Board
	R	Y	D	TWV	YO
Full/Part Load Clg or Htg	X	X			X
Dehumidification w/o TWV	X		X		
Three Way Valve, no Dehumidification	X			X	
Full/Part Load Clg or Htg with Dehum, no TWV	X	X	X		X
Full/Part Load Clg or Htg with TWV, no Dehum*	X	X		X	X
Dehumidification	X		X	X	
Full/Part Load Clg or Htg with Dehumidification	X	X	X	X	X

\* Not a designed operation mode. If there is a TWV input to the modulating water line control board without a "D" call, the valve/actuator combination will continue to modulate, causing a fault with the flow switch. Troubleshooting should start by referencing the dehumidification relay logic board (Bard P/N 8201-133). See Table 11 on page 53.

*NOTE When a "Y" signal becomes active during a dehumidification cycle, the "Y" signal will have a 75-second time delay before "YO" becomes active. If at any point during the 75-second delay a "D" call is no longer required, there will be a 55-second OFF time delay on the "D" terminal. The 55-second OFF time delay runs in parallel with the 75-second delay and will end if the 75-second time delay is removed. This is done to prevent an incidental compressor time delays and to allow the iSmart Actuator time to open up valve to water flow for normal operation.*

## Compressor Solenoid

A nominal 24-volt direct current coil activates the internal compressor solenoid. The input control circuit voltage must be 18 to 28 volt ac. The coil power requirement is 20 VA. The external electrical connection is made with a molded plug assembly. This plug contains a full wave rectifier to supply direct current to the unloader coil.

**Compressor Solenoid Test Procedure** – If it is suspected that the unloader is not working, the following methods may be used to verify operation.

1. Operate the system and measure compressor amperage. Cycle the compressor solenoid on and off at 10-second intervals. The compressor amperage should go up or down at least 25%.
2. If Step 1 does not give the expected results, shut unit off. Apply 18 to 28 volt ac to the solenoid molded plug leads and listen for a click as the solenoid pulls in. Remove power and listen for another click as the solenoid returns to its original position.
3. If clicks can't be heard, shut off power, remove the control circuit molded plug from the compressor and measure the solenoid coil resistance (see Table 17).

**TABLE 17**  
**Solenoid Coil Resistance**

Compressor Model	Solenoid Ohms
ZPS***K4	33.6 $\Omega$
ZPS***K5	350 $\Omega$ or 1640 $\Omega$
ZPS***K6	1640 $\Omega$

4. Next, check the molded plug.

**Voltage Check:** Apply control voltage to the plug wires (18 to 28 volt ac). The measured **dc** voltage at the female connectors in the plug should be around 15 to 27 vdc.

**Resistance Check:** Measure the resistance from the end of one molded plug lead to either of the two female connectors in the plug. One of the connectors should read close to 0 ohms, while the other should read infinity. Repeat with other wire. The same female connector as before should read zero, while the other connector again reads infinity. Reverse polarity on the ohmmeter leads and repeat. The female connector that read infinity previously should now read close to 0 ohms.

Replace plug if either of these test methods does not show the desired results.

# TROUBLESHOOTING GE ECM 5.0™ MOTORS

## CAUTION:

Disconnect power from unit before removing or replacing connectors, or servicing motor. To avoid electric shock from the motor's capacitors, disconnect power and wait at least 5 minutes before opening motor.

## Symptom

## Cause/Procedure

**Motor rocks slightly when startin**

- This is normal start up for ECM

**Motor won't start**  
• No movement

- Check blower turns by hand
- Check power at motor
- Check low voltage (24 Vac R to C) at motor
- Check low voltage connections (G, Y, W, R, C) at motor
- Check for unseated pins in connectors on motor harness
- Test with a temporary jumper between R - G
- Check motor for tight shaft
- Perform motor/control replacement check
- **Perform Moisture Check**

• Motor rocks, but won't start

- Check for loose or compliant motor mount
- Make sure blower wheel is tight on shaft
- Perform motor/control replacement check

**Motor oscillates up & down while being tested off of blower**

- It is normal for motor to oscillate with no load on shaft

**Motor starts, but runs erratically**

• Varies up and down or intermittent

- Check line voltage for variation or "sag"
- Check low voltage connections (G, Y, W, R, C) at motor, unseated pins in motor harness connectors
- Check "Bk" for erratic CFM command (in variable-speed applications)
- Check out system controls, thermostat
- **Perform Moisture Check**

• "Hunts" or "puffs" at high CFM (speed)

- Does removing panel or filter reduce "puffing"?  
- Reduce restriction  
- Reduce max airflow

• Stays at low CFM despite system call for cool or heat CFM

- Check low voltage (Thermostat) wires and connections
- Verify fan is not in delay mode; wait until delay complete
- "R" missing/not connected at motor
- Perform motor/control replacement check

• Stays at high CFM

- "R" missing/not connected at motor
- Is fan in delay mode? - wait until delay time complete
- Perform motor/control replacement check

• Blower won't shut off

- Current leakage from controls into G, Y or W? Check for Triac switched thermostat or solid-state relay

**Excessive noise**

• Air noise

- Determine if it's air noise, cabinet, duct or motor noise; interview customer, if necessary
- High static creating high blower speed?  
- Is airflow set properly?  
- Does removing filter cause blower to slow down? Check filter  
- Use low-pressure drop filter  
- Check/correct duct restrictions

## Symptom

• Noisy blower or cabinet

## Cause/Procedure

- Check for loose blower housing, panels, etc.
- High static creating high blower speed?  
- Check for air whistling through seams in ducts, cabinets or panels  
- Check for cabinet/duct deformation

• "Hunts" or "puffs" at high CFM (speed)

- Does removing panel or filter reduce "puffing"?  
- Reduce restriction  
- Reduce max. airflow

## Evidence of Moisture

- Motor failure or malfunction has occurred and moisture is present
- Evidence of moisture present inside air mover

• Replace motor and Perform Moisture Check

• Perform Moisture Check

## Do

- Check out motor, controls, wiring and connections thoroughly before replacing motor
- Orient connectors down so water can't get in  
- Install "drip loops"
- Use authorized motor and model #'s for replacement
- Keep static pressure to a minimum:  
- Recommend high efficiency, low static filters  
- Recommend keeping filters clean  
- Design ductwork for min. static, max. comfort  
- Look for and recommend ductwork improvement, where necessary

## Don't

- Automatically assume the motor is bad.
- Locate connectors above 7 and 4 o'clock positions
- Replace one motor or control model # with another (unless an authorized replacement)
- Use high pressure drop filters some have ½" H<sub>2</sub>O drop!
- Use restricted returns
- Oversize system, then compensate with low airflow
- Plug in power connector backwards
- Force plugs

## Moisture Check

- Connectors are oriented "down" (or as recommended by equipment manufacturer)
- Arrange harness with "drip loop" under motor
- Is condensate drain plugged?
- Check for low airflow (too much latent capacity)
- Check for undercharged condition
- Check and plug leaks in return ducts, cabinet

## Comfort Check

- Check proper airflow settings
- Low static pressure for lowest noise
- Set low continuous-fan CFM
- Use humidistat and 2-speed cooling units
- Use zoning controls designed for ECM that regulate CFM
- Thermostat in bad location?

## Replacing ECM Control Module

To replace the control module for the GE variable-speed indoor blower motor you need to take the following steps:

1. You **MUST** have the correct replacement module. The controls are factory programmed for specific operating modes. Even though they look alike, different modules may have completely different functionality.

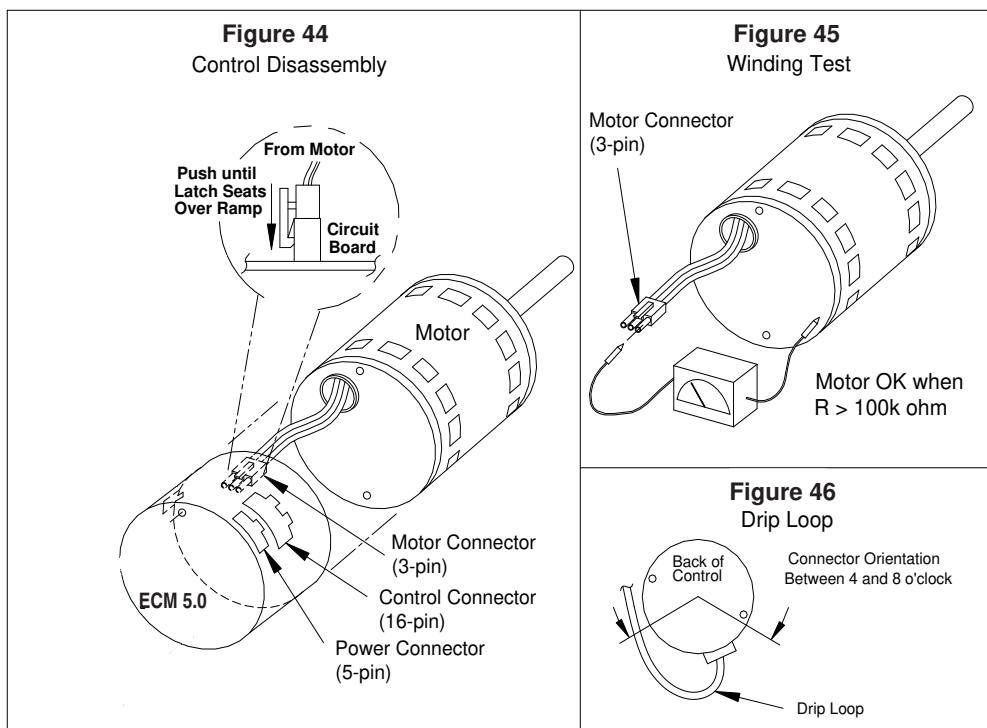
### USING THE WRONG CONTROL MODULE VOIDS ALL PRODUCT WARRANTIES AND MAY PRODUCE UNEXPECTED RESULTS.

2. Begin by removing AC power from the unit being serviced. **DO NOT WORK ON THE MOTOR WITH AC POWER APPLIED.** To avoid electric shock from the motor's capacitors, disconnect power and wait at least 5 minutes before opening motor.
3. It is not necessary to remove the motor from the blower assembly, nor the blower assembly from the unit. Unplug the two cable connectors to the motor control assembly. There are latches on each connector. **DO NOT PULL ON THE WIRES.** The plugs remove easily when properly released.
4. Locate the screws that retain to the motor control bracket to the sheet metal of the unit and remove them. Remove two (2) nuts that retain the control to the bracket and then remove two (2) nuts that retain sheet metal motor control end plate. Refer to Figure 44.
5. Disconnect the three (3) wires interior of the motor control by using your thumb and forefinger squeezing the latch tab and the opposite side of the connector plug, gently pulling the connector. **DO NOT PULL ON THE WIRES, GRIP THE PLUG ONLY.** Refer to Figure 45.
6. The control module is now completely detached from the motor. Verify with a standard ohmmeter that the resistance from each motor lead (in the motor plug just removed) to the motor shell is >100K ohms. Refer to Figure 45. (Measure to unpainted motor end plate.) If any motor lead fails this test, do not proceed to install the control module. **THE MOTOR IS DEFECTIVE AND MUST BE REPLACED.** Installing the new control module will cause it to fail also.
7. Verify that the replacement control is correct for your application. Refer to the manufacturer's authorized

replacement list. **USING THE WRONG CONTROL WILL RESULT IN IMPROPER OR NO BLOWER OPERATION.** Orient the control module so that the 3-wire motor plug can be inserted into the socket in the control. Carefully insert the plug and press it into the socket until it latches. **A SLIGHT CLICK WILL BE HEARD WHEN PROPERLY INSERTED.**

8. Reverse the steps #5, 4, 3 to reconnect the motor control to the motor wires, securing the motor control cover plate, mounting the control to the bracket, and mounting the motor control bracket back into the unit. **MAKE SURE THE ORIENTATION YOU SELECT FOR REPLACING THE CONTROL ASSURES THE CONTROL'S CABLE CONNECTORS WILL BE LOCATED DOWNWARD IN THE APPLICATION SO THAT WATER CANNOT RUN DOWN THE CABLES AND INTO THE CONTROL. DO NOT OVERTIGHTEN THE BOLTS.**
9. Plug the 16-pin control plug into the motor. The plug is keyed. Make sure the connector is properly seated and latched.
10. Plug the 5-pin power connector into the motor. Even though the plug is keyed, **OBSERVE THE PROPER ORIENTATION. DO NOT FORCE THE CONNECTOR.** It plugs in very easily when properly oriented. **REVERSING THIS PLUG WILL CAUSE IMMEDIATE FAILURE OF THE CONTROL MODULE.**
11. Final installation check. Make sure the motor is installed as follows:
  - a. Motor connectors should be oriented between the 4 o'clock and 8 o'clock positions when the control is positioned in its final location and orientation.
  - b. Add a drip loop to the cables so that water cannot enter the motor by draining down the cables. Refer to Figure 46.

