Bard®
SINCE 1914
Climate Control Solutions

Literature Assembly
911-0870-1
BOOK 1 OF 2

Contains the following:

2100-034(G)	User's Guide
2100-479	Leak Test, Evacuation, Charging
2100-773	Wall-Mounted PKG H/P Manual
7960-949	Supplemental Instructions
7960-420	Warranty

USER'S APPLICATION GUIDE AND TECHNICAL PRODUCT OVERVIEW

Manual: 2100-034G
Supersedes: 2100-034F
Date: 12-17-20

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Bard®
SINCE 1914

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.

Contents

Overview

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 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. 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

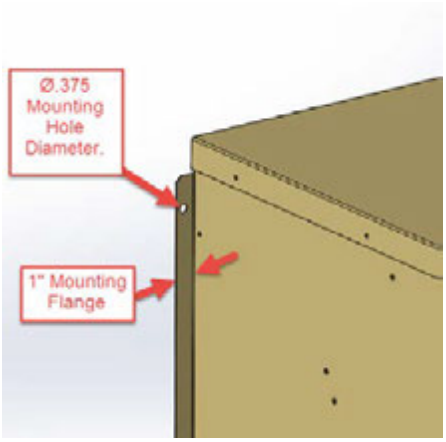
Installation plays a key part in unit functionality, performance and safety. Product securing and placement, duct design and supply/return location, electrical routing and condensate and defrost drainage all play key roles in making sure a unit will perform per the design specifications.

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 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 (Rated-Wet Coil)	
Filter Sizes (inches) STD.	16x25x1
Basic Unit Weight-LBS.	318
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.

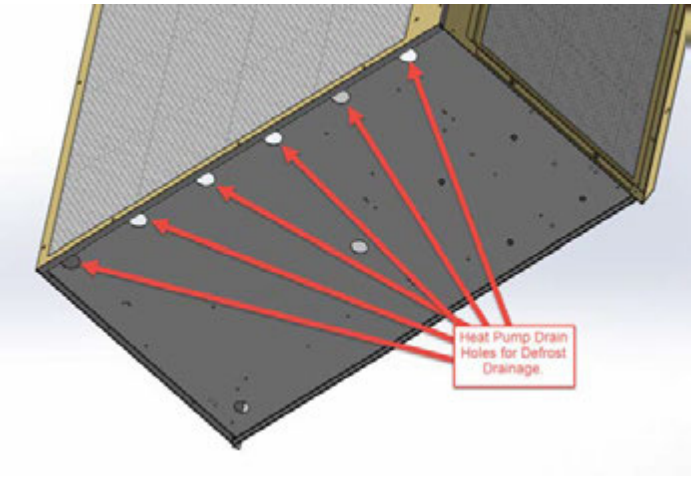
Defrost water drainage from heat pump units needs to be planned before installation. During seasons requiring heating operation, the unit will need to warm the condenser coil to remove frost build-up (defrost). **Outdoor heat pump products include holes in the unit base under the condenser coil for proper 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.

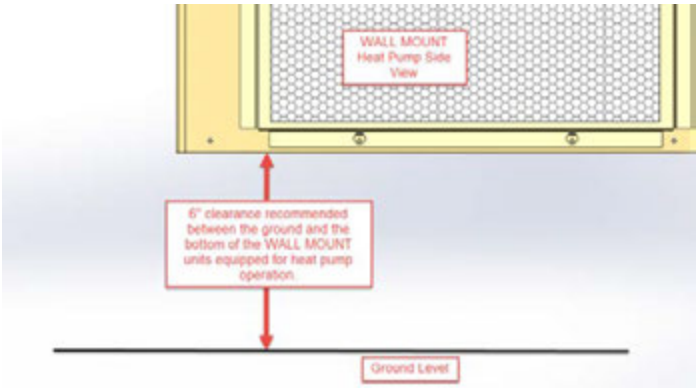
Defrost Water Drainage:

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

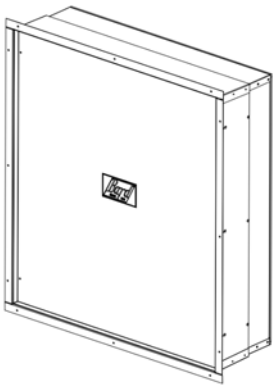
Q-TEC

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.

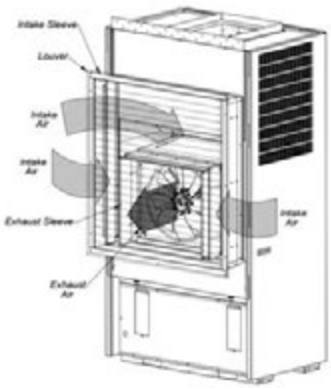
Wall Sleeve:

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

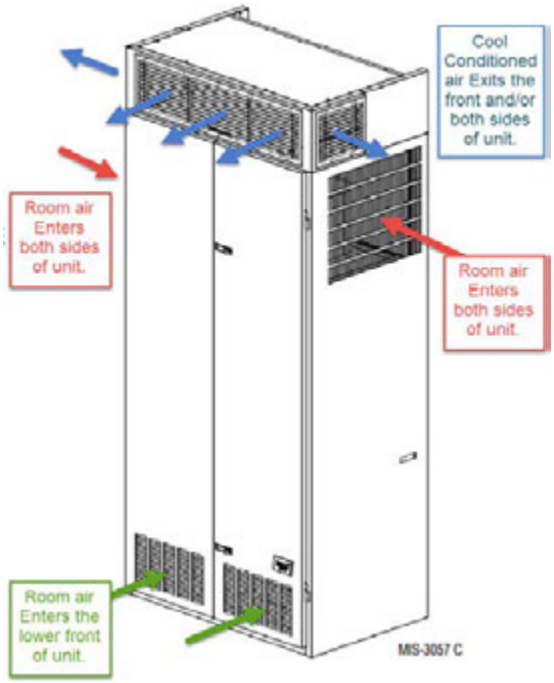
The Bard unit should be placed in an area where the supply (leaving conditioned air) and return (unit air intake) air paths will be unrestricted. Avoid placing objects inside the room within 24" of the return (unit air intake) louvers or grille. Avoid placing objects directly in the path of the supply (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

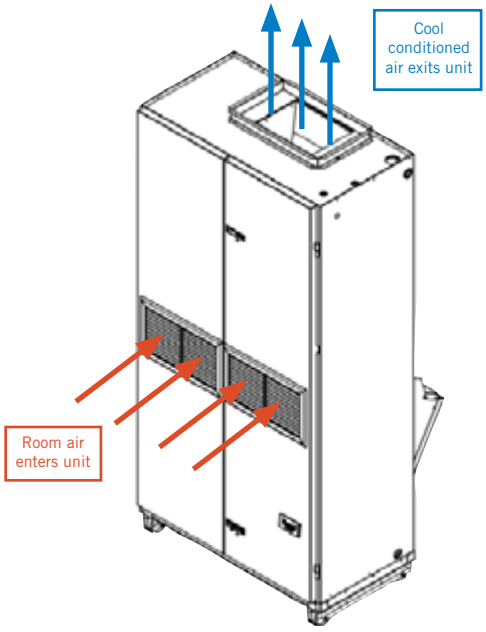
The I-TEC product has been engineered for extremely quiet unit operation and has multiple air paths for air entering and exiting the unit. Room air enters the upper sides to be conditioned (cooled) inside the unit and exits the unit top. The unit will either be ducted to supply registers or have a supply 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.

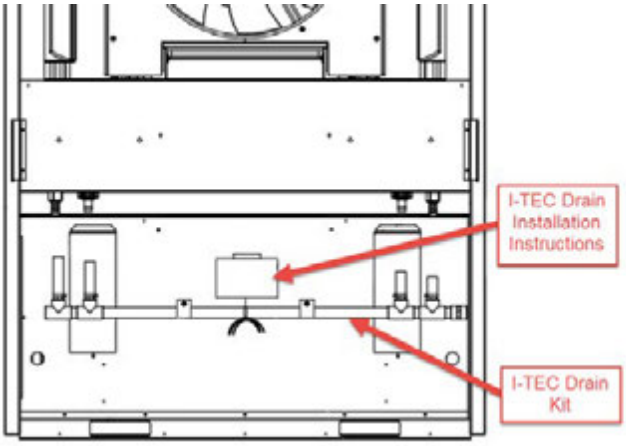
I-TEC and Q-TEC Products – Condensate Drainage

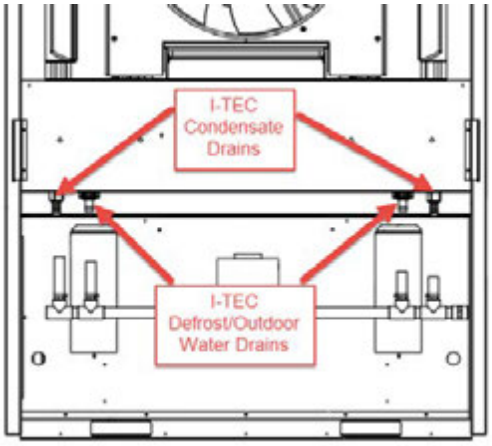
Condensate drainage for Bard indoor cooling units is a very important part of unit installation. During normal air conditioning operation, large amounts of condensate water are generated inside the unit as moisture is extracted from the supply air. This is collected in an evaporator pan and needs to 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:

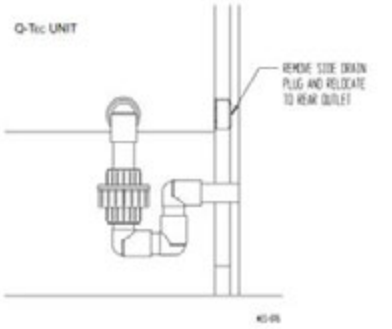
The I-TEC drainage system consists of a manifold drain kit that combines all drains behind the unit to allow connection to the building system.



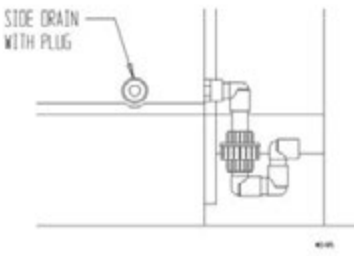


Q-TEC Drain System:

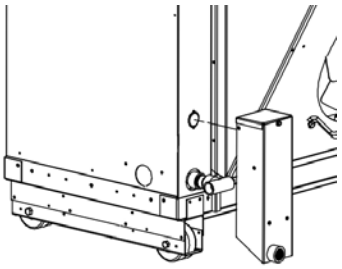
The Q-TEC drainage system consists of a lower right side or lower right rear connection fitting. An optional in-wall drain box may also be purchased as an accessory that allows separate evaporator and defrost water drainage.



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.

Unit Maintenance

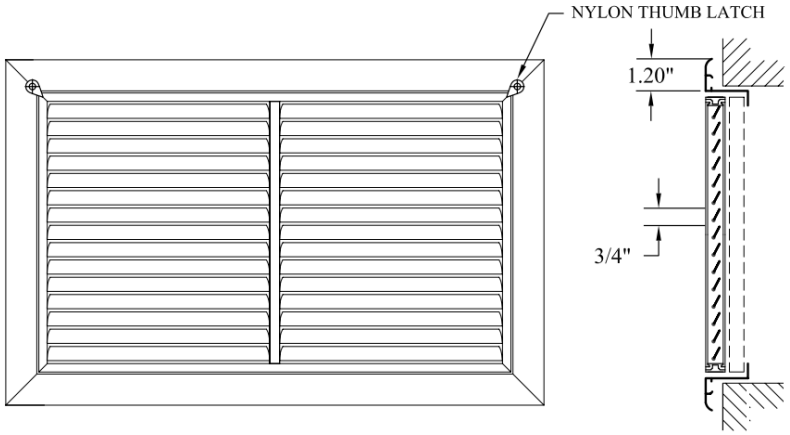
All Products – Filters and Filter Servicing

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.

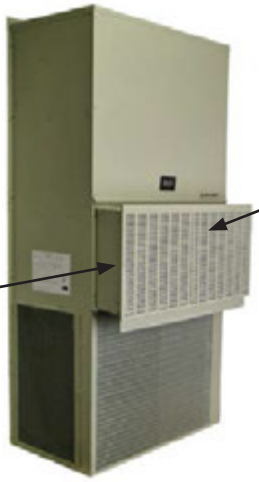
The product installation instructions contain additional information regarding unit maintenance. This information may be accessed at www.bardhvac.com.

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.

Filter Door:
The unit room air filter is located behind this panel for units without a vent hood.

Vent Intake Panel



Vent Intake Panel

Vent Hood Door:
The unit indoor filter is located behind this panel for units with a vent hood. The hood contains a washable pre-filter that needs to be cleaned regularly.

Filter Door:
The unit room air filter is located behind this panel.

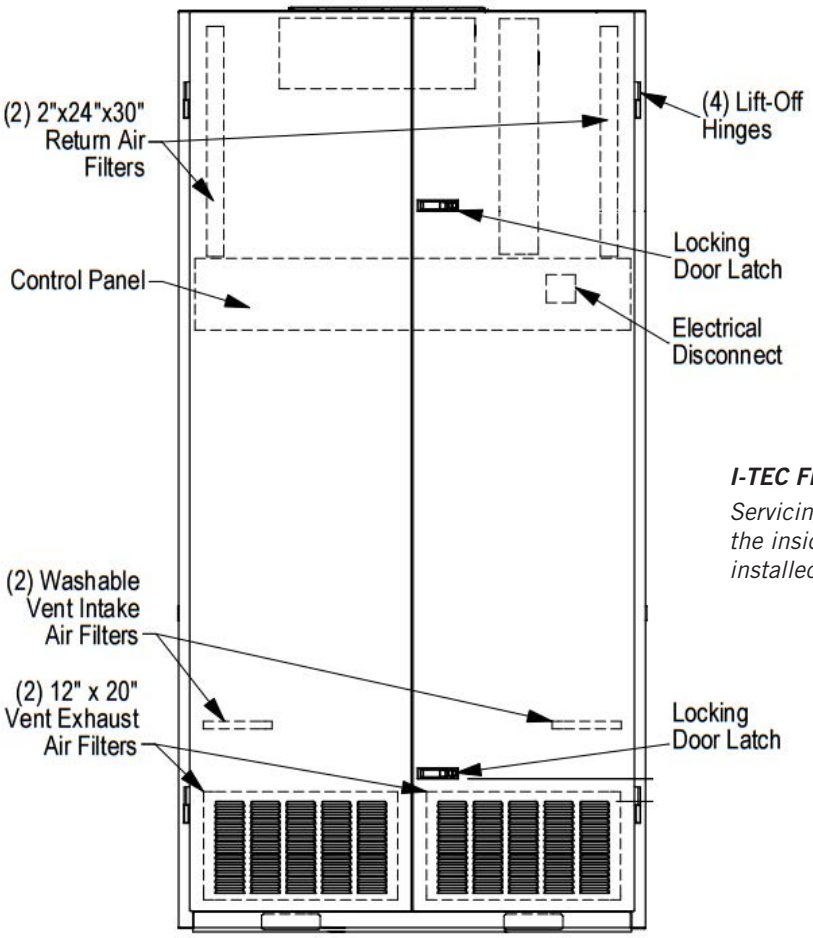
I-TEC Indoor Products – Filters and Filter Servicing

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.

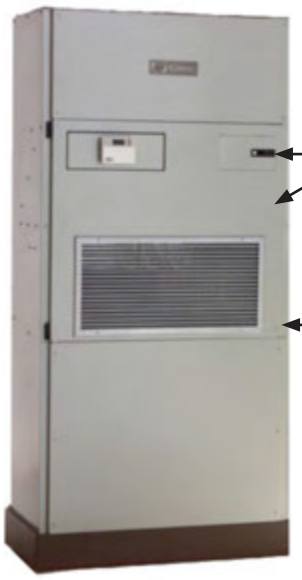
The I-TEC product installation instructions contain additional information regarding unit maintenance. This information may be accessed at www.bardhvac.com.

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.

QWS Unit



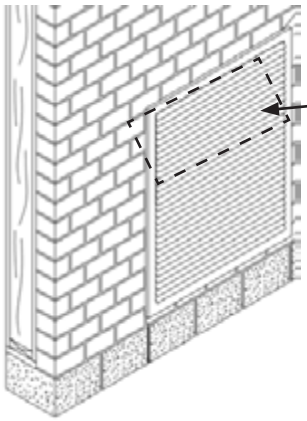
Q-TEC Filter Location:

The Q-TEC room air filters are located behind this hinged door. Unlock door latch and remove screw to open door.

Screw location

QH/QA Unit

Filter locations



Pre-filter location

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.

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.

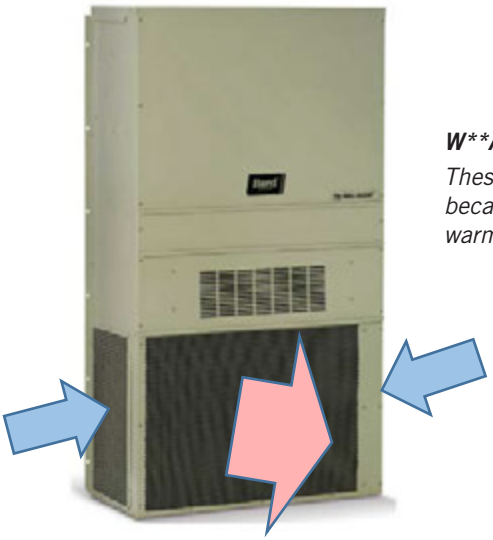
Other conditions that can cause reduction of airflow across the outdoor coil are flowers, shrubbery or other growth too near the outdoor coil air inlet and outlet openings. These living things, especially as they mature and grow, will be just as effective in blocking the airflow and create the same problems 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.

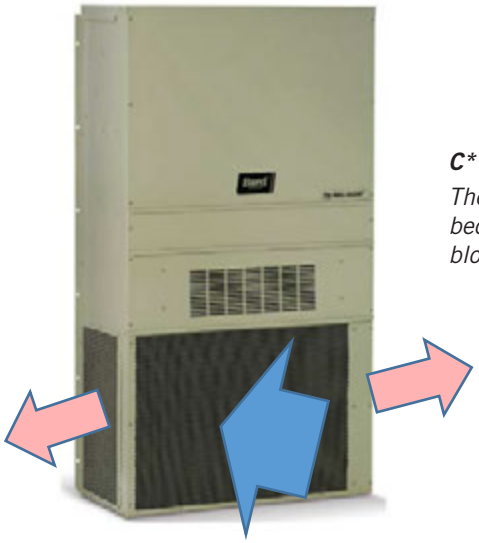
The product installation instructions contain additional information regarding unit coil cleaning. This information may be accessed at www.bardhvac.com.

All Products – Condenser Airflow



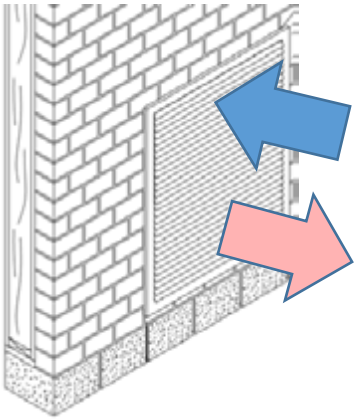
W**A, W**H, T**H, T**S, W*RV Wall Mount Units:

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.

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 0ºF, 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.

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.

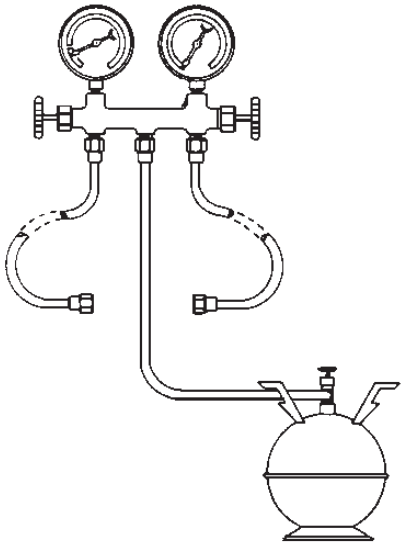
Helpful Hints and Good Operating Practices

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.

SERVICING PROCEDURE

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

CONTENTS

General

⚠ WARNING

The oils used with R-410A refrigerant are hydroscopic 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 CO2 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 CO2 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

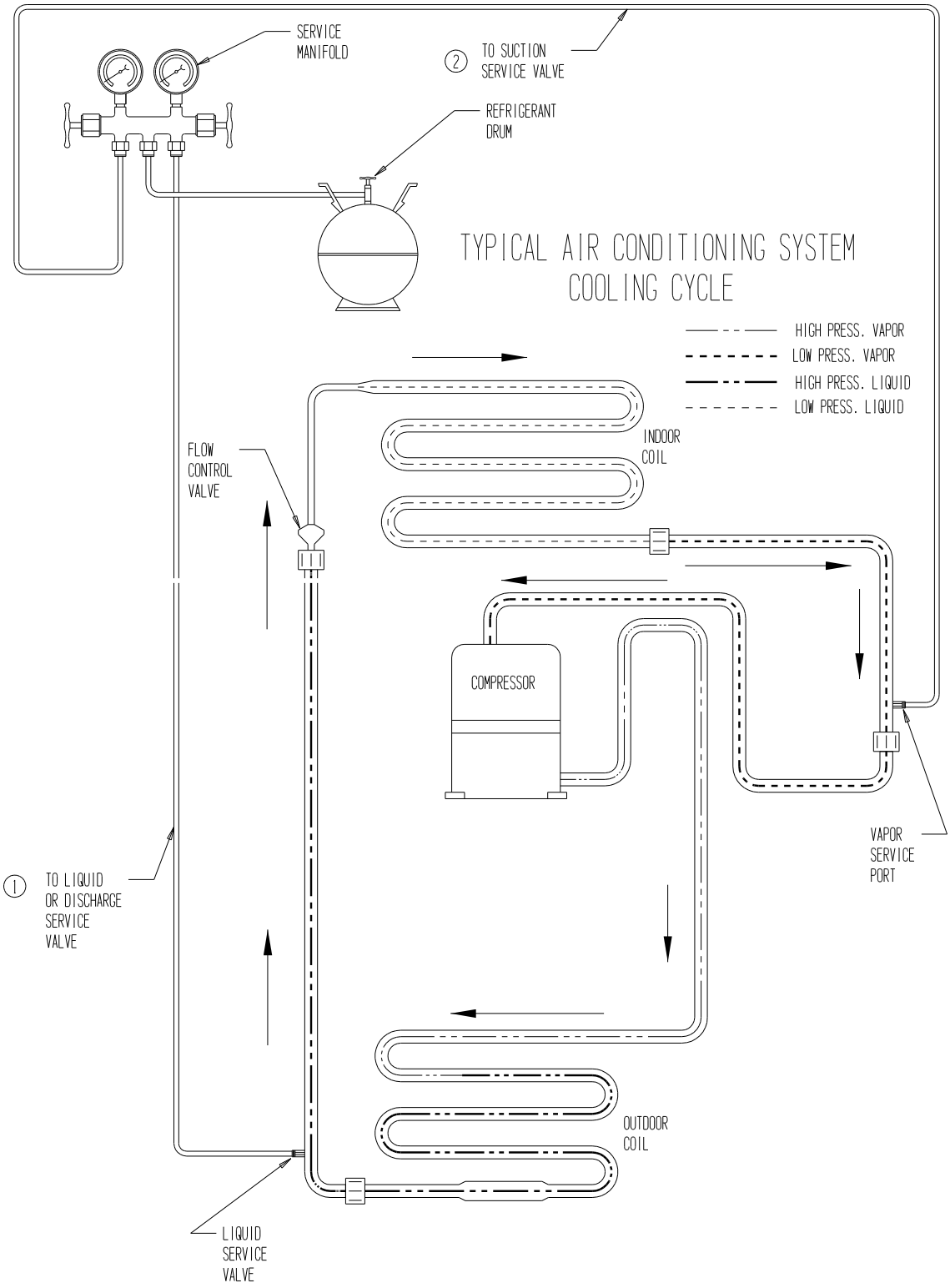
If the system has been open to the atmosphere, the filter dryer should be replaced and then evacuated. Then proceed as follows:

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

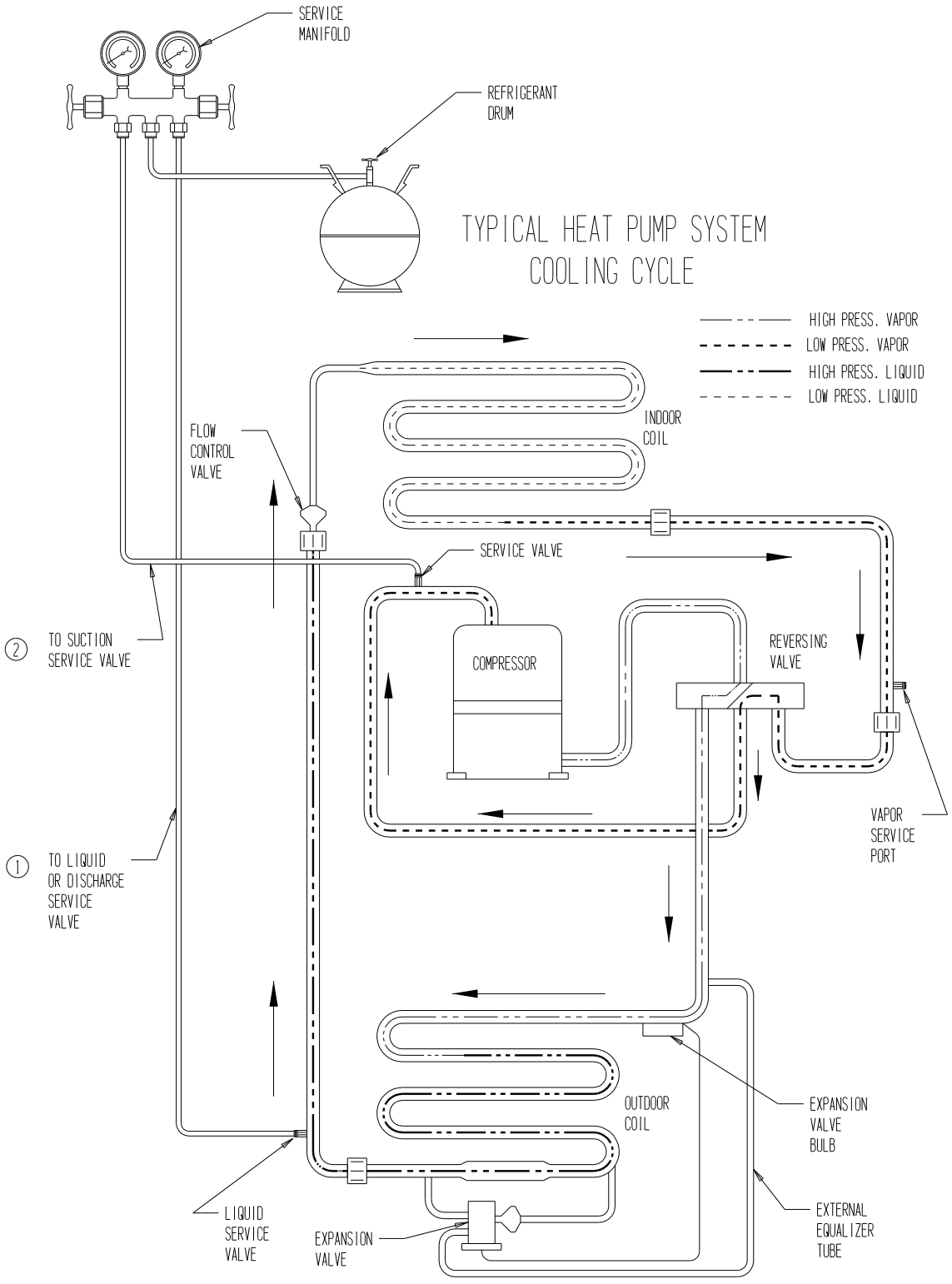
1. Connect manifold as instructed.
2. Place refrigerant drum upright on scale and determine exact weight of the refrigerant and cylinder.
3. With manifold suction valve closed and manifold discharge valve open, open refrigerant cylinder liquid valve and allow pressure in system to balance with pressure 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

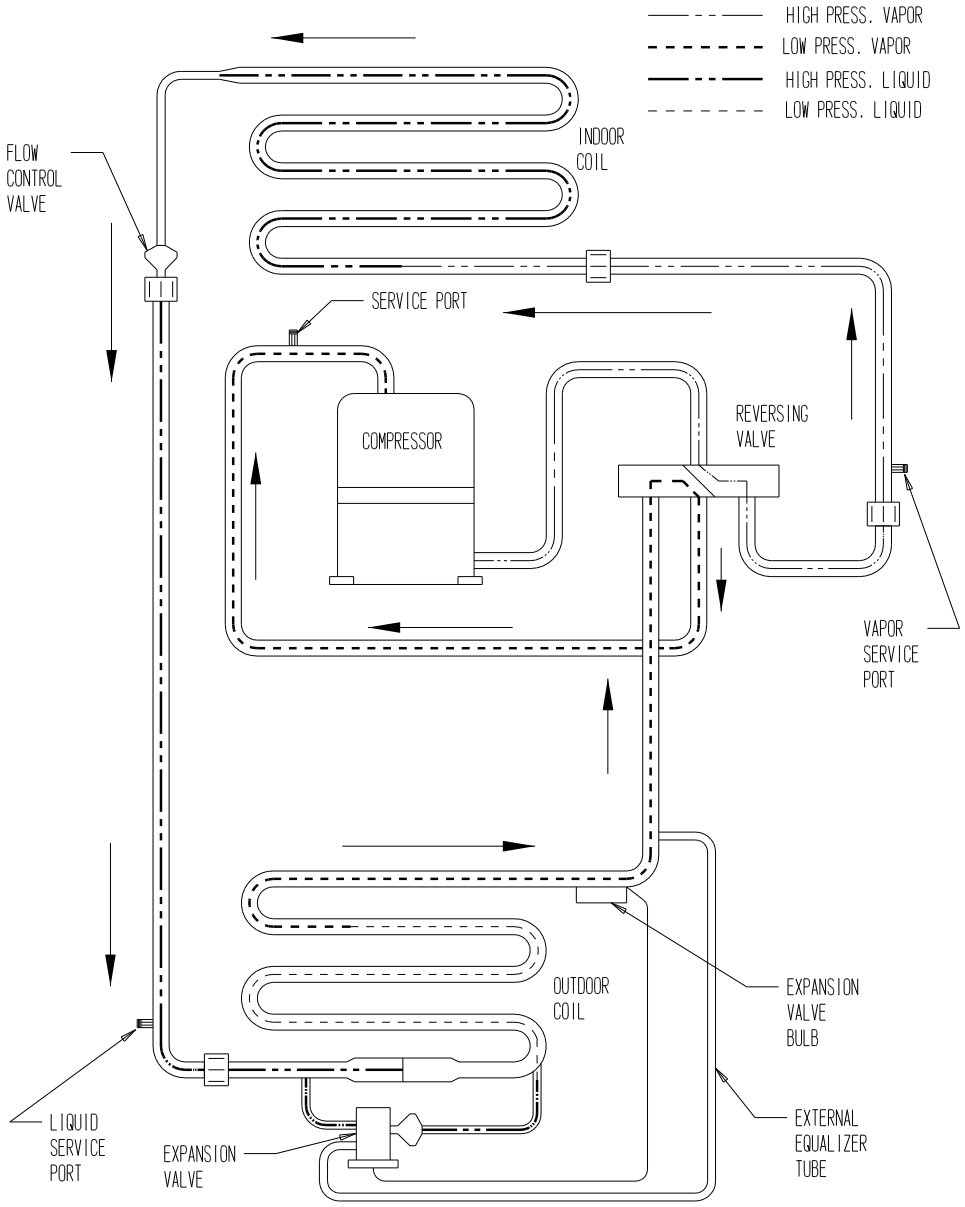


MIS-368

⚠ WARNING

To speed refrigerant flow, it may be necessary to place refrigerant drum in a pan of warm water (not greater than 130ºF). 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

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.①)

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

① Water source heat pump.

HEAT PUMP — HEATING

LOW SUCTION—LOW HEAD PRESSURE

1. Restricted airflow through outdoor coil. (Restricted water flow through water coil.①)
2. Defective outdoor motor. (Defective water pump.①)
3. Low outdoor air temperature. (Low water temperature.①)
4. Frozen outdoor coil. (Frozen water coil.①)
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.①)
2. Low indoor airflow.
3. Overcharged.
4. Air in system.
5. Restricted air coil.
6. High indoor air temperature.

① Water source heat pump.

TROUBLESHOOTING CHART FOR AIR CONDITIONERS

● Generally the cause. Always make these checks first.
◆ Occasionally the cause. Make these checks only if first checks fail to locate trouble.
■ Rarely the cause. Make this check only if previous checks fail to locate trouble.

			Compressor and condenser fan motor will not start	Compressor will not start but condenser fan will run	Condenser fan motor will not start	Compressor "hums" but will not start	Compressor cycles on overload	Compressor short cycles on low pressure	Compressor runs continuously—no cooling	Compressor runs continuously—cooling	Compressor noisy	Compressor loses oil	Head pressure too high	Head pressure too low	Liquid line frosting or sweating	Suction pressure too high	Suction pressure too low	Evaporator frosting	Suction line frosting or sweating	Evaporator blower will not start	Condenser fan motor runs contactor not pulled in	Liquid refrigerant flooding back to compressor—cap tube system	Space temperature too high
Power Supply	Meter to Line Side of Contactor	Power Failure	●																	●			
		Blown Fuses or Tripped Circuit Breakers	●																	●			
		Faulty Wiring	●			●	●													●			
		Loose Terminals	●	◆		●	●													●			
		Low Voltage	◆	◆		◆	●													■			
		Single 1PH Failure of 3PH	■	◆		◆	■													■			
		Unbalanced Power Supply 3PH	■	◆		◆	●																
		Voltage Too High																					
	Load Side of Contactor to Motor Terminal	Open Disconnect Switch	●																				
		Faulty Wiring	●	●	●	●	●													●			
		Loose Terminal	●	●	●	●	●													●			
		Low Voltage	◆	◆		◆	●													■			
		Defective Contacts in Contactor	◆	◆		◆	●																
		Compressor Overload	●	●		●	◆																
		Potential Relay Fails to Open				●	●																
		Potential Relay Fails to Close		◆																			
		Run Capacitor		●			●				◆												
		Start Capacitor		●		●																	
	Control Circuit	Faulty Wiring	●							●										●			
		Loose Terminals	●																	●			
		Control Transformer	●																	●			
		Low Voltage	◆																	■			
		Thermostat	◆							●										■			●
		Contactor Coil	●																				
		Pressure Control	●																				
		Condenser Fan Relay			●																		
		Evaporator Fan Relay																		●			
	Motors	Compressor Motor		●		◆	◆																
		Condenser Motor	■		●																		
		Evaporator Motor	■															◆		●			
		Compressor Off on Internal Overload																			●		
High Pressure Side of System	Compressor	Hold Down Bolts									●												
		Defective Compressor Bearings		●		●					●												
		Seized Compressor		●		◆																	
		Defective Compressor Valves					■		●		●			◆		●							◆
		Compressor Oil Level					■				●		■										
		Open or Short Motor Windings		●		◆	◆																
	System Operation	Refrigerant Charge Low	●				◆	●	●			●		●			●	◆					●
		Overcharge of Refrigerant	■			■	◆						●			◆			●			●	
		High Head Pressure	●			■	◆									●							
		High Suction Pressure					◆		◆														
		Low Suction Pressure	●			■		●				●		●				●					●
		Temperatures				■							●			◆	◆	◆				■	
		Non-Condensables (Air, etc.)	●				◆		◆				●										
		Excessive Load in Space					◆			●			◆			●							
		Liquid Valve Partially Closed													●								
	Condenser Air	Condenser Fins Dirty or Plugged	■				■		■				●										
		Condenser Fan Belt Slipping	■				■		■				●										
		Condenser Air Short Circuiting	■				■		■				◆										
		Low Condenser Air Volume	■				■		■				●										
		Condenser Air Temperature Low					■		■					●									
Low Side	Evaporator Air	Plugged or Restricted Metering Device						●	◆				◆		◆		◆	◆	◆●				◆
		Evaporator Fins Dirty or Plugged						●	●			■					◆	◆	●			◆	●
		Evaporator Belt Slipping						●	●			■					●	●	●			◆	●
		Low Evaporator Air Volume						●	●			■					●	●	◆●			◆	●
		Dirty Filters						●	●			■					●	●	■			◆	●
		Ductwork Small or Restricted						●	●			■					●	●				◆	●
General		Restrictions					■	●	◆			◆	■		●		◆	◆					
		Thermostat Setting	■						■														●
		Thermostat Location							◆	●													◆
		Stratified Air in Space						■	◆								◆	◆				■	◆
		Incorrect Refrigerant Piping									◆	●					■	■					■
		System Too Small								◆													●

TROUBLESHOOTING CHART FOR AIR TO AIR HEAT PUMPS

● Denotes common cause.