The installation is now complete. Reapply the AC power to the HVAC equipment and verify that the new motor control module is working properly. Follow the manufacturer's procedures for disposition of the old control module.





# Ground Source Heat Pump Performance Report

Date: \_\_\_\_\_ Technician: \_\_\_\_\_

Company Reporting: \_\_\_\_\_ Contact Phone: \_\_\_\_\_

Owner's Name: \_\_\_\_\_ Owner's Address: \_\_\_\_\_

**1. Model/Serial Numbers: (For 3-Pc. Geo-Trio system, include coil/compressor/blower information)**

- Model Number(s): \_\_\_\_\_
- Serial Number(s): \_\_\_\_\_

**2. Accessory Information:**

- Thermostat Mfgr. \_\_\_\_\_ Model/Part Number: \_\_\_\_\_
- Flow-Center\* Mfgr. \_\_\_\_\_ Model/Part Number: \_\_\_\_\_  
\*if applicable

**3. Open-Loop Water Source Information:**

- Where/how is water discharged \_\_\_\_\_

**4. Closed-Loop Water Source Information:**

- Horizontal Trenches       Horizontally Bored       Vertical       Pond/Lake  
 Other (Describe) \_\_\_\_\_

- Type of Antifreeze \_\_\_\_\_ % of Antifreeze \_\_\_\_\_ Freezepoint °F \_\_\_\_\_
- Piping Material \_\_\_\_\_ Diameter of Loop Pipe \_\_\_\_\_ Diameter of Header Pipe \_\_\_\_\_
- Length of Loops \_\_\_\_\_ Pressurized/Non-Pressurized Flow Center \_\_\_\_\_
- If Horz. Trench: Loops per trench \_\_\_\_\_ L x W x D of trenches \_\_\_\_\_  
Total Number of Trenches \_\_\_\_\_ Total Number of Loops \_\_\_\_\_
- If Horz. Bored: Avg. Depth of Bores \_\_\_\_\_ Grout was used (Y/N) \_\_\_\_\_  
Total Number of Bores \_\_\_\_\_ Total Number of Loops \_\_\_\_\_
- If Vert. Bored: Depth of Bores \_\_\_\_\_ Grout was used (Y/N) \_\_\_\_\_  
Total Number of Bores \_\_\_\_\_ Total Number of Loops \_\_\_\_\_
- If Pond/Lake: Approx. Acreage of Pond/Lake \_\_\_\_\_ Depth of Loops \_\_\_\_\_  
Style of Loops: (coils, mats, Lake Plates) \_\_\_\_\_ Total Number of Loops \_\_\_\_\_

General Notes: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**The following information is needed to verify performance of the system.**

**Note: Before testing, disable desuperheater, auxiliary electric heat, and any ventilation equipment that may allow outdoor air into the system. Measurements should be taken after a minimum 10 min. run time to ensure “steady-state” of operation. Temperature and pressure measurements should be taken with a single thermometer and pressure gauge to eliminate discrepancies between multiple devices.**

<b>Fluid Data:</b>	<b>1<sup>st</sup> Stg. Cool</b>	<b>2<sup>nd</sup> Stg. Cool</b>	<b>1<sup>st</sup> Stg. Heat</b>	<b>2<sup>nd</sup> Stg. Heat</b>
5. Entering Fluid Temperature °F	_____	_____	_____	_____
6. Leaving Fluid Temperature °F	_____	_____	_____	_____
7. Entering Fluid Pressure psi	_____	_____	_____	_____
8. Leaving Fluid Pressure psi	_____	_____	_____	_____
9. Pressure Drop through coil (psi)	_____	_____	_____	_____

*Using the specific model number and pressure drop, refer to Water Coil Pressure Drop Chart on page 6 to find gallons-per-minute flow through water coil.*

10. GPM through coil	_____	_____	_____	_____
----------------------	-------	-------	-------	-------

<b>Air Data:</b>	<b>1<sup>st</sup> Stg. Cool</b>	<b>2<sup>nd</sup> Stg. Cool</b>	<b>1<sup>st</sup> Stg. Heat</b>	<b>2<sup>nd</sup> Stg. Heat</b>
11. Dry Bulb Return Air Temp °F	_____	_____	_____	_____
12. Wet Bulb Return Air Temp °F	_____	_____	_____	_____
13. Dry Bulb Supply Temperature °F	_____	_____	_____	_____
14. Wet Bulb Supply Air Temp °F	_____	_____	_____	_____
15. Return Static Pressure “WC	_____	_____	_____	_____
16. Supply Static Pressure “WC	_____	_____	_____	_____

<b>Refrigerant Data:</b>	<b>1<sup>st</sup> Stg. Cool</b>	<b>2<sup>nd</sup> Stg. Cool</b>	<b>1<sup>st</sup> Stg. Heat</b>	<b>2<sup>nd</sup> Stg. Heat</b>
17. Head Pressure psi	_____	_____	_____	_____
18. Suction Pressure psi	_____	_____	_____	_____
19. Liquid Line Temperature °F	_____	_____	_____	_____

**Note: Liquid line temperature should be measure directly before metering device.**

20. Suction Line Temperature °F	_____	_____	_____	_____
---------------------------------	-------	-------	-------	-------

**Note: Suction line temperature should be measured approximately 6” from compressor.**

**Calculate the subcooling from line #17 and Line #19 (Typically 10°F to 30°F)**

21. Coil Subcooling °F	_____	_____	_____	_____
------------------------	-------	-------	-------	-------

**Calculate the superheat from line #18 and Line #20 (Typically 6°F to 12°F)**

22. Coil Superheat °F	_____	_____	_____	_____
-----------------------	-------	-------	-------	-------

<b>Electrical Data:</b>	<b>1<sup>st</sup> Stg. Cool</b>	<b>2<sup>nd</sup> Stg. Cool</b>	<b>1<sup>st</sup> Stg. Heat</b>	<b>2<sup>nd</sup> Stg. Heat</b>
23. Voltage at Load Side of Contactor	_____	_____	_____	_____
<b>Note: Voltage must be within 197VAC to 253VAC (for 208V/230V), 414VAC to 506VAC (for 460V)</b>				
24. Amperage Draw of Compressor	_____	_____	_____	_____
25. Amperage Draw of Blower Motor	_____	_____	_____	_____

**Note: Consult Electrical Specifications tables on page 8 to compare against typical run load amps.**



# Literature Assembly

## 911-0825

Contains the following:

7960-356(D)	Installation Instruction
7960-359(H)	Installation Instructions
7960-438(B)	Installation Instructions
2110-1558(E)	Replacement Parts Manual
7960-420	Warranty





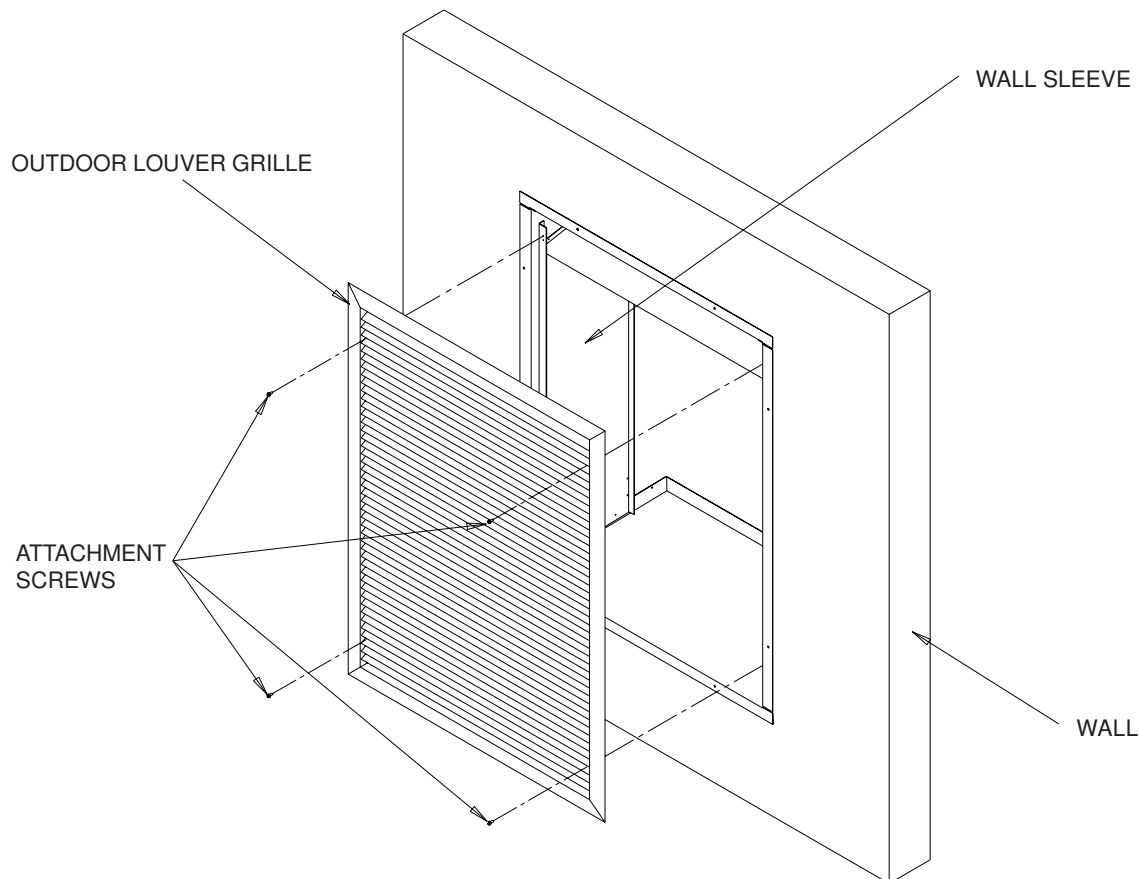


Climate Control Solutions

Bard Manufacturing Company, Inc.  
Bryan, Ohio 43506

**QLG-10, QLG-11, QLG-15,  
QLG-20, QLG-21, QLG-25,  
QLG-30, QLG-31, QLG-35**

## **OUTDOOR LOUVER GRILLE INSTALLATION INSTRUCTIONS**



MIS-967

1. Remove the four screws holding the weather panel. Save these screws, they will be used to attach the grille. *NOTE: A T-25 Torx Driver is required.*
2. Remove the weather panel from the sleeve from the outside and discard.
3. Position the Outdoor Louver Grille in the sleeve opening. The louvers must be facing downward.
4. The Outdoor Louver Grille flanges should touch the sleeve flanges on the outside wall.
5. Locate the four mounting holes in the Outdoor Louver Grille. They can be seen by looking under the louvers.
6. The Outdoor Louver Grille fastens through the same holes in the sleeve as the weather panel.
7. Insert the screws through the grille mounting holes and attach the Outdoor Louver Grille using the mounting holes provided in the sleeve.



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# SUPPLEMENTAL INSTRUCTIONS

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## Plenum Box

### Models:

QPB42-V	QPBS42-V	QPBS48-V
QPB42-X	QPBS42-X	QPBS48-X
QPB42-4	QPBS42-X-8	QPBS48-X-8
	QPBS42-1	QPBS48-4
QPB48-V	QPBS42-4	QPBS48-4-8
QPB48-X	QPBS42-4-8	
QPB48-4		

---

### INSTALLATION

The plenum box is designed for use with the Q-TEC™ Series heat pumps. It is for use in free blow applications.

1. Remove the center screw from each top side of the unit (see Figure 1 on page 2).
2. Place plenum box on top of Q-TEC™ unit with the open side down and the grille facing the front of the unit.
3. Make sure that the bottom offsets of the plenum box are inside the top of the Q-TEC™ unit flange as shown in Figure 1. The outside of the plenum box should be flush with the outside of the unit.
4. Re-install the center screw in each top side of the Q-TEC™ unit. These screws will go through the clearance holes on the plenum box and hold it in place.
5. Adjust louvers to obtain desired air distribution.