◆ Denotes occasional cause.

Power Supply

Cycle	Symptom	Line Voltage: Power Failure	Blown Fuse or Tripped Breaker	Faulty Wiring	Loose Terminals	Low Voltage	Single 1PH Failure of 3PH	Unbalanced 3PH	Defective Contacts in Contactor	Compressor Overload	Potential Relay	Run Capacitor	Start Capacitor	Control Circuit: Faulty Wiring	Loose Terminals	Control Transformer	Low Voltage	Thermostat	Contactor Coil	Pressure Control or Impedance Relay	Indoor Fan Relay
Heating or Cooling Cycles	Compressor and O.D. fan motor do not operate	●	●	●	●		◆	◆	◆	◆				●	●	●	◆	◆	●	●	
Heating or Cooling Cycles	Compressor will not run O.D. fan motor runs			●	●	●	◆	◆		●	●	●	●								
Heating or Cooling Cycles	Compressor "hums" but will not start			●	●	●	●	◆	◆		●	●	●								
Heating or Cooling Cycles	Compressor cycles on overload			●	●	●	◆	◆	◆	●	●	●	●								
Heating or Cooling Cycles	Compressor off on high pressure control																			◆	●
Heating or Cooling Cycles	Compressor noisy																				
Heating or Cooling Cycles	Head pressure too high																				
Heating or Cooling Cycles	Head pressure too low																				
Heating or Cooling Cycles	Suction pressure too high																				
Heating or Cooling Cycles	Suction pressure too low																				
Heating or Cooling Cycles	I.D. blower will not start	●	●	●	●									●	●	●	◆	◆			●
Heating or Cooling Cycles	I.D. coil frosting or icing-																				
Heating or Cooling Cycles	High compressor amps					●															
Cooling Cycle	Compressor runs continuously—no cooling																				
Cooling Cycle	Liquid refrigerant flooding back to compressor																				
Heating Cycle	Compressor runs continuously—no heating																				
Heating Cycle	Defrost cycle initiates no ice on coil																				
Heating Cycle	Reversing valve does not shift			●	●																
Heating Cycle	Ice build up on lower part of O.D. coil																				
Heating Cycle	Liquid refrigerant flooding back to compressor																				
Heating Cycle	Auxiliary heat on I.D. blower off			●	●									●	●			◆			●
Heating Cycle	Excessive operating costs			◆	◆													◆			
Heating Cycle	Excessive ice on O.D. coil			◆	◆																

Outdoor Section

Cycle	Symptom	Compressor: Discharge Line Hitting Inside of Shell	Bearings Defective	Seized	Valve Defective	Motor Windings Defective	Refrigerant System: Refrigerant Charge Low	Refrigerant Overcharge	High Head Pressure	Low Head Pressure	High Suction Pressure	Low Suction Pressure	Non-Condensables	Unequalized Pressures	Defrost Control: Sensing Bulb Loose-Poorly Located	Cycle Too Long (Clock timer)	Defective Control, Timer or Relay	Rev. Valve: Leaking	Defective Valve or Coil	Check Valve: Sticking Closed	Leaking or Defective	Outdoor Fan Motor and Coil: Plugged or Restricted Meter Device (Htg)	Fins Dirty or Plugged	Motor Winding Defective	Recirculation of Air	Air Volume Low (Cooling)	Low Temperature Coil Air (Cooling)
Heating or Cooling Cycles	Compressor and O.D. fan motor do not operate																										
Heating or Cooling Cycles	Compressor will not run O.D. fan motor runs		◆	●		●								●													
Heating or Cooling Cycles	Compressor "hums" but will not start		●	●		●								●													
Heating or Cooling Cycles	Compressor cycles on overload		◆		◆	◆	●	●	◆		◆		●					◆					◆	◆	◆	◆	
Heating or Cooling Cycles	Compressor off on high pressure control							●					●		◆	●	●			●		◆	●	●	●	●	
Heating or Cooling Cycles	Compressor noisy	◆	◆		●																						
Heating or Cooling Cycles	Head pressure too high							●					●		◆	◆			◆	◆		◆	●	●	◆	●	
Heating or Cooling Cycles	Head pressure too low				●		●					●						●			◆						●
Heating or Cooling Cycles	Suction pressure too high				●			●	●									●			◆						
Heating or Cooling Cycles	Suction pressure too low						●			◆										◆		◆	●	●	◆		◆
Heating or Cooling Cycles	I.D. blower will not start																										
Heating or Cooling Cycles	I.D. coil frosting or icing-						●					●								◆							
Heating or Cooling Cycles	High compressor amps		●	●				●	●		●		●							◆							
Cooling Cycle	Compressor runs continuously—no cooling				●		●																◆	◆	◆	◆	◆
Cooling Cycle	Liquid refrigerant flooding back to compressor							●	●																		
Heating Cycle	Compressor runs continuously—no heating				●		●									◆	◆	●									
Heating Cycle	Defrost cycle initiates no ice on coil						◆										●										
Heating Cycle	Reversing valve does not shift						◆			◆									●								
Heating Cycle	Ice build up on lower part of O.D. coil						●					◆			●	●	●										
Heating Cycle	Liquid refrigerant flooding back to compressor							●	●																		
Heating Cycle	Auxiliary heat on I.D. blower off																										
Heating Cycle	Excessive operating costs						●	●									●	●	●				◆	◆	◆		
Heating Cycle	Excessive ice on O.D. coil						●								●	●	●		●								

Indoor Section / Aux. Heat

Cycle	Symptom	Indoor Blower Motor and Coil: Plugged or Restricted Metering Device (Clg)	Fins Dirty or Plugged	Motor Winding Defective	Air Volume Low	Air Filters Dirty	Undersized or Restricted Ductwork	Check: Sticking Closed	Leaking or Defective	Aux. Heat: Auxiliary Heat Upstream of Coil
Heating or Cooling Cycles	Compressor and O.D. fan motor do not operate									
Heating or Cooling Cycles	Compressor will not run O.D. fan motor runs									
Heating or Cooling Cycles	Compressor "hums" but will not start									
Heating or Cooling Cycles	Compressor cycles on overload		◆	◆	◆	●	◆			
Heating or Cooling Cycles	Compressor off on high pressure control	◆	●	●	●	●	●	●		●
Heating or Cooling Cycles	Compressor noisy									
Heating or Cooling Cycles	Head pressure too high	◆	◆	◆	●	●	◆	◆		●
Heating or Cooling Cycles	Head pressure too low								◆	
Heating or Cooling Cycles	Suction pressure too high								◆	
Heating or Cooling Cycles	Suction pressure too low	◆	●	◆	●	●	◆	◆		
Heating or Cooling Cycles	I.D. blower will not start									
Heating or Cooling Cycles	I.D. coil frosting or icing-	◆	●	●	●	●	◆			
Heating or Cooling Cycles	High compressor amps		●	●	●	●	◆	◆		
Cooling Cycle	Compressor runs continuously—no cooling		●	●	●	●	◆			
Cooling Cycle	Liquid refrigerant flooding back to compressor		●	●	●	●	◆	◆		
Heating Cycle	Compressor runs continuously—no heating									
Heating Cycle	Defrost cycle initiates no ice on coil									
Heating Cycle	Reversing valve does not shift									
Heating Cycle	Ice build up on lower part of O.D. coil									
Heating Cycle	Liquid refrigerant flooding back to compressor									
Heating Cycle	Auxiliary heat on I.D. blower off			●						
Heating Cycle	Excessive operating costs		◆	◆	◆					
Heating Cycle	Excessive ice on O.D. coil									

INSTALLATION INSTRUCTIONS

Variable Speed WH Series Wall Mount Heat Pump

Models:

W3VHY-R	W3VHYDR	W5VHY-R	W5VHYDR
W3VHY-S	W3VHYDS	W5VHY-S	W5VHYDS
W3VHY-T	W3VHYDT	W5VHY-T	W5VHYDT

Bard® SINCE 1914
Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Manual: 2100-773
Supersedes: NEW
Date: 11-13-23

CONTENTS

READ ALL INSTRUCTIONS BEFORE USE

Your safety and the safety of others are very important.

We have provided many important safety messages in this manual and on your appliance. Always read and follow all safety messages.

ANSI Z535.5 Definitions:

DANGER: Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury. The signal word "DANGER" is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.

WARNING: Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.

CAUTION: Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.

NOTICE: [this header is] preferred to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to "NOTICE" the word "CAUTION" without the safety alert symbol may be used to indicate a message not related to personal injury.

NOTICE

APPLIANCE ACCESSIBLE TO THE GENERAL PUBLIC.

⚠ WARNING

Electrical shock hazard.

Do not operate this equipment without an earth ground attached and always disconnect the remote electric power supplies before servicing.

Electrical shock can result in serious injury or death.

⚠ WARNING

Heavy item hazard.

Use more than one person to handle unit.

Failure to do so could result in unit damage or serious injury.

⚠ WARNING

Electrical shock hazard.

Have a properly trained individual perform these tasks.

Failure to do so could result in electric shock or death.

⚠ CAUTION

Sharp metallic edges.

Take care and wear appropriate protective devices to avoid accidental contact with sharp edges.

Failure to do so can result in personal injury.

The following symbols are displayed on units.

This symbol indicates that the Operation Manual should be read carefully.

This symbol indicates that a service personnel should be handling this equipment with reference to the Installation Manual.

This symbol indicates that information is available such as the Operation Manual or Installation Manual.

IMPORTANT SAFETY INSTRUCTIONS

⚠ WARNING

To reduce the risk of explosion, fire, death, electric shock, scalding or injury to persons when using this product, follow basic precautions, including the following:

GENERAL

- The equipment covered in this manual is to be installed by trained, experienced service and installation technicians.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- The refrigerant system is completely assembled and charged. All internal wiring is complete.
- The unit is designed for use with or without duct work. Flanges are provided for attaching the supply and return ducts.
- These instructions explain the recommended method to install the air-cooled 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 "Starting 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 Additional Publications 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 Association for the Installation of Air Conditioning and Ventilating 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.

INSTALLATION

- This product is not intended for use at altitudes exceeding 2,000 meters (6,561 feet). For appliances intended for use at altitudes exceeding 2,000 m (6,561 feet), the maximum altitude of use shall be stated.
- Before use, the appliance must be properly installed as described in this manual.
- Contact the authorized service technician for repair or maintenance of this unit.
- Contact the installer for installation of this unit.
- The air conditioner is not intended for use by young children or invalids without supervision.
- Young children should be supervised to ensure that they do not play with the air conditioner.
- Installation work must be performed in accordance with the National Electric Code by qualified and authorized personnel only.
- Connect to a properly rated, protected, and sized power circuit to avoid electrical overload.
- Adhere to all industry recommended safety procedures including the use of long-sleeved gloves and safety glasses.
- Use care when unpacking and installing. The edges of the product may be sharp.
- Keep packaging materials out of the reach of children. These materials can pose a suffocation risk to children.

OPERATION

- This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Use this appliance only for its intended purpose.
- Never attempt to operate this appliance if it is damaged, malfunctioning, partially disassembled, or has missing or broken parts.
- Do not tamper with controls.

INSTRUCTIONS DE SÉCURITÉ

LIRE TOUTES LES INSTRUCTIONS AVANT UTILISATION

Votre sécurité et celle des autres sont très importantes.

Nous avons fourni de nombreux messages de sécurité importants dans ce manuel et sur votre appareil. Lisez et suivez toujours tous les messages de sécurité.

Définitions ANSI Z535.5 :

DANGER : Indique une situation dangereuse qui, si elle n'est pas évitée, entraînera certainement la mort ou des blessures graves. Le mot « DANGER » doit être limité aux situations extrêmes. Les indications « DANGER » ne doivent pas être utilisées pour les risques de dégâts matériels, à moins qu'il n'existe un risque concomitant de blessures corporelles.

AVERTISSEMENT : Indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner la mort ou des blessures graves. Les indications « AVERTISSEMENT » ne doivent pas être utilisées pour les risques de dégâts matériels, à moins qu'il n'existe un risque concomitant de blessures corporelles.

ATTENTION : Indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures à modérées. Les indications « ATTENTION », sans symbole d'avertissement, peuvent être utilisées pour alerter sur des pratiques dangereuses pouvant entraîner des dégâts matériels uniquement.

REMARQUE : cet avis concerne les pratiques n'entraînant aucune blessure corporelle. Le symbole d'avertissement ne doit pas être utilisé avec ce mot. Comme alternative à « AVIS », le mot « ATTENTION » sans symbole d'avertissement peut être utilisé pour indiquer un message non lié à des blessures corporelles.

⚠ AVERTISSEMENT

Risque de choc électrique.

Ces tâches doivent être réalisées par une personne parfaitement qualifiée et formée.

Le non-respect de cette consigne peut entraîner des chocs électriques ou la mort.

⚠ ATTENTION

Arêtes métalliques vives.

Faites attention et portez des dispositifs de protection appropriés pour éviter tout contact accidentel avec des arêtes vives.

Le non-respect de cette consigne peut entraîner des blessures corporelles.

Les symboles suivants sont affichés sur les unités.

Ce symbole indique que le manuel d'utilisation doit être lu attentivement.

Ce symbole indique qu'un membre du personnel de service devrait manipuler cet équipement en se référant au manuel d'installation.

Ce symbole indique que des informations sont disponibles telles que le manuel d'utilisation ou le manuel d'installation.

INSTRUCTIONS DE SÉCURITÉ IMPORTANTES

AVERTISSEMENT

Pour réduire le risque d'explosion, d'incendie, de décès, de choc électrique, d'échaudure ou de blessures pour les personnes lors de l'utilisation de ce produit, suivez les précautions de base, notamment les suivantes :

GÉNÉRALITÉS

- L'équipement couvert dans ce manuel doit être installé par des techniciens de service et d'installation formés et expérimentés.
- Cet appareil n'est pas destiné à être utilisé par des personnes (y compris des enfants) ayant des capacités physiques, sensorielles ou mentales réduites, ou un manque d'expérience et de connaissances, à moins qu'elles n'aient reçu la supervision ou l'instruction concernant l'utilisation de l'appareil par une personne responsable de leur sécurité.
- Le système de réfrigérant est complètement assemblé et chargé. Tout le câblage interne est complet.
- L'unité est conçue pour être utilisée avec ou sans conduits. Des brides sont prévues pour fixer les conduits d'alimentation et de retour.
- Ces instructions expliquent la méthode recommandée pour installer l'unité autonome refroidie à l'air et les connexions de câblage électrique à l'unité.
- Ces instructions et toutes les instructions emballées avec tout équipement distinct requis pour constituer l'ensemble du système de climatisation doivent être lues attentivement avant de commencer l'installation. Notez en particulier « Procédure de démarrage » et les étiquettes et / ou étiquettes attachées à l'équipement.
- Bien que ces instructions soient conçues comme un guide général recommandé, elles ne remplacent en aucune façon les codes nationaux et/ou locaux. Les autorités compétentes devraient être consultées avant que l'installation ne soit effectuée. Voir d'autres publications pour obtenir des renseignements sur les codes et les normes.
- La taille de l'unité pour une installation proposée devrait être basée sur le calcul de la perte de chaleur effectué selon les méthodes de Air Conditioning Contractors of America (ACCA). Le conduit d'air devrait être installé conformément aux Normes de la National Fire Protection Association for the Installation of Air Conditioning and Ventilating Systems of Other Than Residence Type, NFPA No. 90A, et aux Systèmes de chauffage et de climatisation d'air chaud de type résidence, NFPA No. 90B. Lorsque les réglementations locales sont en contradiction avec les instructions, l'installateur doit respecter les codes locaux.

L'INSTALLATION

- Ce produit n'est pas destiné à être utilisé à des altitudes supérieures à 2 000 mètres (6 561 pieds). Pour les appareils destinés à être utilisés à des altitudes supérieures à 2 000 m (6 561 pieds), l'altitude maximale d'utilisation doit être indiquée.
- Avant utilisation, l'appliance doit être correctement installée comme décrit dans ce manuel.
- Communiquez avec le technicien d'entretien autorisé pour la réparation ou l'entretien de cette unité.
- Contactez le programme d'installation pour l'installation de cet appareil.
- Le climatiseur n'est pas destiné à être utilisé par de jeunes enfants ou des invalides sans surveillance.
- Les jeunes enfants devraient être surveillés pour s'assurer qu'ils ne jouent pas avec le climatiseur.
- Les travaux d'installation doivent être effectués conformément au Code national de l'électricité par du personnel qualifié et autorisé uniquement.
- Connectez-vous à un circuit d'alimentation correctement évalué, protégé et dimensionné pour éviter les surcharges électriques.
- Respectez toutes les procédures de sécurité recommandées par l'industrie, y compris l'utilisation de gants à manches longues et de lunettes de sécurité.
- Faites attention lors du déballage et de l'installation. Les bords du produit peuvent être tranchants.
- Gardez les matériaux d'emballage hors de la portée des enfants. Ces matériaux peuvent poser un risque d'étouffement pour les enfants.