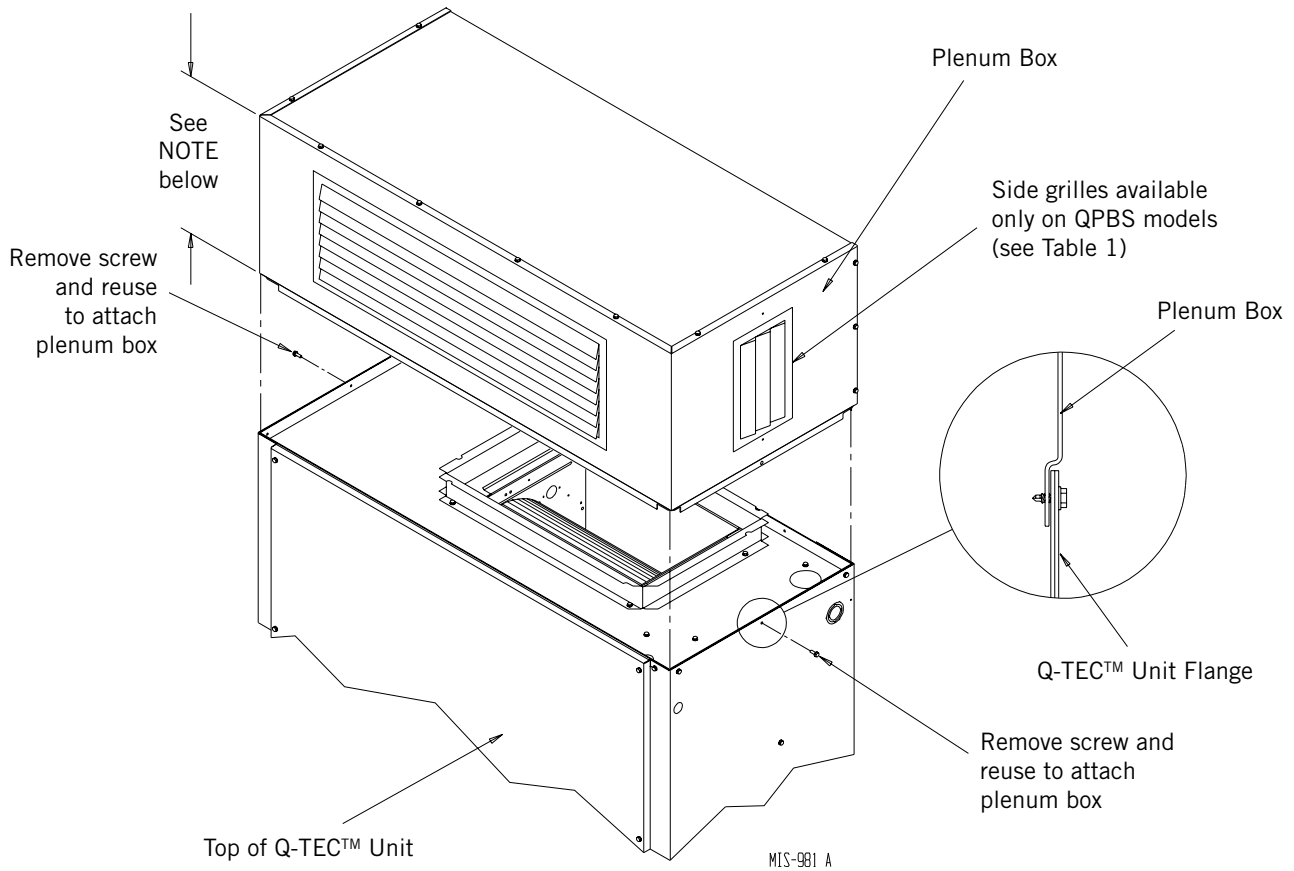


*Climate Control Solutions*

Bard Manufacturing Company, Inc.  
Bryan, Ohio 43506  
[www.bardhvac.com](http://www.bardhvac.com)

Manual: 7960-359H  
Supersedes: 7960-359G  
Date: 4-27-16

**Figure 1**



NOTE: Height of plenum box is 14" on all models except QPBS\*\*-\*-8 models which are 8" tall

**Table 1**

Model Number	Front Grille Part Number	Side Grille Part Number
QPBS42-V	7051-035	7051-046
QPBS42-X	7051-035	7051-046
QPBS42-X-8	7051-073	7051-046
QPBS42-1	7051-035	7051-046
QPBS42-4	7051-035	7051-046
QPBS42-4-8	7051-073	7051-046
QPBS48-V	7051-045	7051-046
QPBS48-X	7051-045	7051-046
QPBS48-X-8	7051-078	7051-046
QPBS48-4	7051-045	7051-046
QPBS48-4-8	7051-078	7051-046
QPB42-V	7051-035	--
QPB42-X	7051-035	--
QPB42-4	7051-035	--
QPB48-V	7051-045	--
QPB48-X	7051-045	--
QPB48-4	7051-045	--



Climate Control Solutions

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Bryan, Ohio 43506

# CABINET EXTENSION INSTALLATION INSTRUCTIONS

**QCX10A-4**

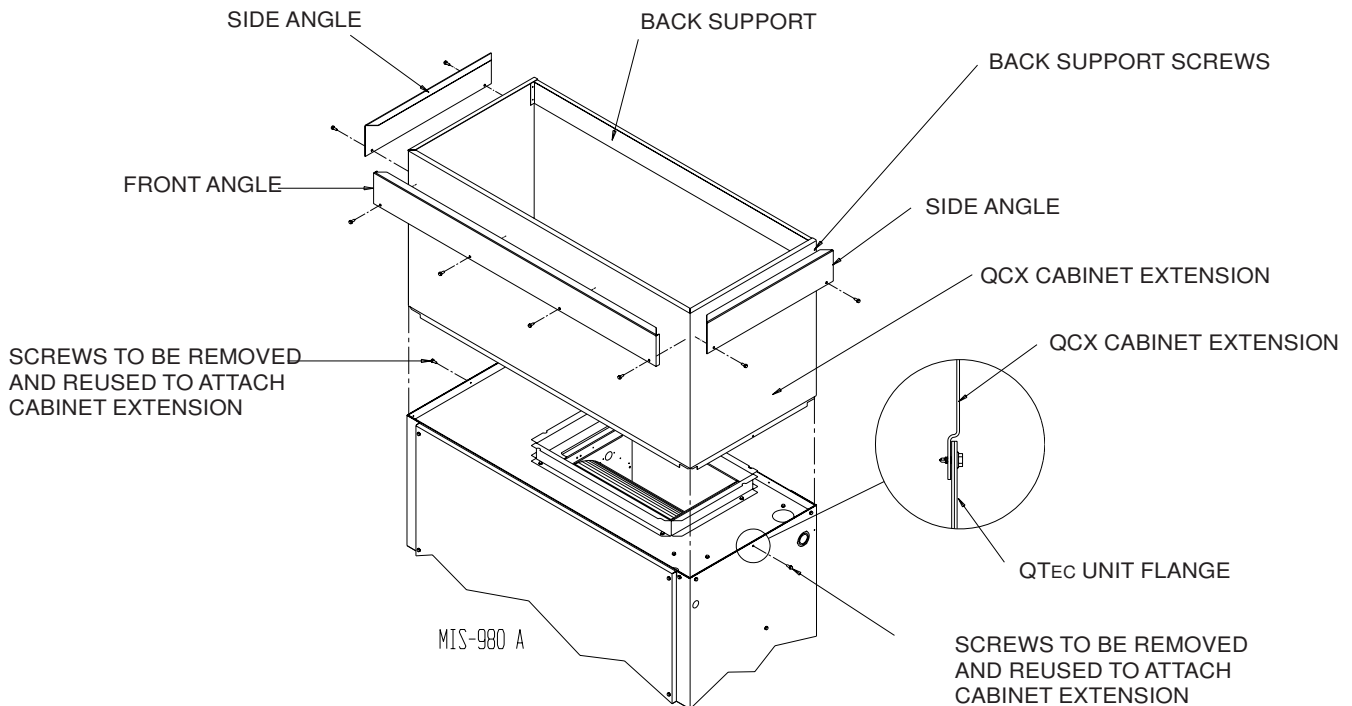
**QCX15A-4**

**QCX10A-V**

**QCX15A-V**

**QCX10A-X**

**QCX15A-X**



1. Remove the four (4) screws holding on the Back Support on the Cabinet Extension.
2. Remove the Back Support from the Cabinet Extension
3. Remove the center screw from each of the top sides of the unit.
4. Place the Cabinet Extension on top of the QTec unit with the open side to the rear and the offsets down. The bottom offset of the extension should be inside the top flange of the unit. The outside of the extension should be flush with the outside of the unit
5. Reinstall the screws in the top of the QTec unit. These screws will hold the Cabinet Extension in place.
6. Slide the Back Support behind the duct and position it on the Cabinet Extension.
7. Reinstall screws to the Back Support.
8. The QCX has additional angles if more height is needed to reach the ceiling. The angles provide up to an additional five (5) inches in height for a maximum trim height of 112 inches.
9. Hold the side angles against the side of the cabinet extension and slide up to the ceiling. Make sure the angle is centered on the side. Mark the holes on the side of the cabinet extension. Drill an 1/8 inch hole in the center of the marks. Reposition the angle and attach with the screws provided.
10. Hold the front angle against the front of the cabinet extension and slide up to the ceiling. Make sure the angle is centered on the front. Mark the holes on the front of the cabinet extension. Drill an 1/8 inch hole in the center of the marks. Reposition the angle and attach with the screws provided.



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# REPLACEMENT PARTS MANUAL

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## Q-TEC™ Series Packaged Heat Pump

Models:

QW2S3DA QW3S3DA QW4S3DA QW5S3DA  
QW2S3DB QW3S3DB QW4S3DB QW5S3DB  
QW2S3DC QW3S3DC QW4S3DC QW5S3DC

---

### Contents

Description	Page	Description	Page
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♦ Usage List.....	3	♦ Usage List.....	11
Functional Components		Pump Module Components	
♦ Exploded View.....	4	♦ Exploded View.....	12
♦ Usage List.....	5	♦ Usage List.....	13
Control Panel Components		Optional Climate Control Components	
♦ Exploded View.....	6	♦ Exploded View.....	14
♦ Usage List.....	7	♦ Usage List – All Units.....	15
♦ Exploded View.....	8	♦ Exploded View.....	16
♦ Usage List.....	9	♦ Usage List – Option S.....	17
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		♦ Exploded View.....	22
		♦ Usage List.....	23

### General Notes

- Revised and/or additional pages may be issued from time to time.
- A complete and current manual consists of pages shown in the following contents section.

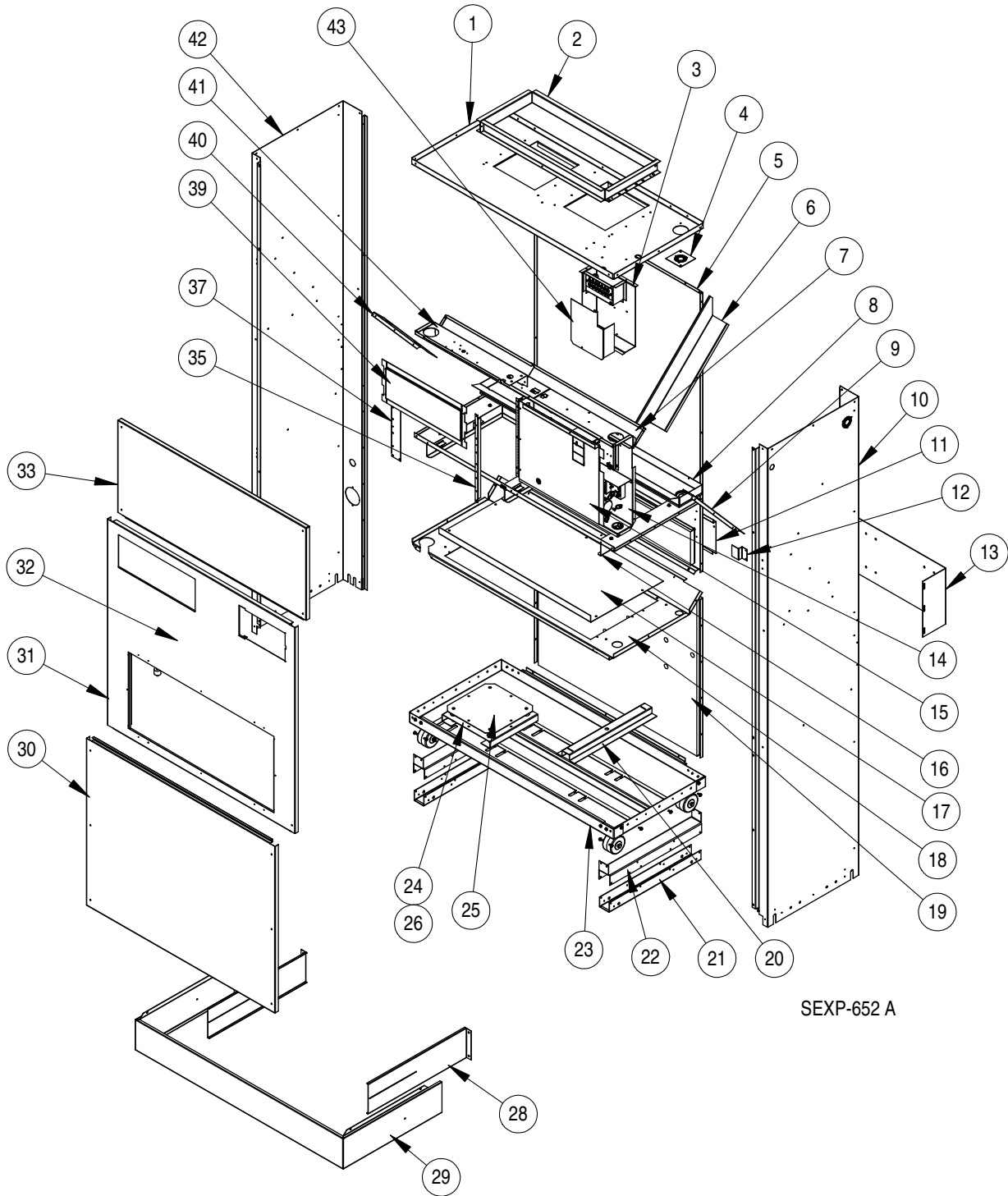


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Manual: 2110-1558E  
Supersedes: 2110-1558D  
Date: 5-4-21



# CABINET COMPONENTS



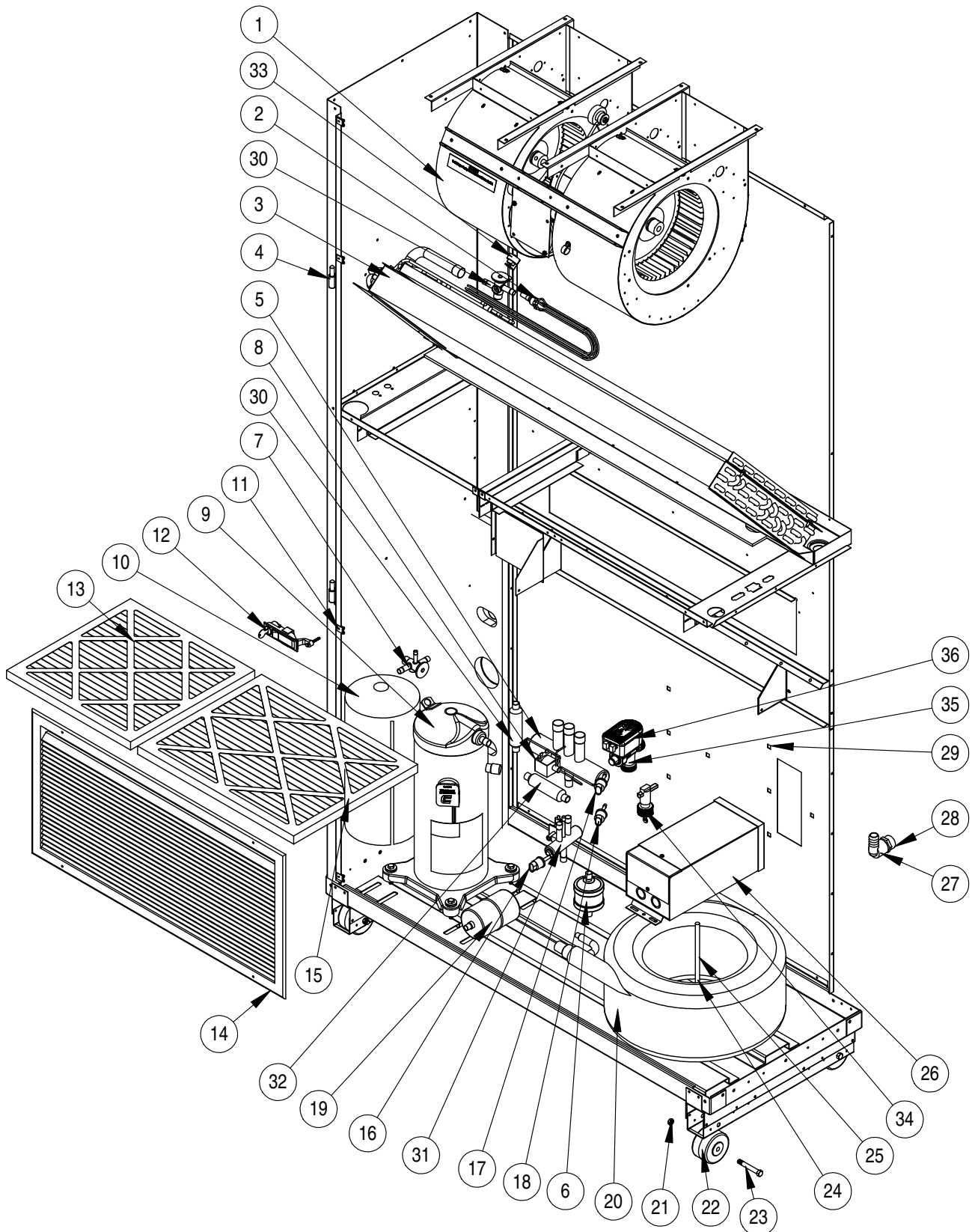
SEXP-652 A

# CABINET COMPONENTS

Drawing No.	Part No.	Description	QW2S3DA, DB, DC	QW4S3DA, DB, DC
			QW3S3DA, DB, DC	QW5S3DA, DB, DC
1	S507-279	Top Assembly	X	
1	S507-278	Top Assembly		X
2	111-142	Outlet Duct Flange	2	
2	111-138	Outlet Duct Flange		2
3	117-285	Low Voltage Box Assembly	X	X
4	136-359	T.K.O. Plate	X	X
5	509-231	Back Assembly	X	
5	509-230	Back Assembly		X
6	134-154	Wire Channel	X	X
7	534-191	Evaporator Coil Shield - Right	X	
7	534-195	Evaporator Coil Shield - Right		X
8	523-104	Evaporator Drain Pan Assembly	X	
8	523-105	Evaporator Drain Pan Assembly		X
9	140X277	Right Evaporator Support	X	X
10	501-557-*	Ride Side Assembly	X	X
11	542-054	Fresh Air Blank-Off Plate Assembly	X	X
12	103-443	Door Latch Offset	X	X
13	113-289	Wall Mounting Bracket	2	2
14	See Pages 7 & 9	Control Panel Components	X	X
15	S133-315	Circuit Breaker Door Inner (230V Models)	X	X
15	S133-316	Disconnect Door (460V Models)	X	X
16	919-0011	Filter Partition Assembly	X	
16	919-0012	Filter Partition Assembly		X
17	537-584	Condenser Blank-Off Plate	X	X
18	521-442	Condenser Partition Assembly	X	
18	521-439	Condenser Partition Assembly		X
19	509-233	Lower Back with Cage Nuts	X	
19	509-223	Lower Back with Cage Nuts		X
20	140-026	Water Coil Hold Down (230V Models)	X	X
20	140-278	Water Coil Hold Down (460V Models)	X	X
21	140-276	Lower Roller Support	2	2
22	140-280	Upper Roller Support	2	2
23	S127-384-X	Lower Base Assembly	X	
23	S127-379-X	Lower Base Assembly		X
24	141-368	Compressor Support	X	X
25	140-369	Compressor Support Plate	X	X
26	5451-018	Motor Mount Grommet	X	X
28	135-258-6	Base Trim Extension	2	2
29	535-253-6	Base Trim Assembly with Extension	X	
29	535-259-6	Base Trim Assembly with Extension		X
30	552-332-*	Condenser Door Assembly	X	
30	553-470-*	Condenser Door Assembly		X
31	553-468-*	Filter Door Assembly w/Circuit Breaker Door	X	
31	553-469-*	Filter Door Assembly w/Circuit Breaker Door		X
32	153-336-*	Circuit Breaker Door		X
33	S552-331-*	Blower Door Assembly	X	
33	S552-333-*	Blower Door Assembly		X
35	104-1096	Right Thermostat Support Angle	X	X
37	104-1157	Left Thermostat Support Angle	X	X
39	See Page 13	Thermostat Mounting Plate	X	X
40	140Y277	Left Evaporator Support	X	X
41	534-190	Left Evaporator Coil Shield	X	X
42	501-573-*	Left Side Assembly	X	X
43	133-201	Low Voltage Box Cover	X	X

\* Exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, reference the following codes: Beige -X, Buckeye Gray -4, Vinyl/Slate Finish -6, Vinyl/Platinum Finish -7