OPÉRATION

- Cet appareil n'est pas destiné à être utilisé par des personnes (y compris des enfants) ayant des capacités physiques, sensorielles ou mentales réduites, ou un manque d'expérience et de connaissances, à moins qu'elles n'aient reçu une supervision ou une instruction concernant l'utilisation de l'appareil par une personne responsable de leur sécurité.
- Utilisez cet appareil uniquement aux fins prévues.
- N'essayez jamais de faire fonctionner cet appareil s'il est endommagé, défectueux, partiellement démonté ou s'il a des pièces manquantes ou cassées.
- Ne pas altérer les contrôles.

General

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

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

The refrigerant system is completely assembled and charged. All internal wiring is complete.

The unit is designed for use with or without duct work. Flanges are provided for attaching the supply and return ducts.

These instructions explain the recommended method to install the air cooled 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 "Starting 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 **Additional Publications** 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 Association for the Installation of Air Conditioning and Ventilating 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.

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.

Additional Publications

These publications can help when installing the heat pump. 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.

National Electrical Code .....ANSI/NFPA 70

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

Load Calculation for Winter and Summer Air Conditioning
..... ACCA Manual J Residential

Duct Design for Residential Winter and Summer Air Conditioning and Equipment Selection
..... ACCA Manual D

For more information, contact these publishers:

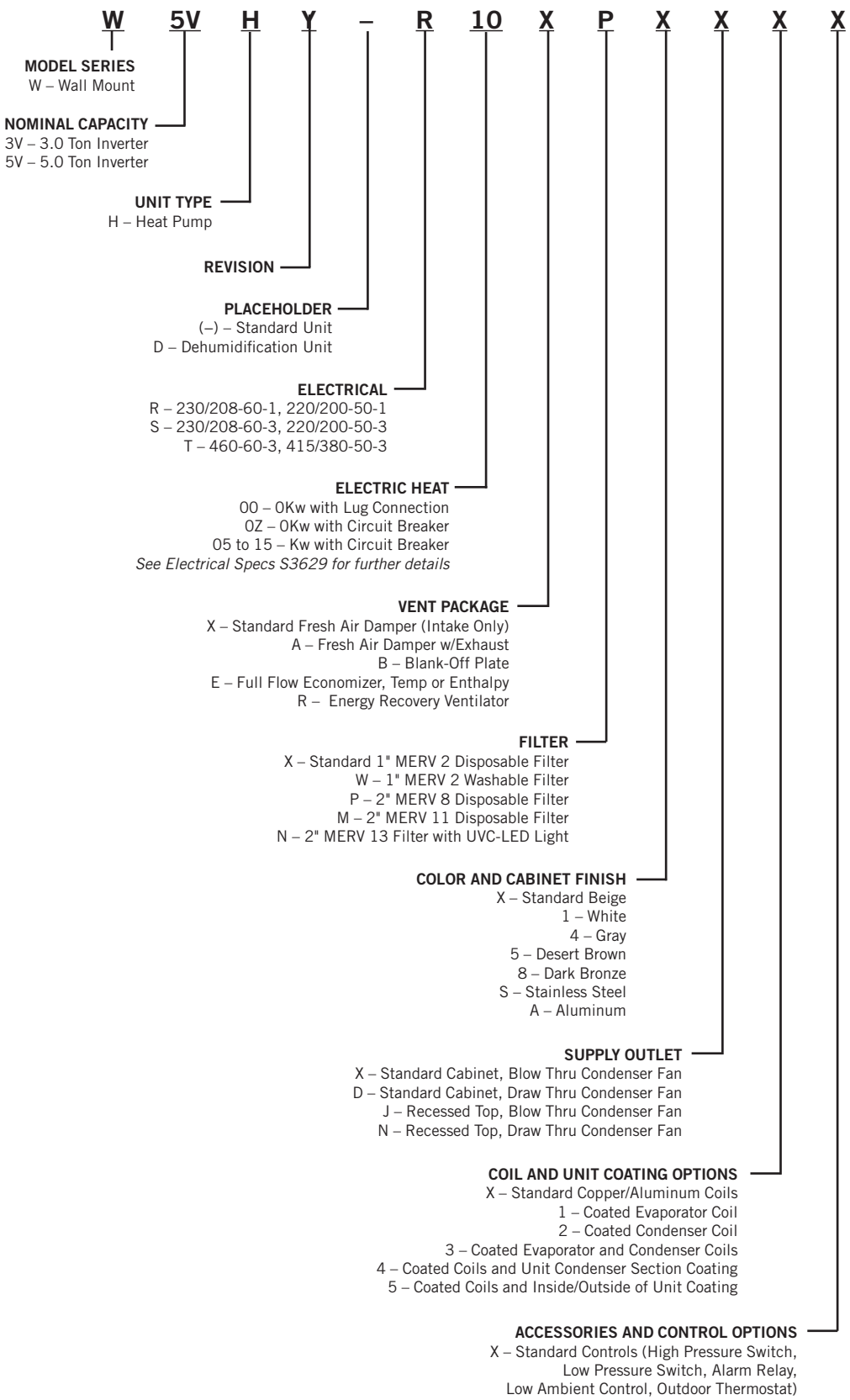
ACCA **Air Conditioning Contractors of America**
1712 New Hampshire Ave. N.W.
Washington, DC 20009
Telephone: (202) 483-9370
Fax: (202) 234-4721

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

Variable Speed Heat Pump Wall Mount Model Nomenclature



Duct Work

All duct work, supply and return, 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.

Design the duct work according to methods given by the Air Conditioning Contractors of America (ACCA). 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.

All model series require a 1/4" clearance to combustible material for the first 3' of duct attached to the outlet air frame is required. See wall mounting instructions beginning on page 13 and Figures 4 – 8 (pages 17 – 20) for further details.

Ducts through the walls must be insulated and all joints taped or sealed to prevent air or moisture entering the wall cavity.

Some installations may not require a return air duct. A metallic return air grille is required with installations not requiring a return air duct. The spacing between louvers on the grille shall not be larger than 5/8".

Any grille that meets with 5/8" louver criteria may be used. It is recommended that Bard Return Air Grille Kits RG5 or RFG5 be installed when no return duct is used. Contact distributor or factory for ordering information. If using a return air filter grille, filters must be of sufficient size to allow a maximum velocity of 400 fpm.

NOTE: *If no return air duct is used, applicable building codes may limit this cabinet to installation only in a single story structure.*

Fresh Air Intake

All units are built with fresh air inlet louvers punched in the side grilles.

If the unit is equipped with a fresh air damper assembly, the assembly is shipped already attached to the unit. The damper blade is locked in the closed position. To allow the damper to operate, remove the two (2) hex head screws in the bottom of the blade (see Figure 1). Remove right side grille to access the damper blade.

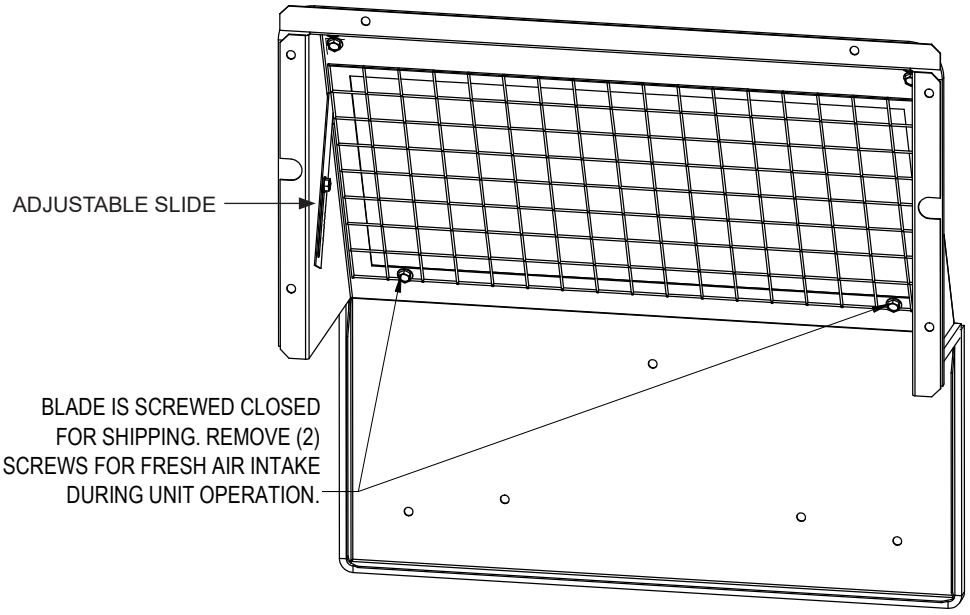
There is an adjustable slide on the side of the fresh air intake that can be adjusted to limit how far the damper opens so that the amount of fresh air that enters the structure is regulated.

Graphs found on pages 32 and 33 gives approximate fresh air amounts based on the slide adjustment setting.

All capacity, efficiency and cost of operation information is based upon the fresh air blank-off plate in place.

The blank-off plate is available upon request from the factory and is installed in place of the fresh air damper shipped with each unit.

FIGURE 1
Fresh Air Damper



MIS-3977

Basic Installation Design and Application Planning

Successful unit installations require proper planning and site inspection before installation begins. Before installing the wall mount unit, make sure that all service and airflow clearances are met and that the unit can meet all applicable code and regulation requirements. Provide an inspection of both the inside and outside of the structure by reviewing floorplans and/or visiting the installation site.

Wall Construction

The wall must be inspected to ensure that the weight of the unit can be supported. Be sure to review all applicable construction codes and regulations including seismic requirements. When inspecting wood frame walls, the wall construction must be strong and rigid enough to carry the weight of the unit without transmitting any unit vibration. It is important that the side unit wall mounting lags and optional bottom bracket are supported by structural members inside the wall cavity. Concrete block and brick walls must be thoroughly inspected to ensure that they are capable of carrying the weight of the installed unit. Metal buildings must contain structural components to support the unit weight. If heavily corrugated siding is present, it may need to be trimmed and flashed similar to a window to provide a flat, even surface to attach and seal the unit to the wall. Heavy gauge corrugations that would be present on shipping containers and blast-proof structures may require the installation of a metal plate over the corrugated area. It is important that the unit area is weatherized and sealed to avoid air and water infiltration into the area between the unit and the wall.

Outdoor Area Inspection

Inspect the outdoor area of the jobsite or review construction plans and locate the area where the wall mount is to be installed. The outdoor area must be free from obstructions including fences, bushes and walls that will hinder unit operation regarding outdoor condenser airflow and unit serviceability. Do not install units in enclosed areas that limit the amount of ambient temperature airflow. Warm air will exit the front condenser section of the unit, and outdoor ambient temperature air must be able to enter side intake condenser openings of the unit. Portable or modular building placement must be in a way that the wall mount units have a constant supply of outdoor air for proper unit operation. Make sure that the service panels of the unit are accessible. Inspect wall surfaces for obstructions that could hinder unit installation and servicing including outdoor electrical conduits, junction boxes, wall drains, vent hoods, windows, doors, overhangs and posts.

Condensate Water Drainage

Review all codes and requirements for unit condensate drainage. A clear, flexible PVC drain hose (3/4" ID, 1" OD) extends from the drain pan in the upper section of the unit and extends down to the unit base. An opening is supplied towards the back of the unit base for the drain hose to pass through, and the hose extends 1" to 2" below the unit base. Water removed from the indoor air (condensate) will be expelled from the unit in large amounts during cooling operation through the hose. Units running in cooling operation in cold outdoor below freezing conditions can cause the condensate to freeze after leaving the drain hose. In the event the drain hose is connected to a drain system of some type, it must be an open or vented type system to ensure proper drainage throughout seasonal use.

Indoor Ducted and Non-Ducted Applications

Air distribution inside the structure being conditioned plays an important role in making sure the area is a consistent temperature. Improper air distribution can result in areas being cooler or warmer, electrical equipment not receiving sufficient airflow or occupancy discomfort felt inside an area. Thermostat or indoor temperature sensor placement inside the area being conditioned also plays an important role in indoor climate control.

Indoor Supply Airflow

Indoor installation areas must provide a non-restrictive path for the conditioned supply air to leave supply grilles and registers. Inspect the area to ensure that all indoor portions of the room or rooms will have access to supply air. Ductwork may be used to ensure proper air circulation and all provided ductwork guidelines and clearances must be followed. Non-ducted applications must use a supply louver grille installed over the supply opening inside the room. Be sure to adjust supply deflectors to properly disperse the conditioned supply air to all parts of the room. Avoid closing sections of the supply grilles which would cause unneeded supply duct pressurization.

Indoor Return Airflow

A non-restrictive path for room air returning to the center section of the unit must be provided inside the room. Avoid placing objects including furniture, electronics equipment, equipment racks and cabinets directly in front of the unit return grilles and registers. Bard recommends at least 2' between solid objects and return grilles or registers. Ductwork may be used to ensure proper air circulation and all provided ductwork guidelines and clearances must be followed. Non-

ducted applications must use a return louver grille installed over the return opening inside the room.

Ducted Applications

Field fabricated supply and return duct work may be installed inside the structure being conditioned. A short supply and/or return stub duct may be connected to the unit supply and return flanges before unit installation to help with duct connections inside the structure. Supply and return ducts 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 conserve energy, reduce heat conductivity, and prevent condensation or moisture damage. Design the duct work according to methods given by the Air Conditioning Contractors of America (ACCA). When duct work is installed in 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. Ducts through the walls must be insulated and all joints taped or sealed to prevent air or moisture from entering the wall cavity.

All model series require a 1/4" clearance to combustible material for the first 3' of duct attached to the outlet air frame is required.

⚠ WARNING

Fire hazard.

Maintain minimum 1/4" clearance between the supply air duct and combustible materials in the first 3' of ducting.

Failure to do so could result in fire causing damage, injury or death.

Free Blow Applications

Some installations may not require extensive supply duct work throughout the structure and are referred to as free blow applications. A short field-fabricated supply duct must be used in the wall cavity to transition between the supply collar on the unit and the supply louver grille in the room. The duct must be properly insulated in order to conserve energy, reduce heat conductivity and prevent condensation or moisture damage. All joints must be taped or sealed to prevent air or moisture entering the wall cavity. Follow all clearances including distances to combustible materials and all instructions provided in this manual.

A non-restrictive metallic supply air grille with deflectors is required for free blow applications. Contact the local Bard distributor or visit www.bardhvac.com for ordering information.

A metallic return air grille is required for non-ducted applications. The spacing between louvers on the grille shall not be larger than 5/8". It is recommended that a Bard Return Air Grille Kit is installed that is designed specifically for the wall mount product. Contact the local Bard distributor or visit www.bardhvac.com for ordering information. A field-supplied return grille that meets the 5/8" louver criteria and does not cause the unit to exceed the maximum specified external static pressure (ESP) may be used. If using a return air filter grille, filters must be of sufficient size to allow a maximum velocity of 400 fpm. Filter return air grilles do not filter air being brought into the structure through ventilation options including fresh air dampers, ventilators, economizers and energy recovery ventilators. Be sure to install the return grille with the louvers pointed downward towards the floor. This will help ensure return air is drawn upward from the floor and improve air circulation in the room.

NOTE: *If no return air duct is used, applicable building codes may limit this cabinet to installation only in a single story structure.*

Thermostat or Indoor Temperature Sensor Placement

The location and installation of the thermostat or temperature sensor that monitors indoor temperature is very important regarding unit operation. Avoid placing the thermostat in an area exposed to direct sunlight or air from doorways leading outdoors. Use a piece of insulating material to close off conduit openings or holes in the wall surface for wire entry into the thermostat or temperature sensor. This will help avoid non-conditioned air from entering the thermostat and effecting temperature and/or humidity readings. As common practice, the thermostat or temperature sensor should measure the temperature of the air being returned to the unit, and not the conditioned air being supplied by the unit. Placing the thermostat or temperature sensor near a return air opening will normally result in optimal unit performance.

Unit Installation

Make sure to have the proper tools at the work site that are needed for unit installation. The following steps are provided to ensure the unit is installed properly to the wall surface, and that the unit will provide years of service with minimal service requirements.

Materials/Tools List

Additional hardware and miscellaneous supplies are needed for installation. These items are field supplied and must be sourced before installation. This list also includes tools needed for installation.

- Appropriate safety gear including gloves and safety glasses
- 5/16" hex bit with drill driver
- Phillips head screwdriver
- Small straight (thermostat) screwdriver
- Tape measure
- Leveling device
- Two (2) tubes of caulk and caulk gun
- Utility knife
- Tools for cutting holes in the wall surface (if needed)
- Electrical components and wiring along with electrical tools
- Multimeter
- Wall fasteners for side flanges, bottom mounting bracket and top rain flashing.
- Duct tape and/or other duct sealing materials.