# FUNCTIONAL COMPONENTS



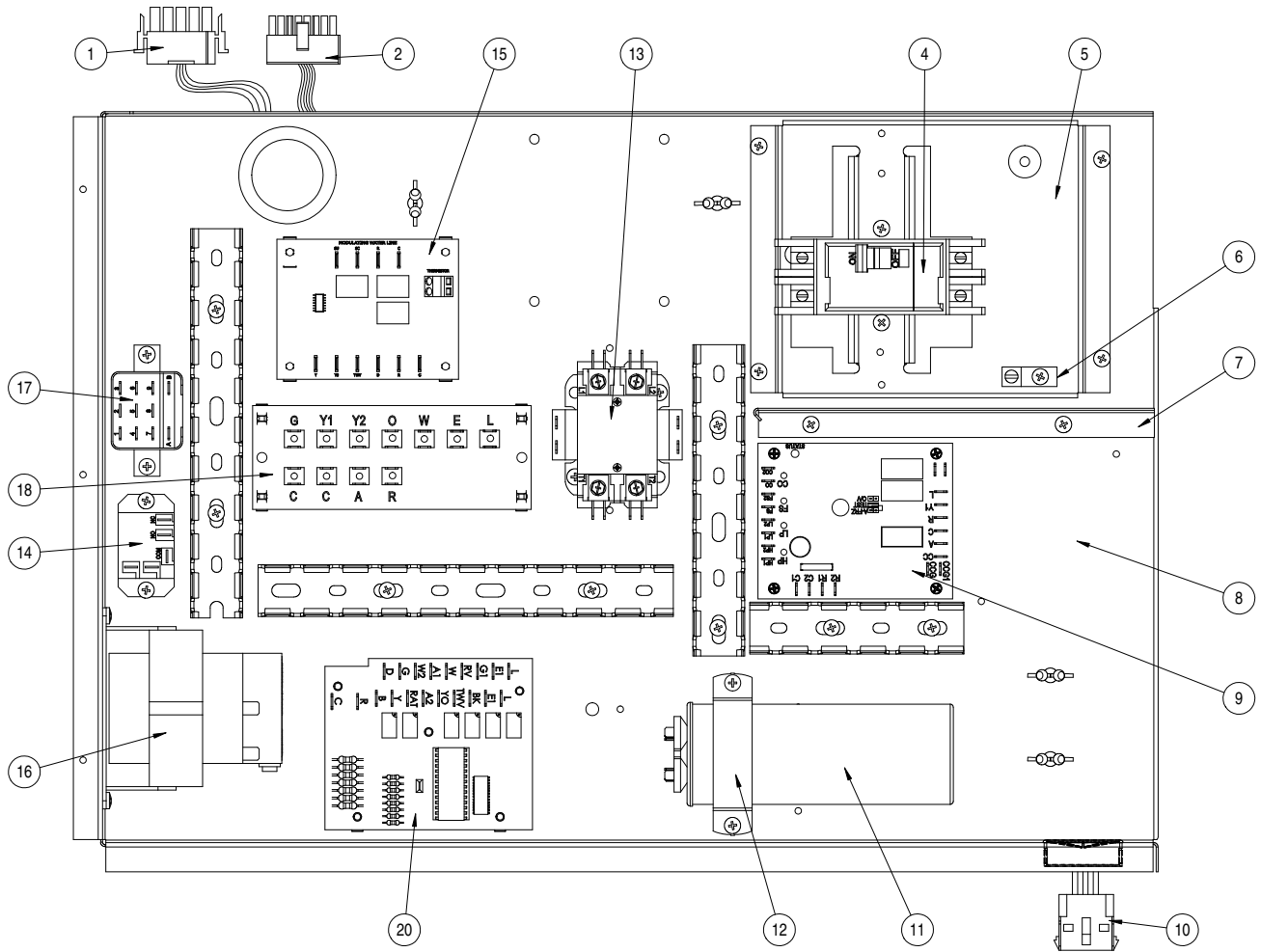
SEXP-1018

# FUNCTIONAL COMPONENTS

Drawing No.	Part No.	Description	QW2S3DA	QW2S3DB	QW2S3DC	QW3S3DA	QW3S3DB	QW3S3DC	QW4S3DA	QW4S3DB	QW4S3DC	QW5S3DA	QW5S3DB	QW5S2DC
1	S900-380-001	Blower Assembly	X	X	X									
1	S900-381-001	Blower Assembly				X	X	X						
1	S900-382-001	Blower Assembly							X	X	X			
1	S900-382-002	Blower Assembly										X	X	X
2	5625-007	Distributor Cooling	X	X	X	X	X	X						
2	5625-008	Distributor Cooling							X	X	X			
2	5625-010	Distributor Cooling										X	X	X
3	917-0086BX	Evaporator Coil	X	X	X	X	X	X						
3	917-0166BX	Evaporator Coil							X	X	X			
3	917-0089BX	Evaporator Coil										X	X	X
4	5400-005	Hinge	2	2	2	2	2	2	2	2	2	2	2	2
5	5650-038	Reversing Valve with 24V Solenoid Coil	X	X	X									
5	5650-039	Reversing Valve with 24V Solenoid Coil				X	X	X						
5	5650-040	Reversing Valve with 24V Solenoid Coil							X	X	X	X	X	X
6	5220-013	Discharge Muffler	X	X	X	X	X	X	X	X	X	X	X	X
7	5651-191	TXV	X	X	X									
7	5651-210	TXV				X	X	X						
7	5651-211	TXV							X	X	X			
7	5651-212	TXV										X	X	X
8	5650-042	Reversing Valve Solenoid, Red Casing (Ranco)	X	X	X	X	X	X	X	X	X	X	X	X
8	5650-043	Reversing Valve Solenoid, Black Casing (Wilspec)	X	X	X	X	X	X	X	X	X	X	X	X
8	5650-046	Reversing Valve Solenoid, Black Casing (San Hua)	X	X	X	X	X	X	X	X	X	X	X	X
9	8000-394	Compressor	X											
9	8000-396	Compressor		X										
9	8000-398	Compressor			X									
9	8000-379	Compressor				X								
9	8000-380	Compressor					X							
9	8000-381	Compressor						X						
9	8000-382	Compressor							X					
9	8000-383	Compressor								X				
9	8000-384	Compressor									X			
9	8000-385	Compressor										X		
9	8000-386	Compressor											X	
9	8000-387	Compressor												X
10	8002-012	Sound Cover	X	X	X	X	X	X						
10	8002-013	Sound Cover							X	X	X	X	X	X
11	1012-315	*U* Clip Fastener	8	8	8	8	8	8	8	8	8	8	8	8
12	1171-049	Keypad/Circuit Breaker Door	X	X	X	X	X	X	X	X	X	X	X	X
13	7004-034	Air Filter 2 Pleated (16 x 16 x 2)	X	X	X	X	X	X	X	X	X	X	X	X
14	7051-034	Return Air Grille (for Beige & Buckeye Gray Units)	X	X	X	X	X	X						
14	7051-061	Return Air Grille (for Vinyl Units)	X	X	X	X	X	X						
14	7051-039	Return Air Grille (for Beige & Buckeye Gray Units)							X	X	X	X	X	X
14	7051-063	Return Air Grille (for Vinyl Units)							X	X	X	X	X	X
15	7004-035	Air Filter 2 Pleated (16 x 20 x 2)	X	X	X	X	X	X						
15	7004-025	Air Filter 2 Pleated (16 x 25 x 2)							X	X	X	X	X	X
16	1804-0827	High Pressure Switch	X	X	X	X	X	X	X	X	X	X	X	X
17	1804-0496	Low Pressure Switch 75 PSIG	X	X	X	X	X	X	X	X	X	X	X	X
18	1804-0499	Low Pressure Switch 55 PSIG	X	X	X	X	X	X	X	X	X	X	X	X
19	5201-019	Filter/Drier	X	X	X	X	X	X						
19	5201-020	Filter/Drier							X	X	X	X	X	X
20	917-0133	Water Coil Assembly	X	X	X	X	X	X						
20	917-0138	Water Coil Assembly (Optional Cupronickel Coil)	X	X	X	X	X	X						
20	917-0125	Water Coil Assembly							X	X	X			
20	917-0139	Water Coil Assembly (Optional Cupronickel Coil)							X	X	X			
20	917-0074	Water Coil Assembly										X	X	X
20	917-0064	Water Coil Assembly (Optional Cupronickel Coil)										X	X	X
21	1012-224	Nut - Locking	4	4	4	4	4	4	4	4	4	4	4	4
22	1171-035	Wheel	4	4	4	4	4	4	4	4	4	4	4	4
23	1012-129	Bolt - Shoulder	4	4	4	4	4	4	4	4	4	4	4	4
24	1012-226	Cage Nut	X	X	X	X	X	X	X	X	X	X	X	X
25	1012-167	3/8 x 7-1/2 Hex Head Bolt	X	X	X	X	X	X						
25	1012-168	3/8 x 9 Hex Head Bolt							X	X	X			
25	1012-169	3/8 x 10 Hex Head Bolt										X	X	X
26	8407-058	Stepdown Transformer 1.0 KVA			X			X			X			
26	8407-003	Stepdown Transformer 1.5 KVA (Units w/ERV)			X			X						
26	8407-004	Stepdown Transformer 2.0 KVA (Units w/ERV)									X			X
26	8407-003	Stepdown Transformer 1.5 KVA												X
27	6094-007	Barbed Drain Fitting	X	X	X	X	X	X	X	X	X	X	X	X
28	6093-011	3/4 Male Adapter	X	X	X	X	X	X	X	X	X	X	X	X
29	1012-218	1/4 Cage Nut	6	6	6	6	6	6	6	6	6	6	6	6
30	5651-200	TXV	X	X	X									
30	5651-210	TXV				X	X	X						
30	5651-211	TXV							X	X	X			
30	5651-212	TXV										X	X	X
31	5650-051	Dehum. Valve, 4-Pipe	X	X	X	X	X	X	X	X	X	X	X	X
32	5651-219	Check Valve	2	2	2	2	2	2	2	2	2	2	2	2
33	8408-048	Freeze Protect Thermostat	X	X	X	X	X	X	X	X	X	X	X	X
34	910-1931	Flow Switch Assembly	X	X	X	X	X	X	X	X	X	X	X	X
35	8603-042	3-Way Valve	X	X	X	X	X	X	X	X	X	X	X	X
36	8603-043	Actuator	X	X	X	X	X	X	X	X	X	X	X	X
NS	1818-064	DOR TO Valve		X								X		
NS	1818-065	1" Threaded TO Valve			X			X			X			X
NS	6031-009	Coremax Valve Core	X	X	X	X	X	X	X	X	X	X	X	X

NS = Not Shown

# CONTROL PANEL COMPONENTS

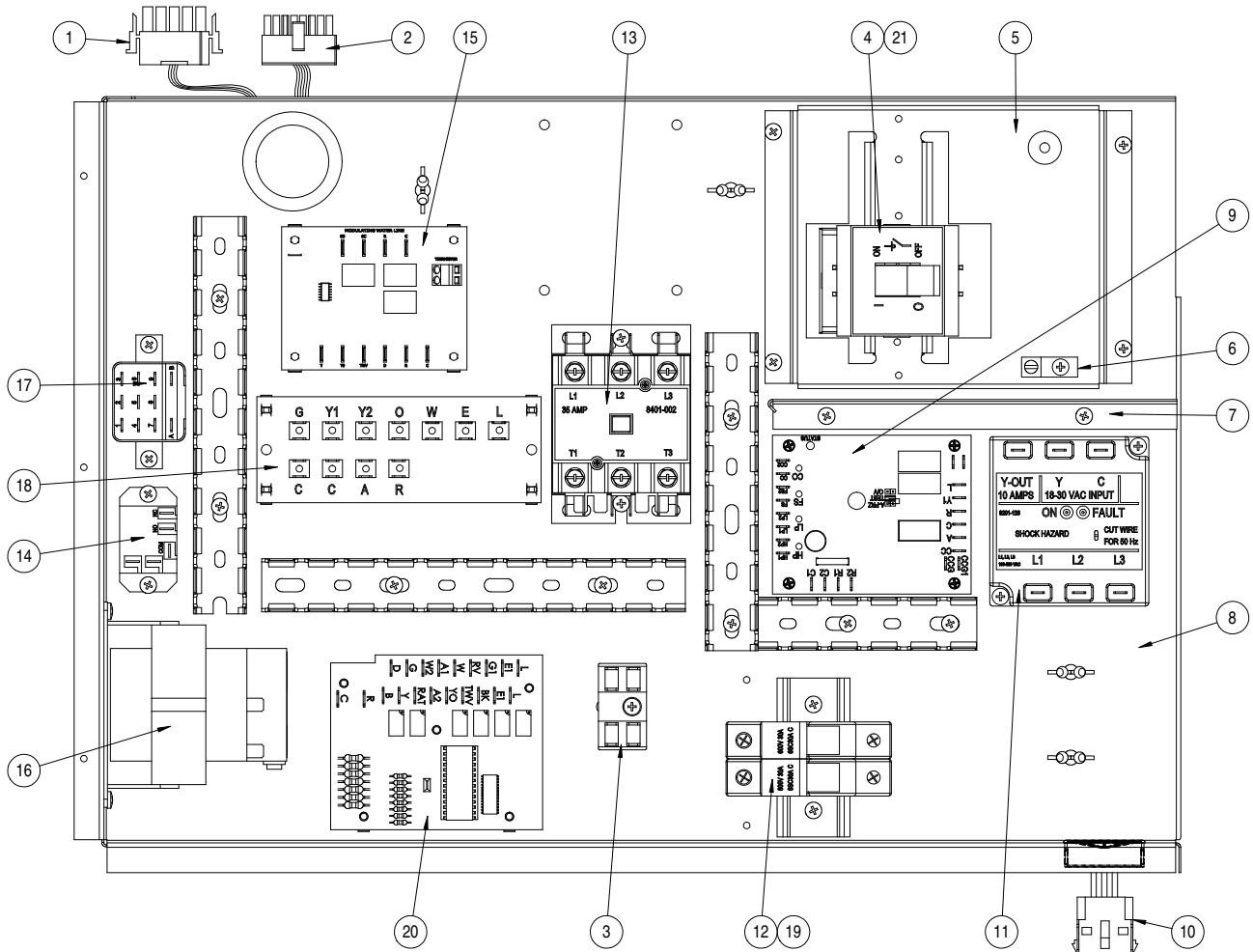


SEXP-1015

## CONTROL PANEL COMPONENTS

Drawing No.	Part No.	Description	QW2S3DA	QW3S3DA	QW4S3DA	QW5S3DA
1	3000-1331	Wire Assembly (Blower Power)	X	X	X	X
2	3000-1677	Wire Assembly (Blower Control)	X	X	X	X
4	8615-037	Circuit Breaker 2 Pole 30A	X			
4	8615-055	Circuit Breaker 2 Pole 40A		X		
4	8615-040	Circuit Breaker 2 Pole 50A			X	
4	8615-041	Circuit Breaker 2 Pole 60A				X
5	126-550	Circuit Breaker Base	X	X	X	X
6	8611-006	Terminal	X	X	X	X
7	117-242	Circuit Breaker Box Partition	X	X	X	X
8	117-421	Control Panel	X	X	X	X
9	8201-140	Compressor Control Module	X	X	X	X
10	3000-1349	Wire Assembly (Vent Control)	X	X	X	X
11	8552-086	Capacitor 35 - 370V	X			
11	8552-035	Capacitor 40 - 370V		X		
11	8552-095	Capacitor 30 - 370V			X	
11	8552-096	Capacitor 40 - 440V				X
12	8550-006	Capacitor Bracket	X	X	X	
12	8550-007	Capacitor Bracket				X
13	8401-025	Contactors	X	X	X	X
14	8201-130	Relay, SPDT	X	X	X	X
15	8201-168	Water Modulation Control Board	X	X	X	X
16	8407-065	Transformer 208/240 - 24VAC 75 VA	X	X	X	X
17	8201-159	Relay, DPDT	X	X	X	X
18	8607-029	Terminal Strip	X	X	X	X
20	8201-113	Dehum Logic Board	X	X	X	X
NS	4113-108	Wiring Diagram	X	X	X	X

# CONTROL PANEL COMPONENTS



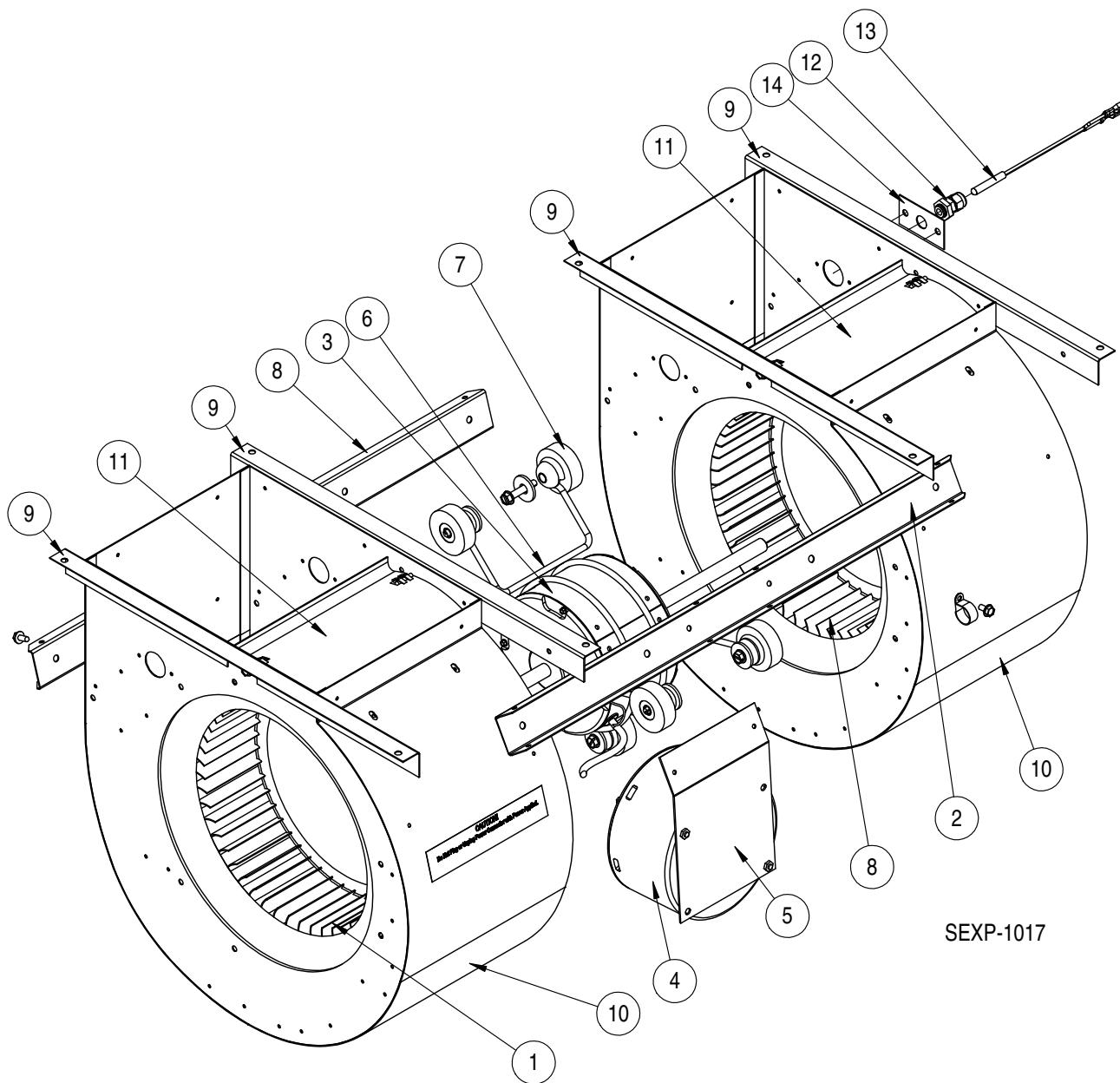
SEXP-1016

# CONTROL PANEL COMPONENTS

Drawing No.	Part No.	Description	QW2S3DB	QW2S3DC	QW3S3DB	QW3S3DC	QW4S3DB	QW4S3DC	QW5S3DB	QW5S3DC
1	3000-1331	Wire Assembly (Blower Power)	X	X	X	X	X	X	X	X
2	3000-1677	Wire Assembly (Blower Control)	X	X	X	X	X	X	X	X
3	8607-017	Terminal Block		X		X		X		X
4	8615-054	Circuit Breaker 2 Pole 20A	X							
4	8615-052	Circuit Breaker 2 Pole 30A			X					
4	8615-042	Circuit Breaker 2 Pole 35A					X			
4	8615-043	Circuit Breaker 2 Pole 40A							X	
4	8615-095	460V Toggle Disconnect		X		X		X		X
5	127-549	Circuit Breaker Base		X		X		X		X
5	127-550	Circuit Breaker Base	X		X		X		X	
6	8611-006	Terminal	X	X	X	X	X	X	X	X
7	117-242	Circuit Breaker Box Partition	X	X	X	X	X	X	X	X
8	117-421	Control Panel	X	X	X	X	X	X	X	X
9	8201-140	Compressor Control Module	X	X	X	X	X	X	X	X
10	3000-1349	Wire Assembly (Vent Control)	X	X	X	X	X	X	X	X
11	8201-126	3 Phase Line Monitor	X	X	X	X	X	X	X	X
12	8614-058	Fuse Block		X		X		X		X
13	8401-002	Contactor	X	X	X	X	X	X	X	X
14	8201-130	Relay, SPDT	X	X	X	X	X	X	X	X
15	8201-168	Water Modulation Control Board	X	X	X	X	X	X	X	X
16	8407-065	Transformer 208/240 - 24VAC 75 VA	X		X		X		X	
16	8407-050	Transformer 480/24VAC 75 VA		X		X		X		X
17	8201-159	Relay, DPDT	X	X	X	X	X	X	X	X
18	8607-029	Terminal Strip	X	X	X	X	X	X	X	X
19	8614-047	Fuse 3.2A		2		2		2		
19	8614-046	Fuse 5A (Units with ERV)		2		2				
19	8614-042	Fuse 7A (Units with ERV)						2		2
19	8614-046	Fuse 5A								2
20	8201-113	Dehum Logic Board	X	X	X	X	X	X	X	X
21	8615-069	Switch Cover Plate		X		X		X		X
NS	4113-208	Wiring Diagram	X		X		X		X	
NS	4113-308	Wiring Diagram		X		X		X		X



# BLOWER ASSEMBLY COMPONENTS

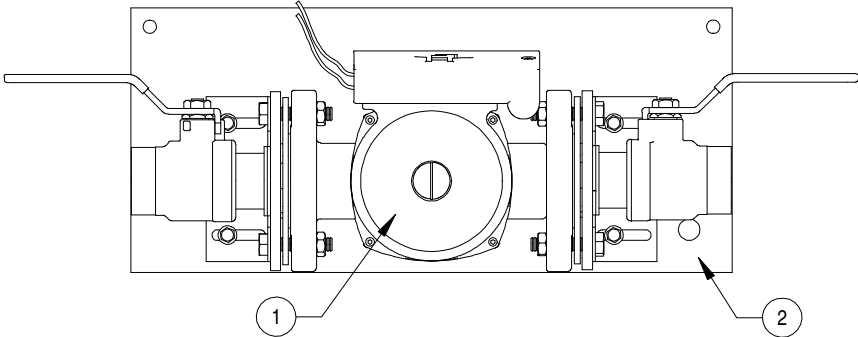


## BLOWER ASSEMBLY COMPONENTS

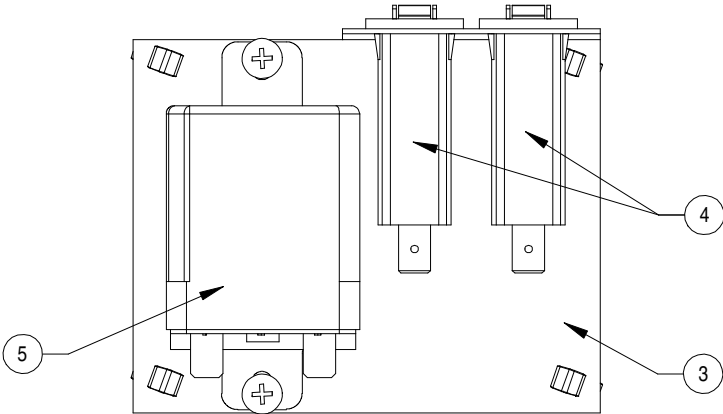
Drawing No.	Part No.	Description	900-380-001	900-381-001	900-382-001	900-382-002
1	5152-096	Blower Wheel	X	X		
1	5152-011	Blower Wheel			X	X
2	5152-072	Blower Wheel	X	X		
2	5152-012	Blower Wheel			X	X
3	S8105-060-0198	1/3 HP Programmed Motor	X			
3	S8106-052-0199	1/2 HP Programmed Motor		X		
3	S8107-017-0200	3/4 HP Programmed Motor			X	
3	S8107-017-0201	3/4 HP Programmed Motor				X
4	C8105-060-0198	Programmed Motor Control Only	X			
4	C8106-052-0199	Programmed Motor Control Only		X		
4	C8107-017-0200	Programmed Motor Control Only			X	
4	C8107-017-0201	Programmed Motor Control Only				X
5	113-380	Blower Motor Control Bracket	X	X	X	X
6	8200-040	Dual Motor Mount	X	X	X	X
7	5451-011	Grommet	6	6	6	6
8	165-572	Blower Support Channel	2	2	2	2
9	104-980	Blower Angle	4	4	4	4
10	151-117	Blower Housing	2	2		
10	151-101	Blower Housing			2	2
11	144-167	Diffuser	2	2		
11	144-166	Diffuser			2	2
12	8611-099	LTF 7 Fitting	X	X	X	X
13	8408-040	Inlet Thermistor	X	X	X	X
14	142-234	Sensor Plate	X	X	X	X

# PUMP MODULE COMPONENTS

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PUMP ASSEMBLY



RELAY ASSEMBLY

SEXP-574

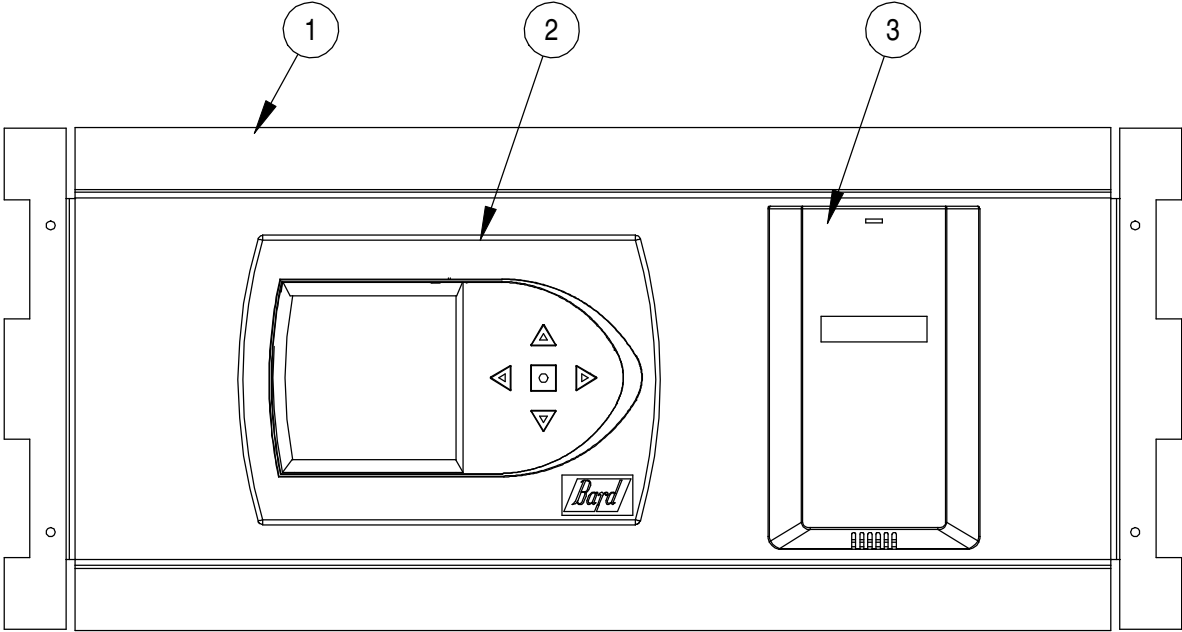
# PUMP MODULE COMPONENTS

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Drawing No.	Part No.	Description				
			QW2S2DA, -DB, -DC	QW3S2DA, -DB, -DC	QW4S2DA, -DB, -DC	QW5S2DA, -DB, -DC
1	8300-008	Circulating Pump UPS15-42F	X	X		
1	8300-009	Circulating Pump UPS26-99FC			X	X
2	141-346	Water Pump Bracket	X	X	X	X
3	113-399	Pump Relay Bracket	X	X	X	X
4	8614-036	Mini Circuit Breaker 3 Amp	2	2	2	2
5	8201-048	Relay DPDT	X	X	X	X

# OPTIONAL CLIMATE CONTROLS

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SEXP-560

# OPTIONAL CLIMATE CONTROLS

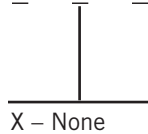
Drawing No.	Part No.	Description	ALL UNITS			
			Option X	Option D	Option H	Option K
1	S127-313-*	Thermostat Plate	X			
1	S127-308-*	Thermostat Plate		X		
1	S127-372-*	Thermostat Plate			X	
1	S127-409-*	CO <sub>2</sub> Plate				X
2	8403-060	Electronic/Programmable Manual/Auto Changeover		X	X	
3	8403-067	CO <sub>2</sub> Sensor with Relay			X	X
NS	4115-100	Wiring Diagram		X		
NS	4115-101	Wiring Diagram			X	
NS	4115-102	Wiring Diagram	X			
NS	4115-105	Wiring Diagram				X
NS	8607-021	Terminal Strip 8 Terminal	X			
NS	8607-029	Terminal Strip	X			X
NS	3000-1332	Wire Assembly Thermostat Connection	X			X
NS	3000-1333	Wire Assembly CO <sub>2</sub> Control Connection	X			
NS	3000-1334	Wire Assembly Thermostat Connection		X	X	
NS	3000-1335	Wire Assembly CO <sub>2</sub> Control Connection			X	X

\* Exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, include the complete model number and serial number of the unit for which parts are being ordered.