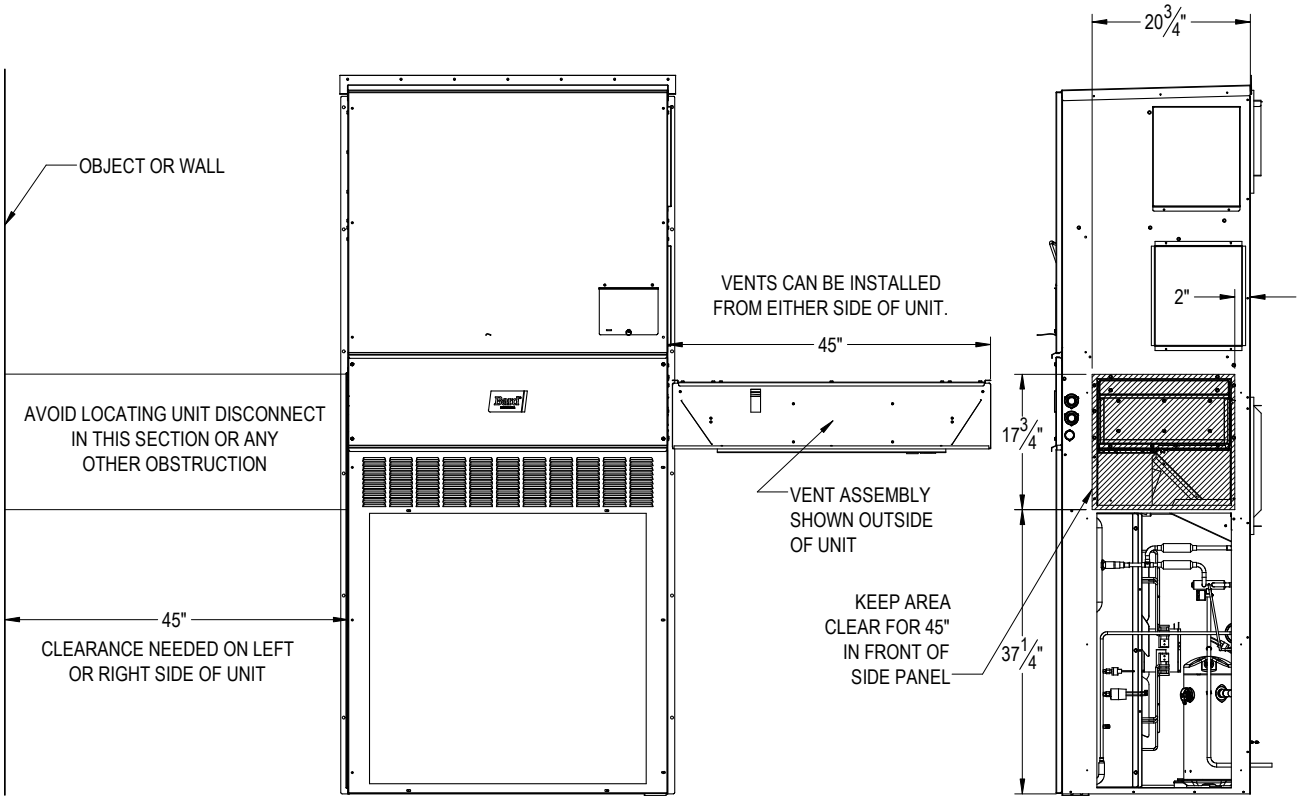
Wall Preparation

1. Two holes for the supply and return air openings must be cut through the wall as shown in Figure 4 on page 17. Be sure the openings are square and level. Follow all clearances including distances to combustible materials and all instructions provided in this manual.
2. Review all electrical requirements provided in this manual and plan out electrical entrances into the building. Also plan electrical conduit routing and thermostat placement, if necessary.
3. Install necessary duct work and prepare the openings for unit installation.
4. Clean the exterior wall where the unit is to be installed and make sure it is able to provide a smooth, level, debris-free surface. Remove all construction debris from the supply, return and electrical hole cutting process.

Wall Mount Installation to Wall Surface

1. Remove packaging from unit and make sure the unit is not damaged before installation. A top rain flashing is supplied for field use and is mounted to the back of the unit for shipping. Remove the rain flashing before locating the unit against the wall. Top rain flashing is required to avoid water entering the area behind the unit that is against the wall. A bottom mounting bracket, attached to the skid for shipping, is provided for ease of installation but is not required. Review all requirements listed on unit labels and on serial plate located on the side of the unit.
2. Locate and mark bolt hole locations and bottom mounting bracket location. Install bottom mounting bracket with field-supplied fasteners to wall if it is to be used (optional). Bracket must be level and installed in the correct location to help support the unit during the installation process (see Figure 14).
3. Position the wall mount unit close to the wall surface where it will be installed. Install rain flashing at the top of the unit facing the wall by hooking the hem bend into the rear bend of the unit top (see Figure 14).
4. Apply a liberal amount of caulk on left and right cabinet side wall mount brackets and back of top rain flashing. Place unit back surface flush against wall. Unit must be level to ensure proper condensate drainage. Optional bottom bracket may be used to help support the unit.
5. Units are secured to the wall by using field-supplied fasteners along each side of the wall mount through the built-in wall mounting brackets. It is the responsibility of the installer to select the proper fastener to secure the unit to the wall based on wall construction and applicable building codes. Typical installations may include 5/16" fasteners with 7/8" diameter flat washers. Be sure unit is securely mounted and all weight-bearing fasteners are attached to the weight supporting structural members of the wall.
6. Apply a bead of caulk between the back of the unit top and the front surface of the top rain flashing (see Figure 14).
7. Connect unit duct work from the inside of the building following all clearances and instructions provided. For additional mounting rigidity, the return air and supply air frames or collars can be drilled and screwed or welded to the structural wall itself (depending upon wall construction). Be sure to use code approved duct tape or other sealing materials to seal the duct work to the unit.
8. On side-by-side installations, maintain a minimum of 20" clearance on both sides to allow access to heat strips and to provide proper airflow to the outdoor coil. Additional clearance may be required to meet local or national codes.

FIGURE 2
Economizer Vent Installation/Removal Clearance Required



MIS-4042 A

TABLE 1
Clearance Required for Service Access and Adequate Condenser Airflow

Model	Left Side	Right Side	Discharge – Front
W3VHY W5VHY	20"	20"	10'

1. For vent installation and removal, one side of the unit requires 45" clearance in the vent area. See Figure 2 for clarity.
2. Bard recommends a minimum clearance of 4" under the unit cabinet for condenser defrost drainage during heat pump operation.

See Specifications Sheet S3629.

TABLE 2
Minimum Clearances Required to Combustible Materials

Model	Supply Air Duct (1st 3')	Cabinet
W3VHY W5VHY	1/4"	0"

FIGURE 3
Unit Dimensions

	Width (W)	Depth (D)	Height (H)	Supply		Return															
				A	B	C	B	E	F	G	I	J	K	L	M	N	O	R	S	T	
W3VHY	42.00	25.52	84.75	9.88	29.88	15.88	29.88	43.88	12.63	39.06	30.06	43.25	26.94	55.59	52.59	8.82	43.00	1.44	16.00	1.88	
W5VHY	42.00	25.52	92.88	9.88	29.88	15.88	29.88	43.88	12.63	45.00	30.06	49.25	35.06	61.72	58.72	8.82	43.00	1.44	16.00	10.00	

All dimensions are in inches. Dimensional drawings are not to scale.

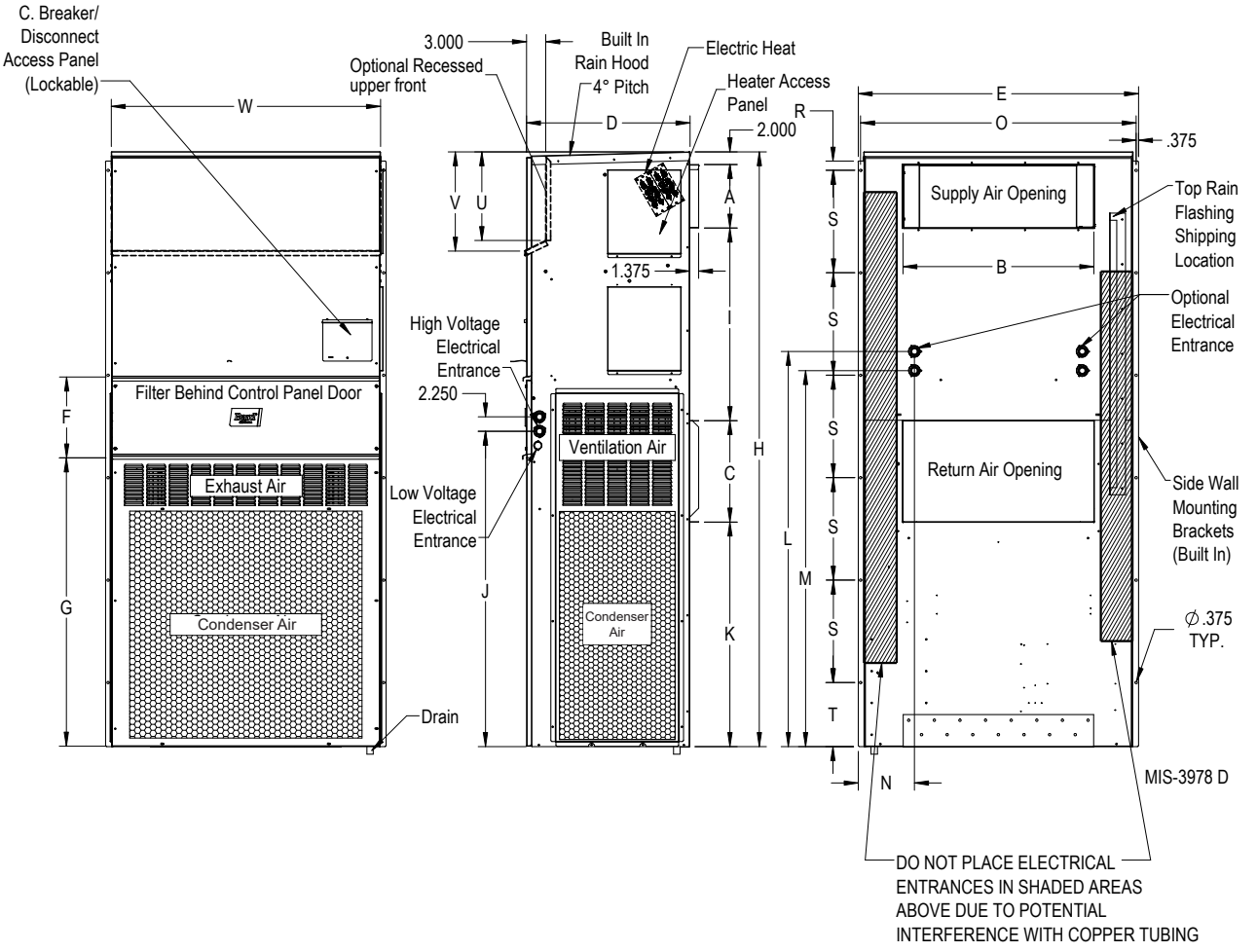
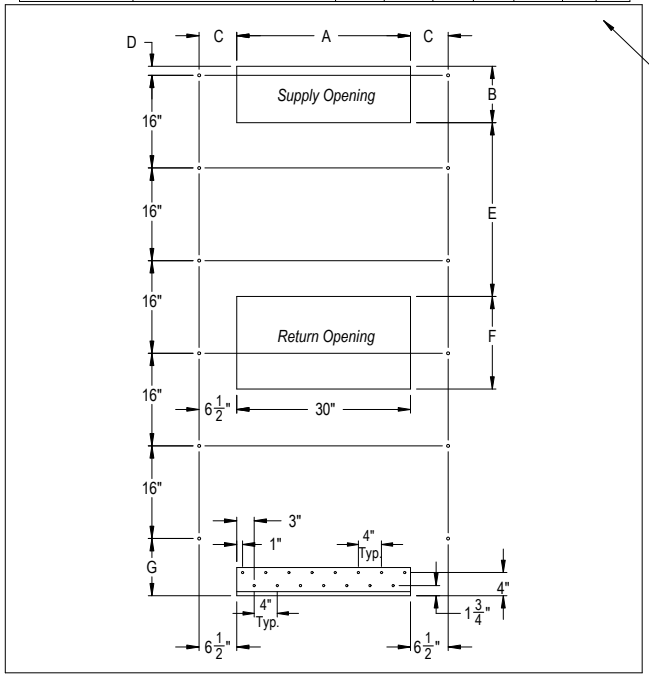
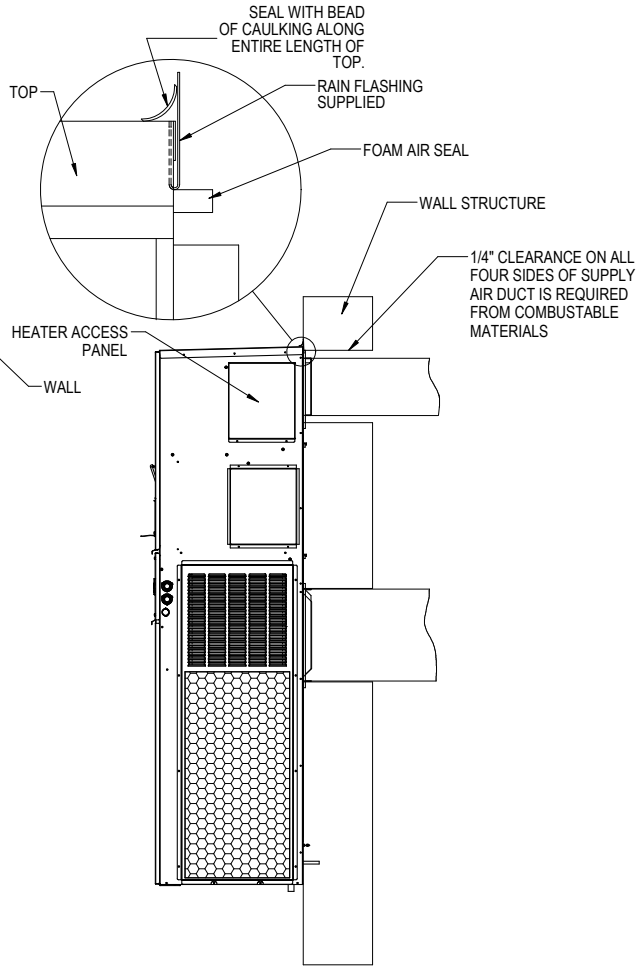


FIGURE 4
Mounting Instructions

UNITS	REQUIRED DIMESIONS	A	B	C	D	E	F	G
W3VHY	REQUIRED DIMESIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	30 1/2	10 1/2	6 1/4	1 1/4	29 3/4	16	1 7/8
	REQUIRED DIMENSIONS TO MAINTAIN RECOMMENDED 1" CLEARANCE FROM COMBUSTIBLE MATERIALS	32	12	5 1/2	2	29	16	1 7/8
W5VHY	REQUIRED DIMESIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	30 1/2	10 1/2	6 1/4	1 1/4	29 3/4	16	10
	REQUIRED DIMENSIONS TO MAINTAIN RECOMMENDED 1" CLEARANCE FROM COMBUSTIBLE MATERIALS	32	12	5 1/2	2	29	16	10



Wall Opening and Hole Location View



Right Side View

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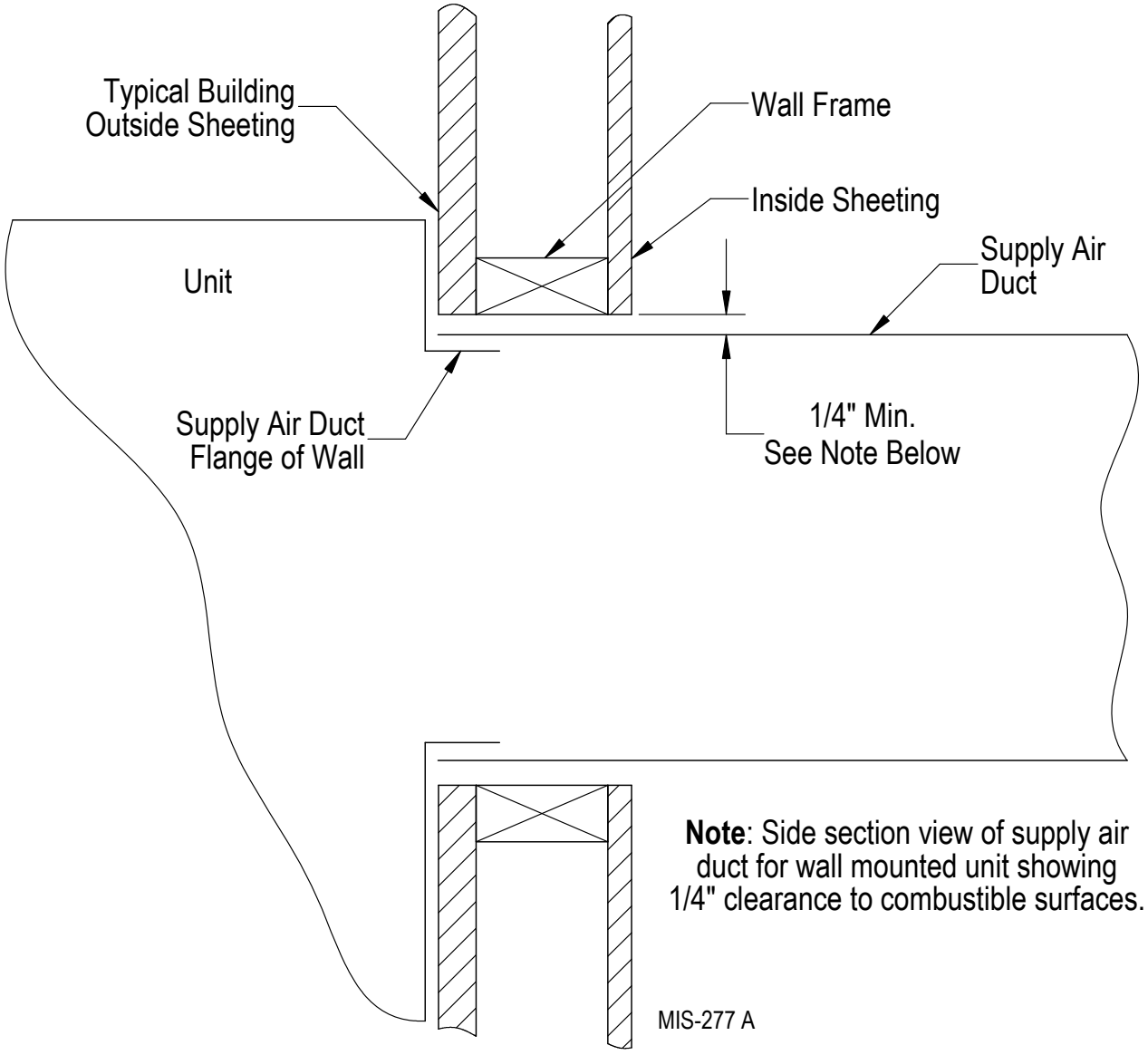
FIGURE 5
Electric Heat Clearance