NS – Not Shown

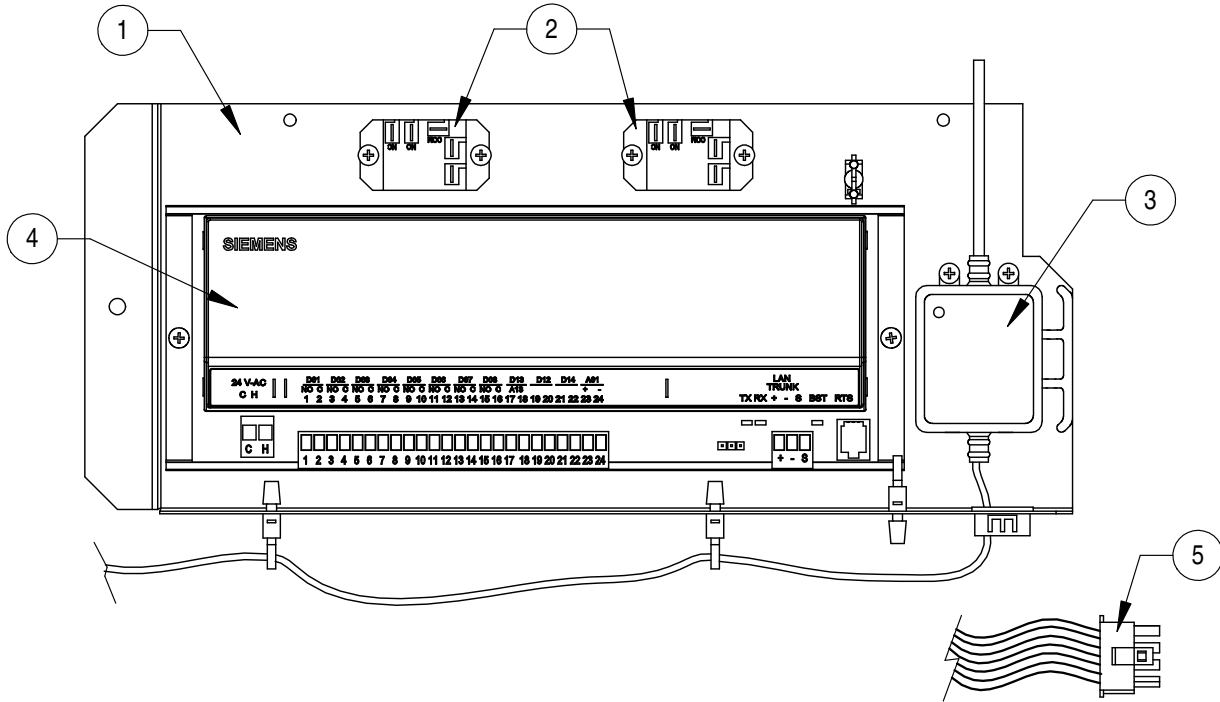
## CLIMATE CONTROL OPTION NOMENCLATURE AS SHOWN IN UNIT MODEL NUMBER

**QW 3 S 3 D A 02 X X X X X X**



- X – None
- D – Electronic, programmable, manual changeover
- H – Electronic, programmable, manual/auto changeover, CO<sub>2</sub> Control
- K – CO<sub>2</sub> Control with remote thermostat connection

# OPTIONAL CLIMATE CONTROLS



SEXP-639

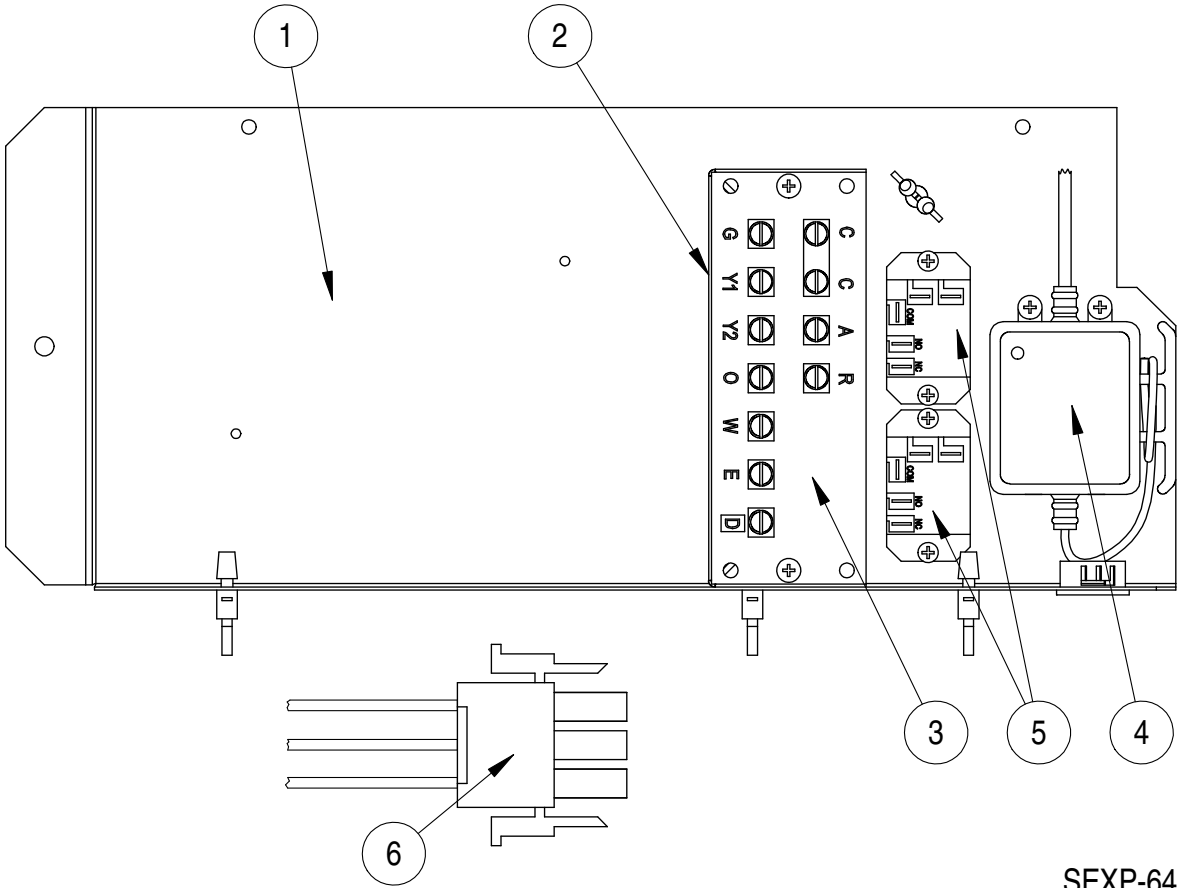
## OPTIONAL CLIMATE CONTROLS

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<b>Drawing No.</b>	<b>Part No.</b>	<b>Description</b>	<b>Option S</b>
1	117-325	Control Panel	X
2	8201-130	Relay, SPDT, Pilot Duty	2
3	S910-1820	Condensate Overflow Assembly	X
4	8403-068	Siemens DDC Interface	X
5	3000-1414	Wire Harness	X
NS	4115-106	Wiring Diagram	X
NS	133-122	Control Panel Cover	X



# OPTIONAL CLIMATE CONTROLS



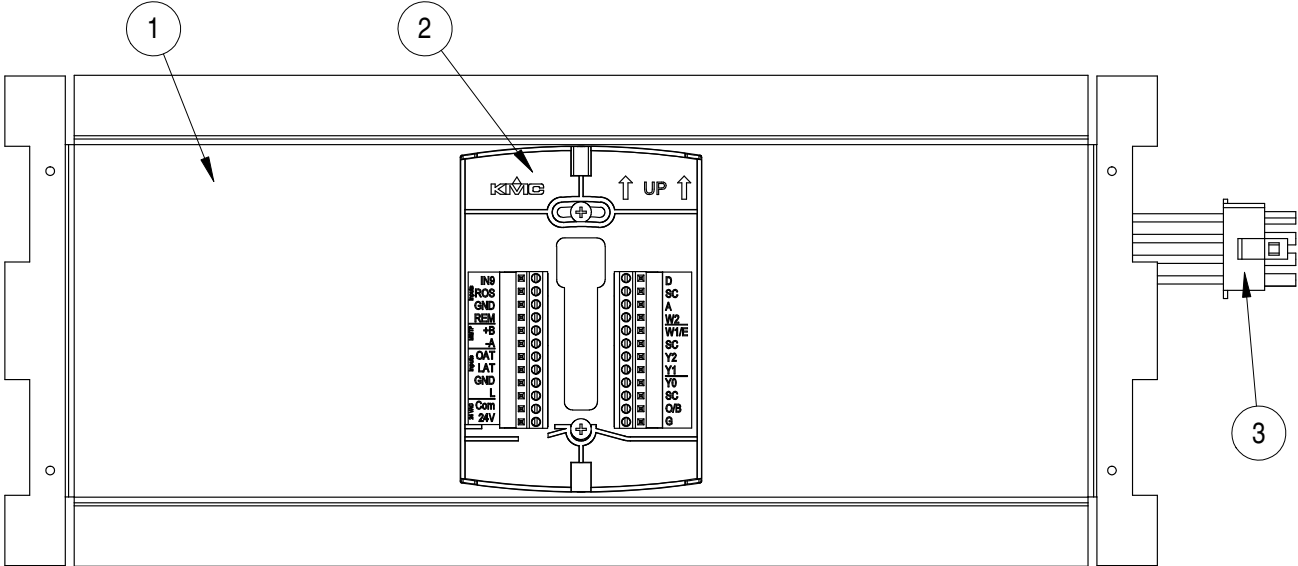
SEXP-646

## OPTIONAL CLIMATE CONTROLS

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Drawing No.	Part No.	Description	Option C
1	117-328	Control Panel	X
2	117-329	Low Voltage Control Box	X
3	8607-029	Low Voltage Terminal Strip	X
4	910-1822	Condensate Overflow Assembly	X
5	8201-130	Relay, SPDT Pilot Duty	2
6	3000-1415	Wire Harness	X
NS	4115-107	Wiring Diagram	X
NS	133-222	Control Panel Cover	X