⚠ WARNING

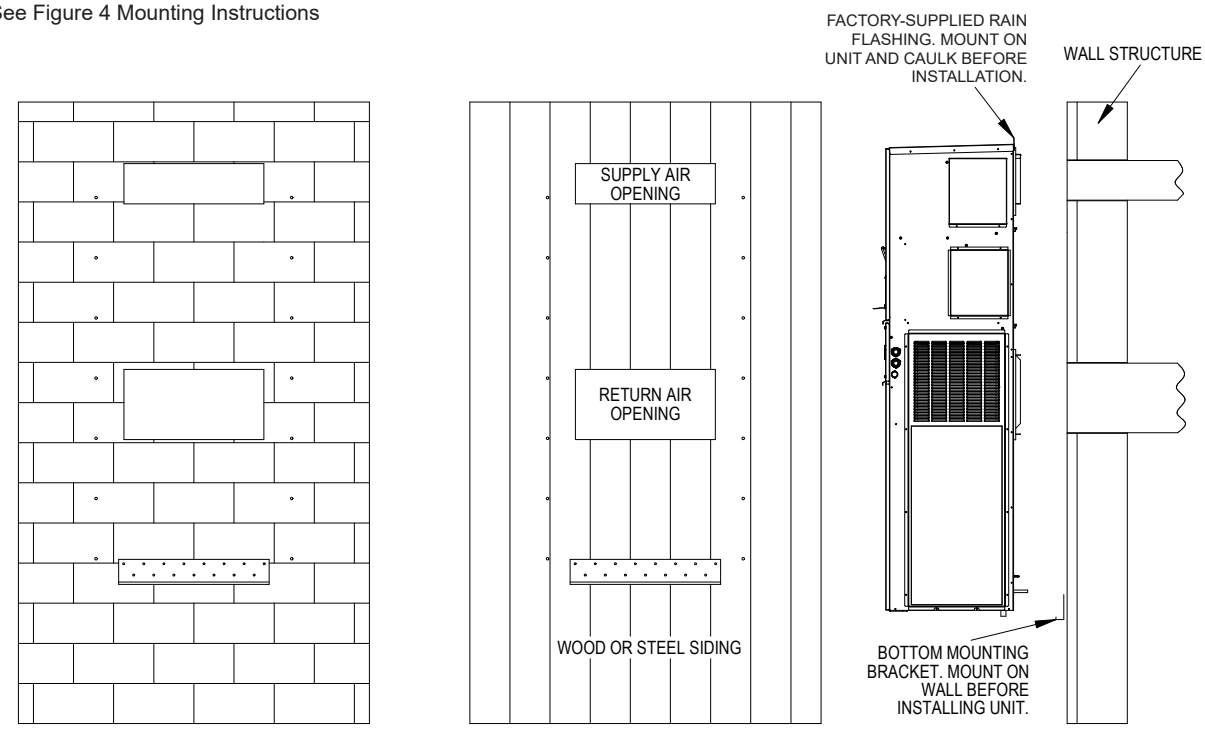
Fire hazard.

Maintain minimum 1/4" clearance between the supply air duct and combustible materials in the first 3' of ducting.

Failure to do so could result in fire causing damage, injury or death.

FIGURE 6
Wall Mounting Instructions

See Figure 4 Mounting Instructions



CONCRETE BLOCK WALL INSTALLATION *WOOD FRAME WALL INSTALLATION* *SIDE VIEW*

MIS-3981 B

FIGURE 7
Wall Mounting Instructions

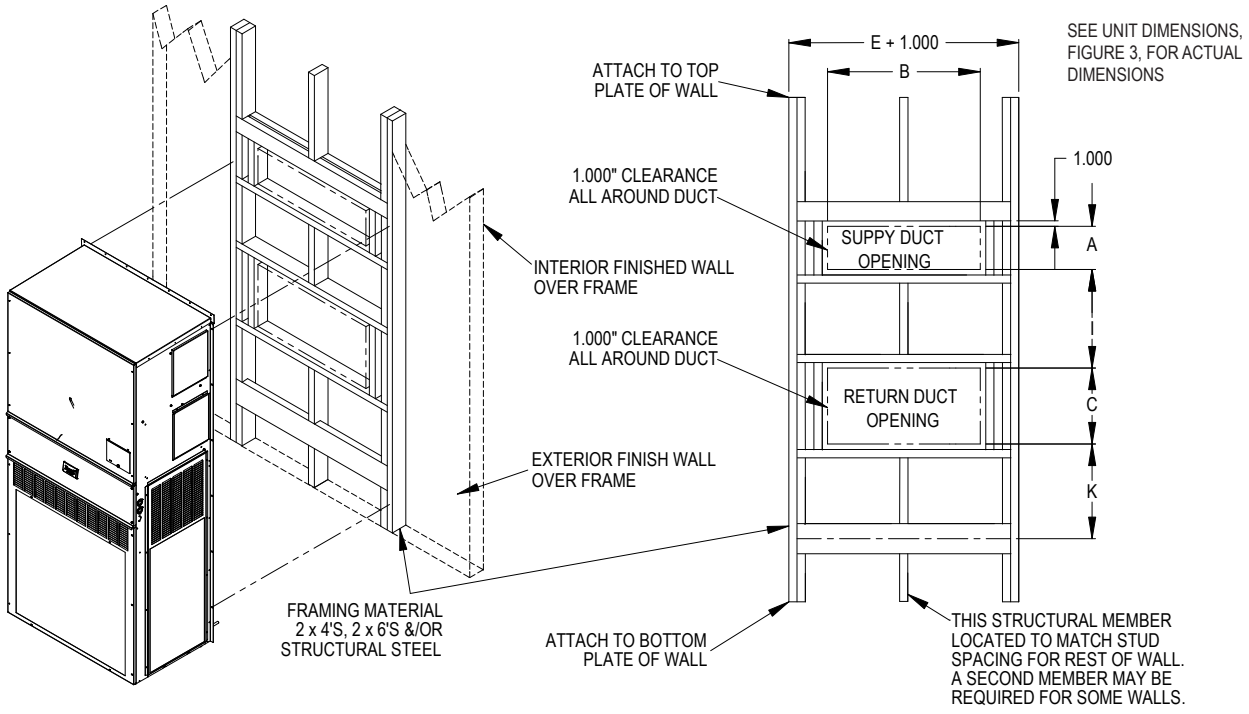


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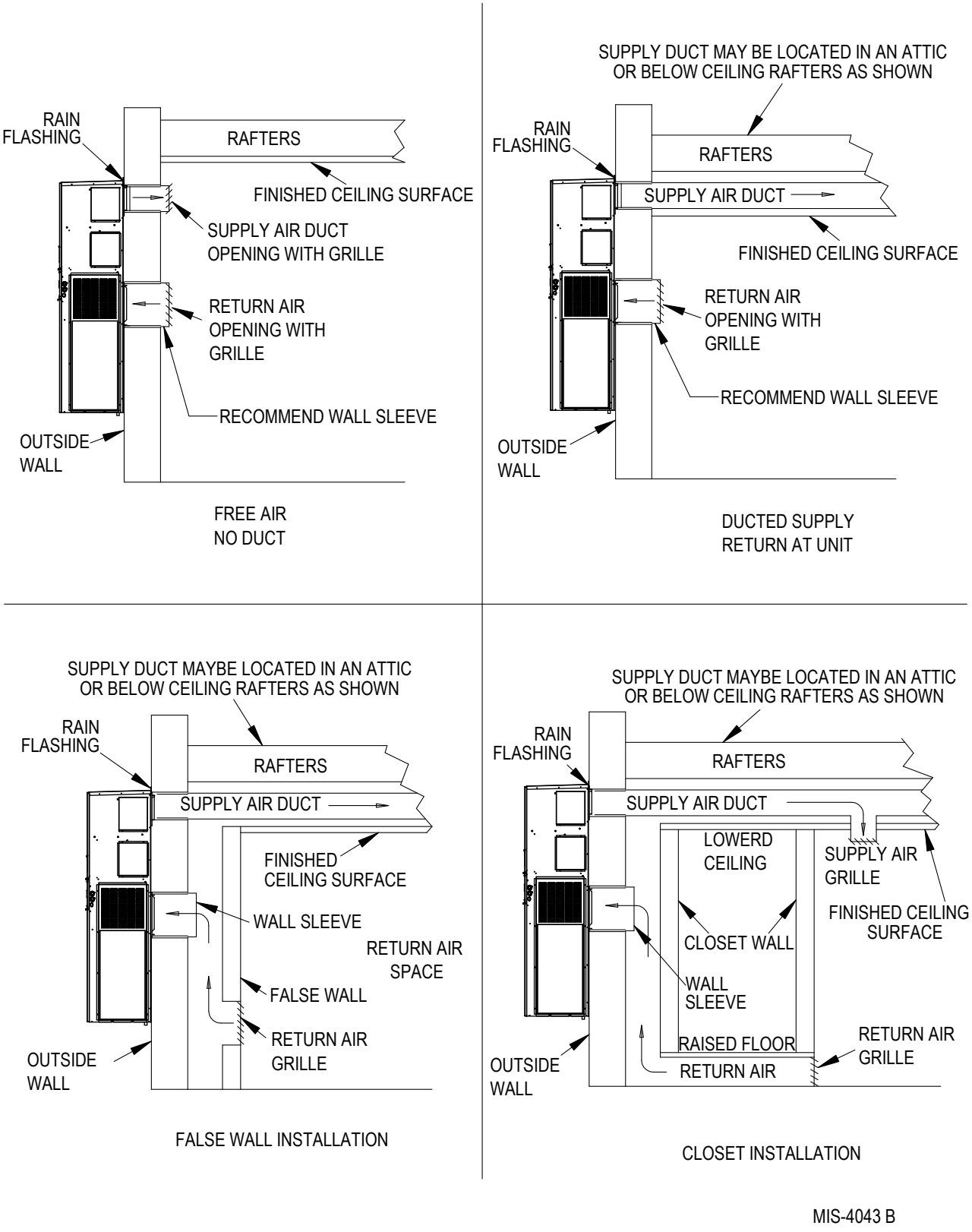
FIGURE 8
Common Wall Mounting Installations



MIS-4043 B

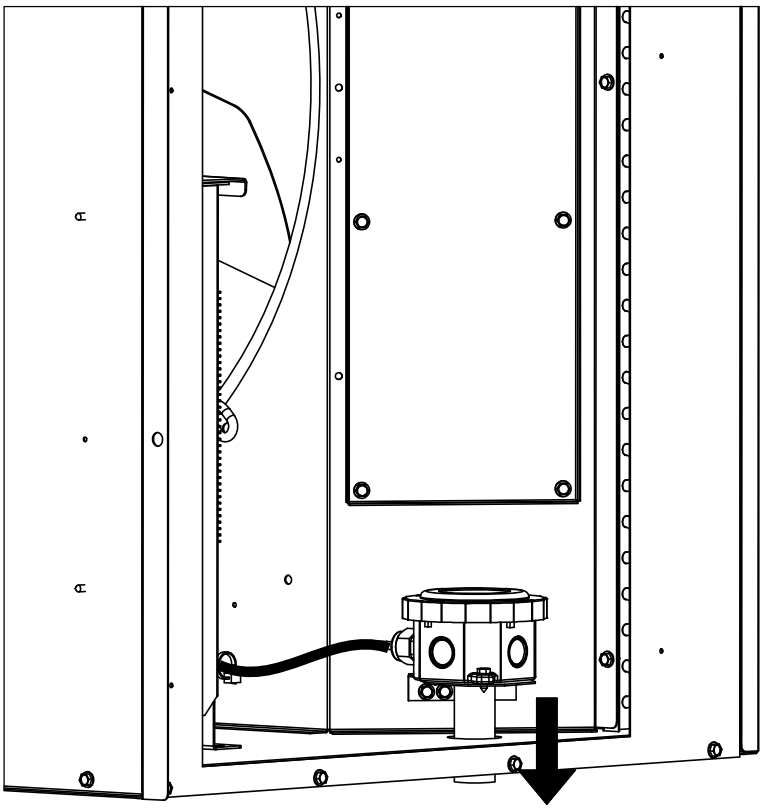
FIGURE 9
Outdoor Thermostat Mounting

Outdoor thermostat must be relocated through the unit base before unit begins operation. This ensures that the sensor is exposed to actual outdoor conditions and not impacted by condenser fan operation. Unit is delivered with the outdoor thermostat in "shipping only" position to prevent damage to sensor during loading and shipping.

To install outdoor thermostat in proper position for unit operation:

1. Remove two (2) screws from mounting bracket holding thermostat in shipping position.
2. Lower sensor assembly to next lower set of mounting holes.
3. Re-install screws into the lower set of holes. In proper position, the sensor extension will protude through the unit base as shown below.

IMPORTANT: *Failure to relocate outdoor sensor may result in inaccurate outdoor temperature readings and improper unit operation.*



SENSOR MUST PROTRUDE THROUGH BASE. FAILURE TO MOVE SENSOR INTO THE PROPER POSITION MAY RESULT IN REDUCED UNIT PERFORMANCE AND ECONOMIZER MALFUNCTION.

IMPORTANT: FAILURE TO RELOCATE OUTDOOR SENSOR MAY RESULT IN INACCURATE OUTDOOR TEMPERATURE READINGS AND PROPER UNIT OPERATION.

MIS-4458

Wiring – Main Power

⚠ WARNING

Electrical shock hazard.

Do not operate this equipment without an earth ground attached and always disconnect the remote electric power supplies before servicing.

Electrical shock can result in serious injury or death.

Main electrical power must be supplied to the unit from a clean, reliable power source. Verify voltage being supplied to the unit is consistent during all times of the day and within the range specified for the unit in the unit specifications and on the unit serial plate. Voltage must be measured at the field power connection point in the unit and while the unit is operating at full load (maximum amperage operating condition).

Refer to the unit serial plate and unit specifications for wire sizing information and maximum fuse or circuit breaker size. Each outdoor 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.

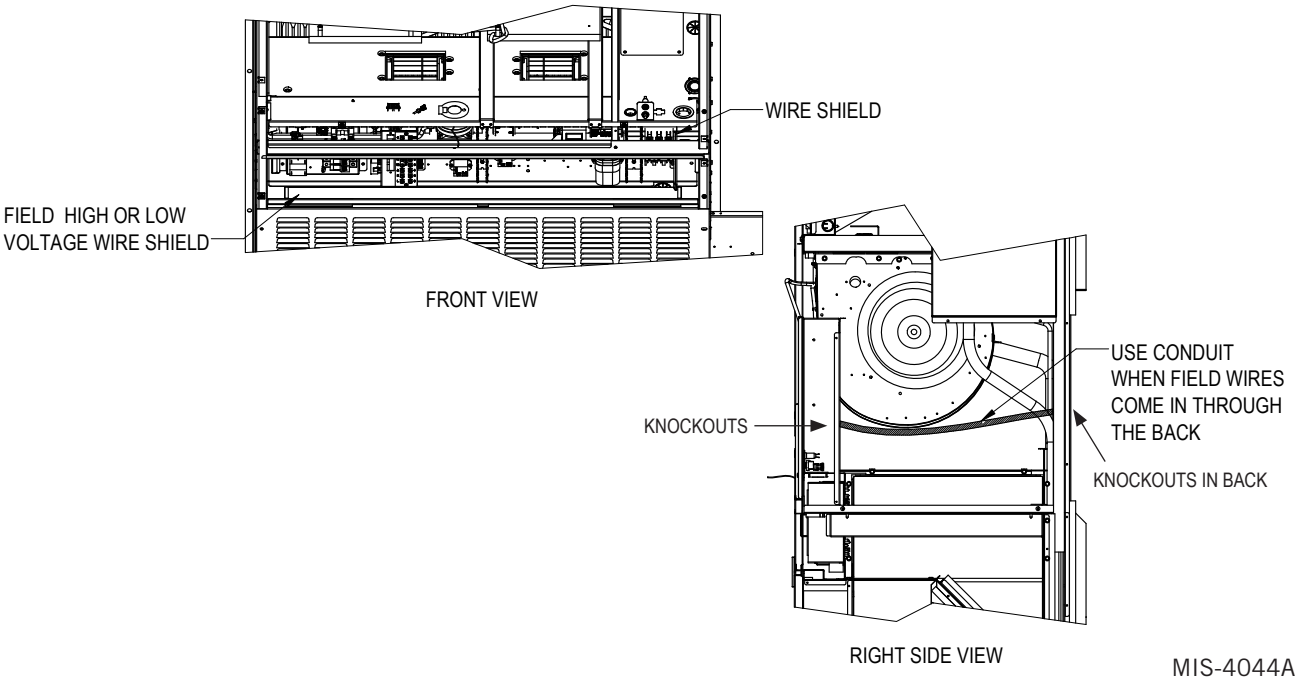
The electrical data on the serial plate, in the unit specifications and also in Table 6 on page 30 list fuse and wire sizes (75°C copper) for all models including the most commonly used heater sizes. Also shown are the number of field power circuits required for the various models with heaters. The unit rating plate lists a "Maximum Time Delay Relay Fuse" or circuit breaker that is to be used with the equipment. The correct type and size must be used for proper circuit protection and also to ensure that there will be no nuisance tripping due to the momentary high starting current of the compressor motor.

High Voltage Connections

1 phase and 3 phase models should be wired following high voltage field wiring practices. The variable speed drive boards handle any phase and power issues by disabling compressor control and providing alarm outputs to the PLD Pro display (see service manual 2100-791).

Route field wires under the field wire shield shown in Figure 10. (The field wire shield can be removed for wire installation.) If field power is supplied to the left side of the unit, run the high voltage wires under the shield shown in Figure 10 and to the right of the wire shield

FIGURE 10
High Voltage Connections



next to the power terminal block and up into the upper control panel where the connections are made. If field power is supplied to the right side of the unit, the low voltage wires can be run under the field wire shield to access the low voltage terminal strip.

When field wires are supplied through the back of the unit, flexible conduit must be extended through the back of the unit and terminate into the knock-outs on the upper control panel (see Figure 10).

Wiring – Low Voltage

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).*

230/208V Wiring

All 230/208V 1 phase and 3 phase equipment have dual primary voltage transformers. All equipment leaves the factory wired on 240V tap. **It is very important that the correct voltage tap is used.** For 208V operation, reconnect from 240V to 208V tap. The acceptable operating voltage range for the 240 and 208V taps are: 240V tap (253 – 216) and 208 tap (215 – 197).

460V Wiring

460V 3 phase equipment use triple primary voltage transformers. All equipment leaves the factory wired on 480V tap. **It is very important that the correct voltage tap is used.** The acceptable operating voltage range for the 480V, 415V and 380V taps are: 480V tap (429 and above), 415 Tap (395 – 428) and 380 tap (below 395).

For low voltage wiring, an 18 gauge copper, color-coded cable is recommended. See Table 3 for more information.

TABLE 3
Thermostat Wire Size

Transformer VA	FLA	Wire Gauge	Maximum Distance In Feet
55	2.3	18 gauge 16 gauge 14 gauge 12 gauge	60 100 160 250

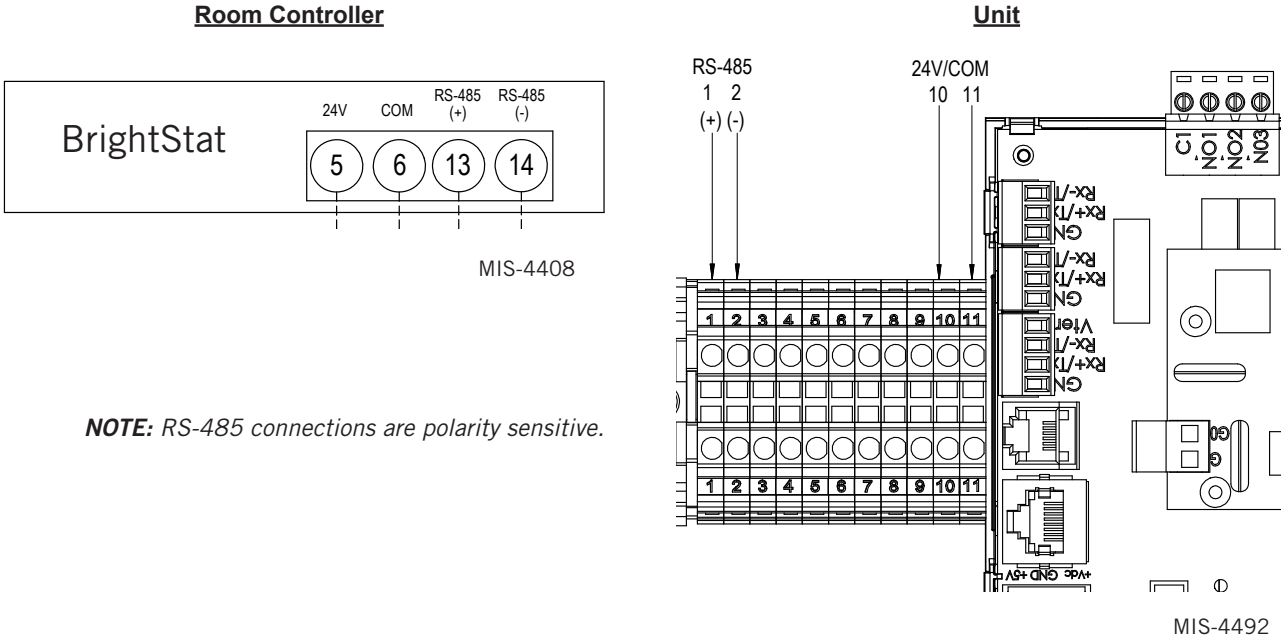
Low Voltage Connections

These units use a 24-volt AC low voltage circuit.

Connect thermostat to unit terminals (see Figure 11):

Terminal #1 Rx/Tx (–) communication
Terminal #2 Rx/Tx (+) communication
Terminal #10 is 24VAC
Terminal #11 is the 24VAC common and is grounded

FIGURE 11
Thermostat Connections



NOTE: *RS-485 connections are polarity sensitive.*

Unit Disable Input/Alarm

The unit is equipped with an input that can be used in conjunction with a smoke detector, fire suppression system or unit disable switch with a dry contact on DI1 (see Figure 12). When this connection is open between DI1 and terminal #5, the wall unit will cease all operations. The alarm can be set to automatically clear when the alarm condition is no longer present, or require manual reset from the end user.

Dehumidification Feature (Optional)

When dehumidification is active, a 3-way valve solenoid is energized. The reheat coil located behind the evaporator coil is then active to reheat the supply air during cooling mode. This allows humidity to be removed from the air entering the unit without a large amount of sensible cooling capacity. During dehumidification, the indoor blower speed is reduced to help with the humidity removal.

If there is a call for dehumidification and comfort cooling at the same time, the call for cooling takes precedence over dehumidification.

Ventilation Features (Optional)

See ventilation instructions provided with unit for low voltage wiring.

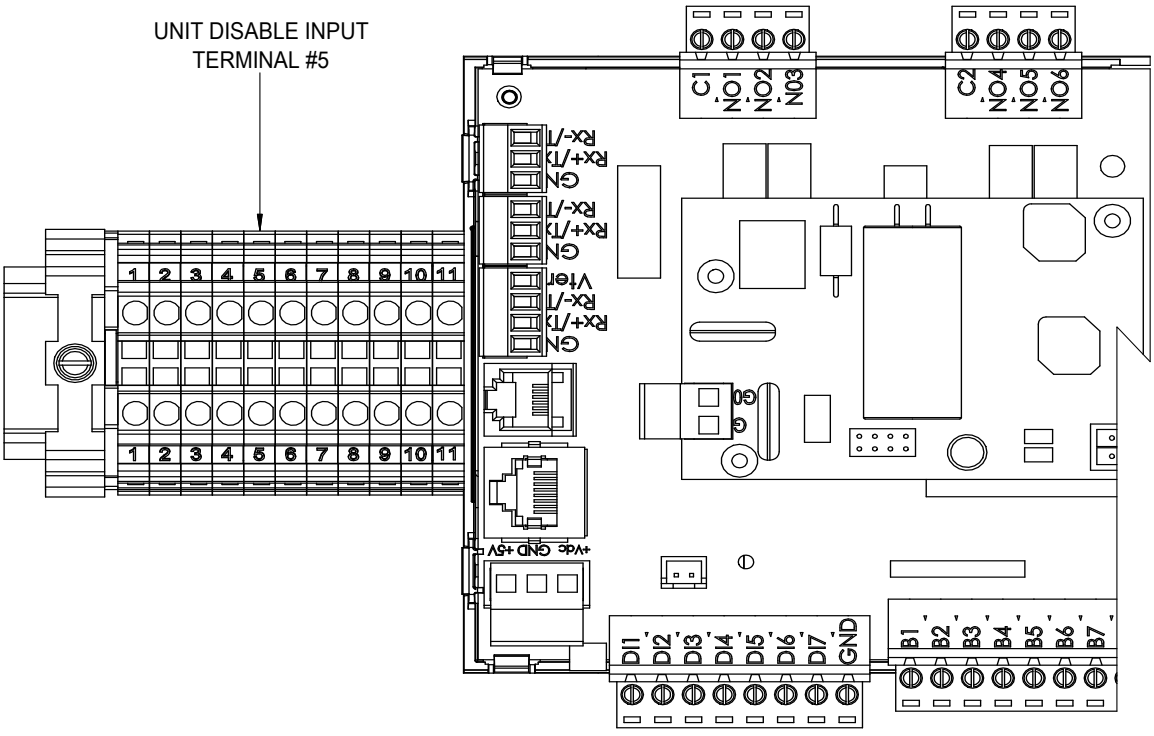
Low Ambient Control (LAC)

The low ambient control utilizes the high pressure transducer that is attached to the disharge line of the system and monitors high side system pressure. Operation of the LAC occurs as discharge pressure drops below 240 psi. LAC operation cycles the condenser fan on/off based on discharge pressure. Fan modulates down to 240 psi.

Freeze Protection

The unit monitors suction pressure to determine a freeze event in cooling mode. If the discharge pressure falls below 93 psi for 5 minutes, the compressor operation is disabled for 5 minutes.

FIGURE 12
Unit Disable Input/Alarm Connection



MIS-4491

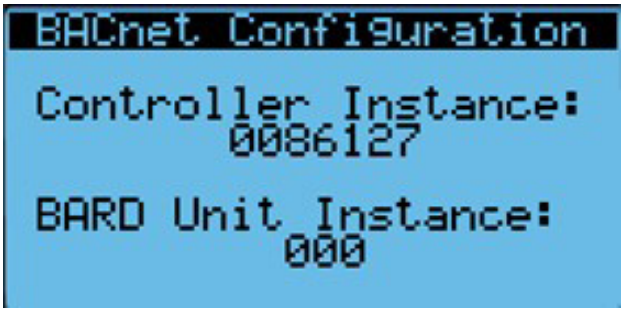
BACnet Set Up

Once the unit is powered, the room controller and unit will need to be configured for BACnet communication.

Room Controller

The instance number is how the room controller is identified and the same instance number must be present in the unit controller. In the unit, the controller instance number can be seen or changed using the PLD-Pro hand-held monitor to view the BACnet configuration screen shown in Figure 13.

FIGURE 13
BACnet Configuration



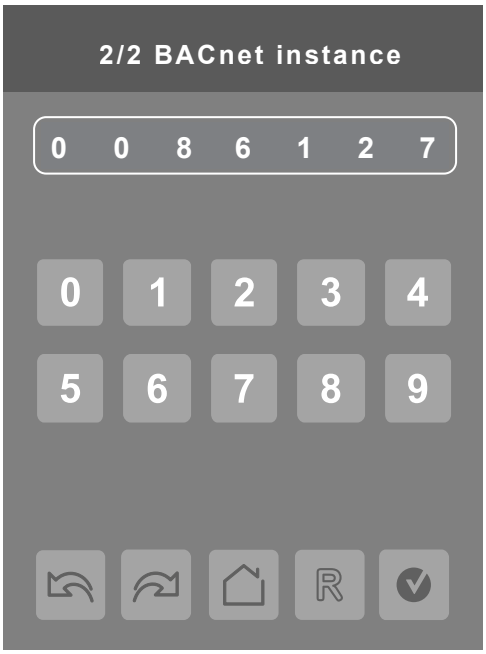
In the room controller, the instance number can be viewed or changed by navigating to the Network screens. Touch and hold the top middle of the screen for 3 seconds. In the menu, select Network and navigate to the screen shown in Figure 14. The room controller instance must be set to the same value as the unit controller, which is 86127 (see Bard manual 2100-681).

The controller instance number in the unit and the instance number in the controller must be the same for the devices to communicate.

Unit Controller

Bard Unit Instance: This is used ONLY if more than one unit/controller combination is utilizing the same RS-485 line. If so, they will a unique number assigned. This is the address for the unit communication. The unit instance is the address that is used to tell the room controller which device it is communicating back to. The default is 000 (see service manual 2100-791).

FIGURE 14
BACnet Instance



Sequence of Operation

Inverter Drive Operation

System operation is variable including fan, blower and compressor. Unit is equipped with an inverter drive module. This drive is connected to the compressor and provides variable control of the compressor which can modulate output from 1,850 RPMs to 7,200 RPMs.

Cooling

When a demand for cooling is present, both the compressor and blower will start. Outdoor fan operation is based on discharge pressure, so a brief delay may occur prior to condenser fan operation. The system is completely variable so the compressor, condenser fan and indoor blower are all capable of modulating. See each component section for operation details. Cooling operation seeks to maintain a space temperature by gradually increasing/reducing refrigeration demand as setpoint is approaching and may satisfy the thermostat call.

Heating

When a demand for heating is present, the unit will operate in heat pump mode. The system will activate the reversing valve that controls heating cycle operation. The system is completely variable so the compressor, condenser fan and indoor blower are all capable of modulating. Blower operation is designed to target a certain discharge pressure in heating, so a brief delay in blower response may occur. See each component section for operating details. Heating operation seeks to maintain a space temperature by gradually increasing/ reducing refrigeration demand as setpoint is approaching and may satisfy the thermostat call. If demand continues to increase, then the unit will continue to increase system output until heat pump alone can not satisfy. In the event that heat pump alone won't approach setpoint, then 1st stage electric heat is engaged.

Low Pressure Bypass Operation

The control has a configurable low pressure bypass time delay to ignore the low pressure input when the compressor starts to operate. This delay (120 to 300 seconds) can be adjusted via the Low Pressure Alarm B5 screen (default is 120 seconds).

After this period expires, the control will then monitor the low pressure transducer to ensure pressure remains above 40psi during compressor operation.

Drive Assembly

High Pressure Switch Operation

A high pressure switch is connected to the inverter drive and when tripped (635-665 psi), the system is immediately shut down. However, the control logic has high pressure mitigation designed to reduce high pressure lockouts. In high ambient or high demand, the compressor output will be gradually reduced to target and maintain a max of 575 psi discharge pressure. This is to allow continued system operation and conditioning to the space in lieu of cycling or locking out.

Discharge Limit Temperature (DLT) Sensor

A discharge limit temperature sensor is connected to the inverter drive. To protect the compressor, the drive will terminate cooling/heating operation if DLT sensor reaches 120°C/250°F.

Operational Mitigations

System operation is designed to provide heating and cooling capacity in undesirable conditions. This may require compressor output to be reduced, but will continue to provide BTUs to the space in lieu of shutting down. These include discharge pressure management during high ambient, drive temp protection and excessive compressor amp draw.

See service manual 2100-791 for details.

Stator Heat

The variable speed compressor comes with built-in stator heat to prevent refrigerant migration. When enabled, no alarms are present and compressor speed is zero when stator heat is active. The compressor drive board provides a low amount of power to energize the motor windings in a manner that does not turn the motor. This energizes the motor windings to generate heat to warm the compressor.

Defrost Cycle

The defrost cycle is controlled by temperature and time on the unit PLC.

When the outdoor temperature is in the lower 40°F temperature range or colder, the outdoor coil temperature is 32°F or below. This coil temperature is sensed by the coil temperature sensor mounted near the bottom of the outdoor coil. Once coil temperature reaches 30°F or below, the coil temperature sensor sends a signal to the PLC and the defrost timer will start accumulating run time.

After 30, 60 or 90 minutes of heat pump operation at 30°F or below, the heat pump control will place the system in the defrost mode.

During the defrost mode, the refrigerant cycle switches back to the cooling cycle, the outdoor motor stops, electric heaters are energized and hot gas passing through the outdoor coil melts any accumulated frost. When the temperature rises to approximately 57°F, the coil temperature sensor will send a signal to the PLC which will return the system to heating operations automatically.

If some abnormal or temporary condition such as a high wind causes the heat pump to have a prolonged defrost cycle, the heat pump control will restore the system to heating operation automatically after 8 minutes.

Vent Connection Plug

All units are equipped with a vent connection in the back of the control panel for different packages to plug in to. This plug is located in the control panel (remove control panel doors to access). If unit is shipped with a factory-installed vent package, it will be plugged in.

Pressure Service Ports

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressure tables covering all models can be found on page 29. It is imperative to match the correct pressure table to the unit by model number. Unit must be operated in test mode with overrides for troubleshooting. Refer to service manual 2100-791 for instructions.

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. See the replacement parts manual for replacement core part numbers.

R-410A Refrigerant Charge

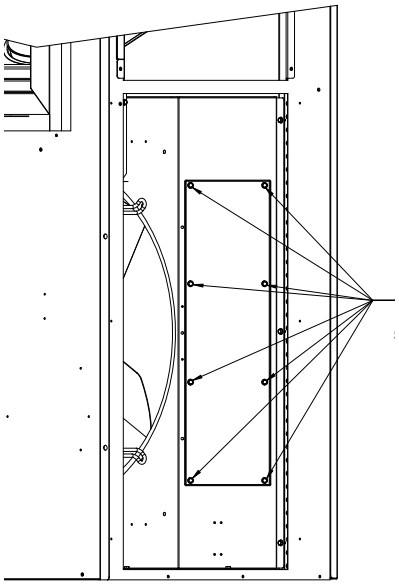
This unit was charged at the factory with the quantity of refrigerant listed on the serial plate. AHRI capacity and efficiency ratings were determined by testing with this refrigerant charge quantity.

The pressure tables on page 29 show nominal pressures for the units. Since many installation specific situations can affect the pressure readings, this information should only be used by certified technicians as a guide for evaluating proper system performance. They shall not be used to adjust charge. If charge is in doubt, reclaim, evacuate and recharge the unit to the serial plate charge.

Condenser Coil Cleaning Access

1. Disconnect all power to the unit.
2. On the side opposite of the compressor, remove the screws holding grille in place (see Figure 16).
3. Remove screws connecting fan shroud access door to fan shroud.
4. Clean condenser coil as thoroughly as needed.
5. Reverse steps to re-install.

FIGURE 16
Condenser Coil Access Removal



Parts hidden for clarity

MIS-4427

Important Cleaning Note

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

Please be aware of the cabinet style of installed unit. The units are manufactured as blow thru or draw thru. This will affect which side of coil will need most attention when cleaning.

Blow Thru

On blow thru units, dirt and debris will collect on the back side of the coil inside the fan shroud area.

Draw Thru

On draw thru units, dirt and debris will collect on the front side of the coil behind the front condenser grille.