# OPTIONAL CLIMATE CONTROLS



SEXP-1042

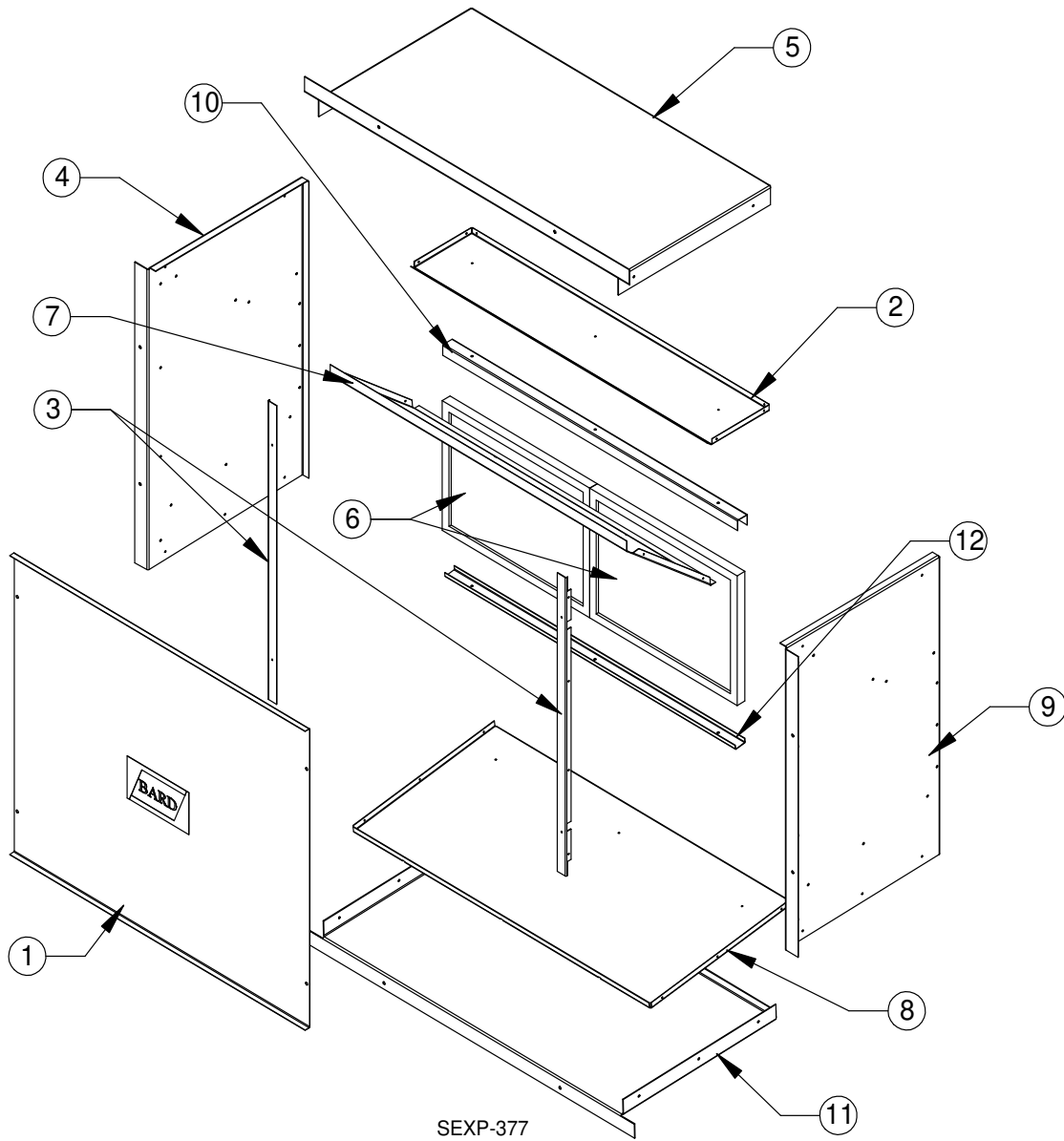
## OPTIONAL CLIMATE CONTROLS

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Drawing No.	Part No.	Description	Option 1	Option 2	Option 3	Option 4
1	127-427-*	Thermostat Mounting Plate	X	X	X	X
2	CS9B-THOA	CompleteStat TEMP/HUM/OCC	X			
2	CS9B-THOCA	CompleteStat TEMP/HUM/OCC/CO2		X		
2	CS9BE-THOA	CompleteStat TEMP/HUM/OCC with BACnet			X	
2	CS9BE-THOCA	CompleteStat TEMP/HUM/OCC/CO2 with BACnet				X
3	3000-1704	Wire Assembly	X	X	X	X

# WALL SLEEVE CABINET COMPONENTS

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## WALL SLEEVE CABINET COMPONENTS

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Drawing No.	Part No.	Description	QWS42
1	142-076	Cover	X
2	121-350-X	Top Partition	X
3	105-1103-X	Angle	2
4	110-073-X	Left Side	X
5	110-074-X	Top	X
6	7003-056	Mist Eliminator	2
7	111-076-X	Air Deflector	X
8	121-349-X	Partition	X
9	110-072-X	Right Side	X
10	165-566-X	Upper Support Channel	X
11	110-075-X	Base	X
12	165-567-X	Lower Support Channel	X





# Limited Warranty

**For units applied within the United States, Puerto Rico,  
US Virgin Islands, Guam, Canada and Mexico**

## Limited Warranty To Original Purchaser:

Bard Manufacturing Company, Inc. Bryan, Ohio 43506 warrants to you, the original purchaser, that your Bard product will be free from defects in materials and workmanship when used under normal conditions from the installation date through the time periods outlined in the "Duration of Warranty" section (see reverse side).

## Proof Of Purchase:

You must be able to show us the date on which you purchased your product when you make a claim under this warranty. Your owner's registration card filed online at [www.wallmountwarranty.com](http://www.wallmountwarranty.com) or your contractor's invoice, bill of sale, or similar document is sufficient at time of warranty claim. If you can not show us the actual date of purchase, the time periods in this warranty will start on the date that we shipped your Bard product from our factory.

## What This Warranty Does Not Cover: (Also see Duration of Warranty on reverse side.)

This warranty does not cover defects or damage caused by:

1. Alterations not approved by us; improper installation (including over or under sizing), improper repairs, or servicing; or improper parts and accessories not supplied by us.
2. Misuse or failure to follow installation and operating instructions (including failure to perform preventative maintenance) or limitations on the rating plate. This includes failure to use low ambient controls on all applications requiring compressor operation in cooling mode below 60F outdoor ambient.
3. Any corrosion from operation in a corrosive atmosphere (examples: acids, halogenated hydrocarbons or environmental conditions).
4. Parts that must be replaced periodically (such as filters, oil nozzles, mist eliminators, ERV belts, pile seals, etc.).
5. Improper fuel or electrical supply (such as low voltage, voltage transients, power interruption, and units on generators with no brownout protection).
6. Accidents or other events beyond our reasonable control (such as storm, fire, or transportation damage).
7. Defects that happen after
  - (a) Anyone has tampered with the product.
  - (b) The product has been improperly serviced according to accepted trade practices;
  - (c) The product has been moved from its original place of installation; or,
  - (d) The product has been damaged by an event beyond Bard's control (See also No. 5 above).
8. Consequential damages (such as increased living expenses while the product is being repaired). Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
9. This warranty has certain limitations for units installed on over-the-road trucks, vans and trailers. (See reverse side.)
10. Cost of service call at installation site to diagnose causes of trouble, labor to replace defective component or transportation costs for replacement parts.
11. This Limited Warranty does not apply to products installed or operated outside of the US, Puerto Rico, US Virgin Islands, Guam, Canada and Mexico. Units operated in coastal areas where the operating environment is exposed to airborne saline particles (typically 5 miles from coast line) must have corrosion protection or warranty claims will be declined on corrosion-based cabinet and part failures.
12. Bard does not endorse, approve or certify any online sales of its products through auction websites, online retailers, liquidators or any other method of online sales direct to consumers. Bard will not honor the factory warranty of any Bard equipment purchased over the Internet.

## Your Responsibilities:

You are responsible for -

1. Preventative maintenance of the product (such as cleaning and replacement of filters, nozzles and other consumable parts).
2. Insuring that the instruction manual is followed for care and use of your product.
3. Insuring that your product is installed by a competent, qualified contractor, following all local and national codes, and industry standards.

## What We Will Do About A Defect:

We will either repair or replace the defective part only. Replacement parts may be reconditioned parts. The warranty for the repaired or replaced part will last only for the remainder of the warranty period for the original part. For Heat Exchangers that are no longer available, we will give you credit equal to the then current retail price of an equivalent Heat Exchanger.

Defective parts and a properly completed Bard parts warranty form must be returned to a Bard distributor for submitting to Bard to be eligible for a warranty credit or replacement. Credits are issued to the Bard distributor.

We will not pay or be responsible for labor or defective/replacement part transportation costs or delays in repairing or failures to complete repairs caused by events beyond our reasonable control.

## What You Must Do

1. Tell your heating and air conditioning contractor as soon as you discover a problem and have the contractor make repairs.
2. Pay for all transportation, related service labor, diagnostic charges, refrigerant, refrigerant recovery and related items.

## Service

If your product requires service, you should contact the contractor who installed it or the contractor that has been providing the product's preventative maintenance and repair service. You may find the installing contractor's name on the product or in your Owner's packet. If you do not know who that is, you should contact a competent, qualified contractor to make the repairs. If in doubt, you should contact the nearest distributor that handles Bard products ([www.bardhvac.com](http://www.bardhvac.com)). Please note that contractors and distributors that handle Bard products are independent contractors and distributors, and therefore, are not under the direction of Bard Manufacturing Company, Inc.

## Only Warranty

This is the only warranty that we make. There are no other express warranties. All implied warranties are limited in duration to the duration of the applicable written warranty made above.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you.

## Other Rights

This warranty gives you specific legal rights and you may have other rights which vary from state to state.

**BARD MANUFACTURING CO., INC. — BRYAN, OHIO 43506**  
*Dependable quality equipment . . . since 1914*

Form No. 7960-420  
Issued: 12/04/19  
Supersedes: 08/22/19



**Duration Of Warranty is limited to defects arising during the periods shown in the following table:**

Model Number Series: Includes all Models in each Series & which may have additional characters. (Example: W12-70A includes W36A w/additional characters.)	— Number of Years from Installation Date ① —			
	Compressor ⑤	Sealed System Components ②③⑦	All Other Functional Parts ③	Heat Exchangers
<b>AIR CONDITIONERS</b> W12A, W17A, W18A, W24A, W30A, W36A, W42A, W48A, W60A, W70A, W72A, W090A, W120A, W150, W180A, W17L, W18L, W24L, W30L, W36L, W42L, W48L, W60L, W70L, W72L, WA3S, WA4S, WA5S, WL3S, W4LS, WL5S, D25A, D28A, D35A, D36A, D42A, D48A, D60A, D25L, D28L, D35L, D36L, D42L, D48L, D60L, Q24A, Q30A, Q36A, Q42A, Q48A, Q60A, I30A, I36A, I42A, I60A	5	5	5	N/A
<b>AIR SOURCE HEAT PUMPS</b> W18H, W24H, W30H, W36H, W42H, W48H, W60H, C24H, C30H, C36H, C42H, C48H, C60H, T24H, T30H, T36H, T42H, T48H, T60H, T24S, T30S, T36S, T42S, T48S, T60S, Q24H, Q30H, Q36H, Q42H, Q43H, Q48H, Q60H, I30H, I36H, I42H, I48H, I60H, I36Z, I48Z, I60Z	5	5	5	N/A
<b>ENVIRONMENTAL CONTROL UNITS</b> W3RV, W4RV, W5RV, W6RV, W3LV, W4LV, W5LV, W6LV	5	5	1	N/A
<b>EQUIPMENT SHELTER UNITS</b> W**A2P, W**AAP, WR**, D**AAP, HR**, H12A, H72A	5	5	1	N/A
<b>GEOTHERMAL/WATER SOURCE HEAT PUMPS</b> QW2S, QW3S, QW4S, QW5S	5	5	5	N/A
<b>CHILLED WATER</b> QC50 (No Compressor)	N/A	5	5	N/A
<b>GAS/ELECTRIC WALL-MOUNT</b> W24G, W30G, W36G, W42G, W48G, W60G, WG3S, WG4S, WG5S	5	5	5	10
<b>OIL FURNACES</b> ECM "V" Blower Models FC085, FH085, FH110, FLF075, FLF110, FLR075, FLR100, FLR130 PSC "D" Blower Models FC085, FH085D, FH110D, FLF085, FLF110, FLR085, FLR110, FLR140 SOF: SOF175, SOF265	N/A	N/A	10 ⑥	LIFETIME ④
	N/A	N/A	5	LIFETIME ④
	N/A	N/A	1	10
<b>ACCESSORIES</b> Factory/Field Installed Bard Ventilation and Heater Packages Bard branded Thermostats/Temperature Controllers LC1000, LC1500, LC2000, LC5000, LC6000, LV1000, MC4002, DC3003, TEC40, BG1000, PGD, PGDX Humidistats, CO <sub>2</sub> Controllers and all other field installed accessories not listed separately	N/A	N/A	5	N/A
	N/A	N/A	5	N/A
	N/A	N/A	1	N/A
	N/A	N/A	1	N/A

- ① For equipment that does not have an online warranty registration, the warranty period starts when the product was shipped from the factory.
- ② Heat transfer coils (refrigerant to air coils for air source and coaxial coils for water source units) are covered for leaks for 5 years. Physical damage to air side coils resulting in leaks or insufficient airflow, or fin deterioration due to corrosive atmosphere (such as acids, halogenated hydrocarbons or coastal environmental conditions) are not covered. Leaks in coaxial coils due to freezing of the coils are not covered. Copper coaxial coils for QW are not warranted for ground water/open loop installations.
- ③ Functional parts warranty is 1-year for all telecommunication, electric switch stations, pump stations and similar applications. This also applies to all OTR (over the road) applications.
- ④ Limited lifetime warranty on Heat Exchangers applies to original purchaser in private, owner occupied residences. Subsequent owners and commercial uses are warranted for 20 years from date of installation.
- ⑤ All OTR (over the road) applications that are moved from one location to another:  
Factory Warranty applies up to the point of initial start-up and test at all OEM manufacturing locations or subsequent outfitting facility. Once it goes into OTR service, the warranty expires immediately for compressor and sealed system components. This OTR exemption does not apply to relocatable classrooms, construction or office trailers.
- ⑥ Standard warranty for non-registered Oil Furnaces is 5-year parts. Must be registered at [www.wallmountwarranty.com](http://www.wallmountwarranty.com) within 90 days of installation for the 10-year parts coverage to be in effect.
- ⑦ Factory coated coils have a "5" year warranty in corrosive environments that are listed as approved.



**Internet Resources**

Recognized as a leader in the HVAC industry, Bard combines quality products and outstanding service with innovation and technological advances to deliver high-performance heating and cooling products around the world. Please visit [www.bardhvac.com](http://www.bardhvac.com) for additional information regarding warranty and product information.