TABLE 5A
Rated Output Cooling Pressure – Standard Airflow

Air Temperature Entering Outdoor Coil °F

Model	Return Air Temp (DB/WB)	Pressure	75	80	85	90	95	100	105	110	115	120	125
W3VHY	75/62	Low Side	128	130	131	133	134	136	137	138	139	141	142
		High Side	298	320	343	367	391	416	442	468	495	523	551
	80/67	Low Side	137	139	140	142	143	145	146	148	149	150	152
		High Side	306	329	352	376	401	427	453	480	508	536	565
	85/72	Low Side	142	143	145	147	148	150	152	153	154	156	157
		High Side	316	340	364	389	415	442	469	497	525	555	585
W5VHY	75/62	Low Side	128	130	131	132	133	134	135	136	137	138	138
		High Side	314	333	353	374	397	421	446	472	500	529	560
	80/67	Low Side	137	139	140	141	143	144	145	146	147	147	148
		High Side	322	342	362	384	407	432	457	485	513	543	574
	85/72	Low Side	142	143	145	146	148	149	150	151	152	153	153
		High Side	334	354	375	397	421	447	473	502	531	562	594

Low side pressure ± 4 PSIG
High side pressure ± 10 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operating charge being in the system, the charge should be removed and system evacuated and recharged to serial plate charge weight.

Unit must be operated in test mode with overrides for troubleshooting. Refer to service manual 2100-791 for instructions.

TABLE 5B
Heating Pressure – Standard Airflow

Air Temperature Entering Outdoor Coil °F

Model	Indoor Temperature	Pressure	0	5	10	15	20	25	30	35	40	45	50	55	60	65
W3VHY	70	Low Side	33	41	48	55	63	71	78	86	94	102	110	118	126	135
		High Side	328	333	339	343	348	353	358	362	367	371	376	380	684	388
W5VHY	70	Low Side	41	46	51	56	62	68	74	81	88	95	103	110	118	127
		High Side	303	309	315	320	326	331	337	342	347	352	356	361	365	370

Unit must be operated in test mode with overrides for troubleshooting. Refer to service manual 2100-791 for instructions.

TABLE 6
Electrical Specifications – W*VHY Series

Model	Rated Volts, Hz & Phase	No. Field Power Circuits	Single Circuit		Multiple Circuit			
			① Minimum Circuit Ampacity	② Maximum External Fuse or Circuit Breaker	① Minimum Circuit Ampacity		② Maximum External Fuse or Circuit Breaker	
					Circuit A	Circuit B	Circuit A	Circuit B
W3VHY-R0Z		1	29	35				
③ R05	230/208-60-1	1	55	60				
③ R10	220/200-50-1	1 or 2	81	90	29	52	35	60
④ R15		1 or 2	84	90	32	52	35	60
W3VHY-S0Z		1	22	25				
③ S05	230/208-60-3 ⑤	1	37	40				
③ S09	220/200-50-3 ⑤	1	49	50				
④ S15		1	51	60				
W3VHY-T0Z		1	13	15				
③ T05	460-60-3 ⑤	1	21	25				
③ T09	415/380-50-3 ⑤	1	27	30				
④ T15		1	27	30				
W5VHY-R0Z		1	38	45				
③ R05	230/208-60-1	1 or 2	64	70	38	26	45	30
③ R10	220/200-50-1	1 or 2	90	90	38	52	45	60
④ R15		1 or 2	90	90	38	52	45	60
W5VHY-S0Z		1	27	35				
③ S05	230/208-60-3 ⑤	1	42	45				
③ S09	220/200-50-3 ⑤	1	54	60				
④ S15		1	54	60				
W5VHY-T0Z		1	16	20				
③ T05	460-60-3 ⑤	1	23	25				
③ T09	415/380-50-3 ⑤	1	29	30				
④ T15		1	29	30				

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 5 Kw, 9 Kw and 10 Kw electric heat operation is 1 stage. Electric heat is supplemental to heat pump operation and may operate concurrently.

④ 15 Kw electric heat operation is 2 stage: 10 Kw 1st stage and 5 Kw 2nd stage. 2nd stage electric heat does not operate concurrently with heat pump operation.

⑤ 3-phase equipment uses a Delta configuration (3 power wires and a ground).

NOTE: *The Maximum Overcurrent Protection (MOCP) value listed is the maximum value as per UL 60335 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 60335 allowable MOCP value, but still above the UL 60335 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.*

TABLE 7A
Electric Heat – 60 Hz

Electric Heat Nomenclature	Nominal Kw	Total KW and BTUH @ Field-Supplied Voltage										
		@ 208V ①				@ 230V ①				@ 460V		
		Kw	1- PH Amps	3-PH Amps	BTUH	Kw	1-PH Amps	3-PH Amps	BTUH	Kw	3-PH Amps	BTUH
05	5.0	3.8	18.0	10.4	12,800	4.6	20.0	11.5	15,700	4.6	5.8	15,700
09	9.0	6.8	--	18.7	23,000	8.3	--	20.8	28,300	8.3	10.4	28,300
10	10.0	7.5	36.1	--	25,600	9.2	40.0	--	31,400	--	--	--
15	15.0	11.3	54.1	31.2	38,400	13.8	60.0	34.6	47,100	13.8	17.3	47,100

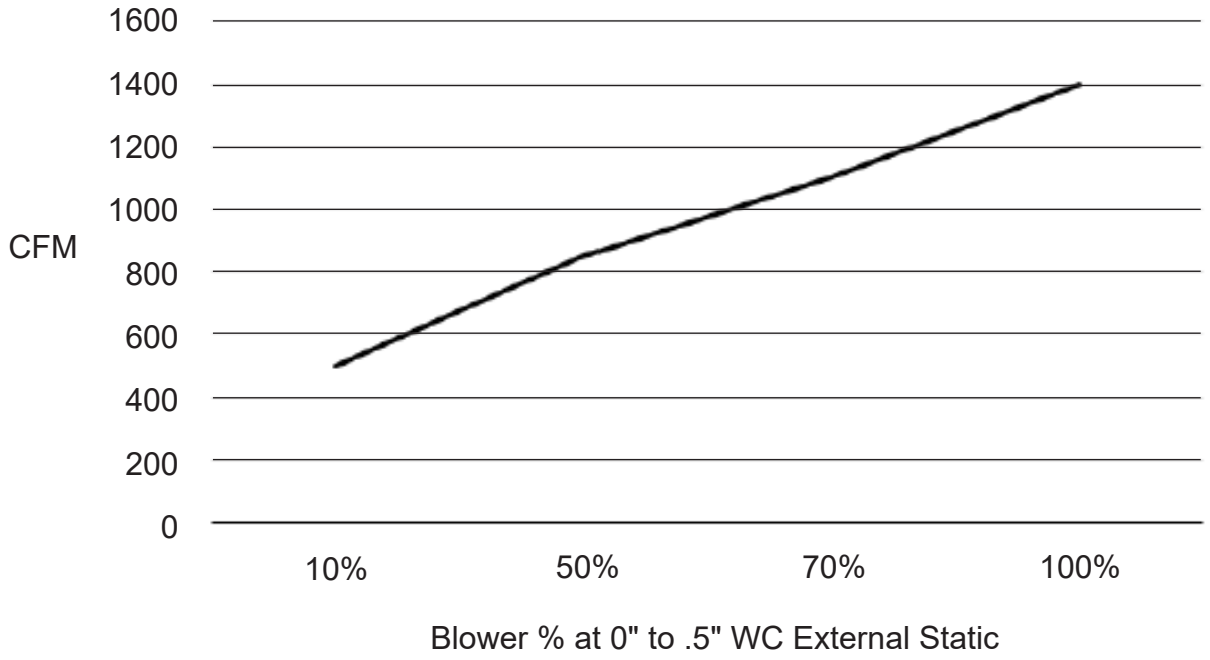
① Listed electric heaters are available for 230/208V units only.

TABLE 7B
Electric Heat – 50 Hz

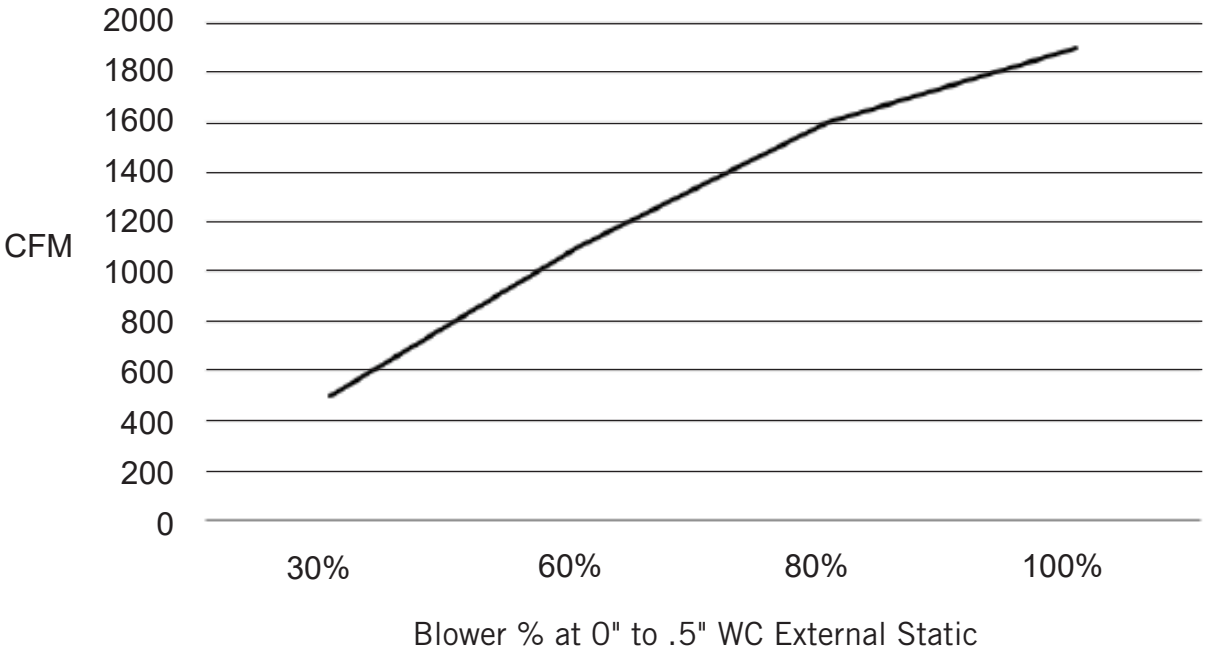
Electric Heat Nomenclature	Nominal Kw	Total KW and BTUH @ Field-Supplied Voltage										
		@ 200V ①				@ 220V ①				@ 415V		
		Kw	1-PH Amps	3-PH Amps	BTUH	Kw	1-PH Amps	3-PH Amps	BTUH	Kw	3-PH Amps	BTUH
05	5.0	3.5	17.3	10.0	11,800	4.2	19.1	11.0	14,300	3.8	5.2	12,800
09	9.0	6.2	--	17.9	21,200	7.6	--	19.8	25,800	6.8	9.4	23,000
10	10.0	6.9	34.5	--	23,500	8.4	38.2	--	28,700	--	--	--
15	15.0	10.4	51.8	29.9	35,300	12.6	57.3	33.1	43,000	11.3	15.7	38,400

① Listed electric heaters are available for 200/200V units only.

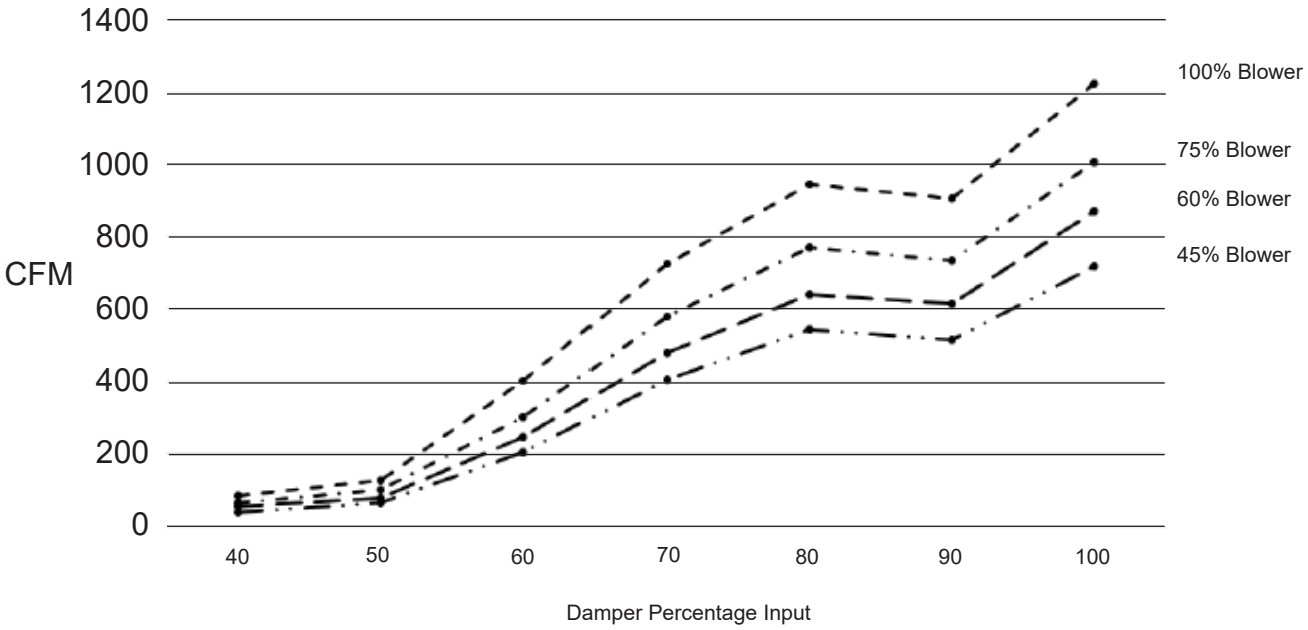
GRAPH 1
W3VHY Indoor Blower Performance



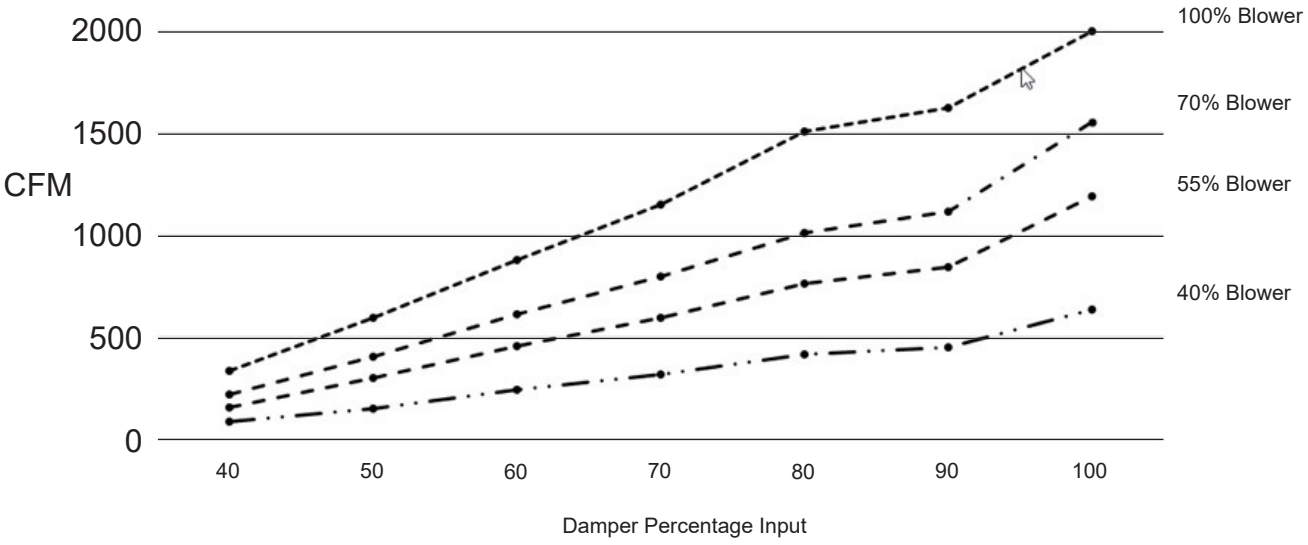
GRAPH 2
W5VHY Indoor Blower Performance



GRAPH 3
W3VHY Economizer Ventilation Airflow



GRAPH 4
W5VHY Economizer Ventilation Airflow



Supplemental Instructions

Models:

W3VHYD W5VHYD

This model provides a unique dehumidification circuit for periods of low outdoor ambient temperature and high indoor humidity conditions.

Refer to Specification Sheet S3629 for the standard features of the base units and this manual for electrical data.

Dehumidification Circuit

The dehumidification circuit incorporates an independent heat exchanger coil in the supply air stream. This coil reheats the supply air after it passes over the cooling coil without requiring the electric resistance heater to be used for reheat purposes. This results in very high mechanical dehumidification capability from the air conditioner on demand without using electric resistance reheat.

The dehumidification refrigerant reheat circuit is controlled by a dehumidification valve directing the refrigerant gas to the normal condenser during periods when standard air conditioning is required. During periods of time of low ambient temperature (approximately 65° to 75° outdoor) and high indoor humidity, a humidistat senses the need for mechanical dehumidification. It then energizes both the compressor circuit and the dehumidification 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 system condenser for further heat transfer. When the humidistat is satisfied, the system automatically switches off. The result is separate humidity control at minimum operating cost.

Dehumidification Sequence of Operation

Dehumidification is controlled through the thermostat (if capable) or through a separate humidistat. On a call for dehumidification mode of operation, the compressor and dehumidification valve of the unit are energized to provide dehumidification. Dehumidification will continue until the humidistat is satisfied.

A cooling call takes precedence over a dehumidification call for as long as the cooling call is present.

A heating call takes precedence over a dehumidification call unless an occupied signal is received. When occupied, a dehumidification call takes precedence over first stage heating. A second stage heating call takes precedence over a dehumidification call even when occupied.

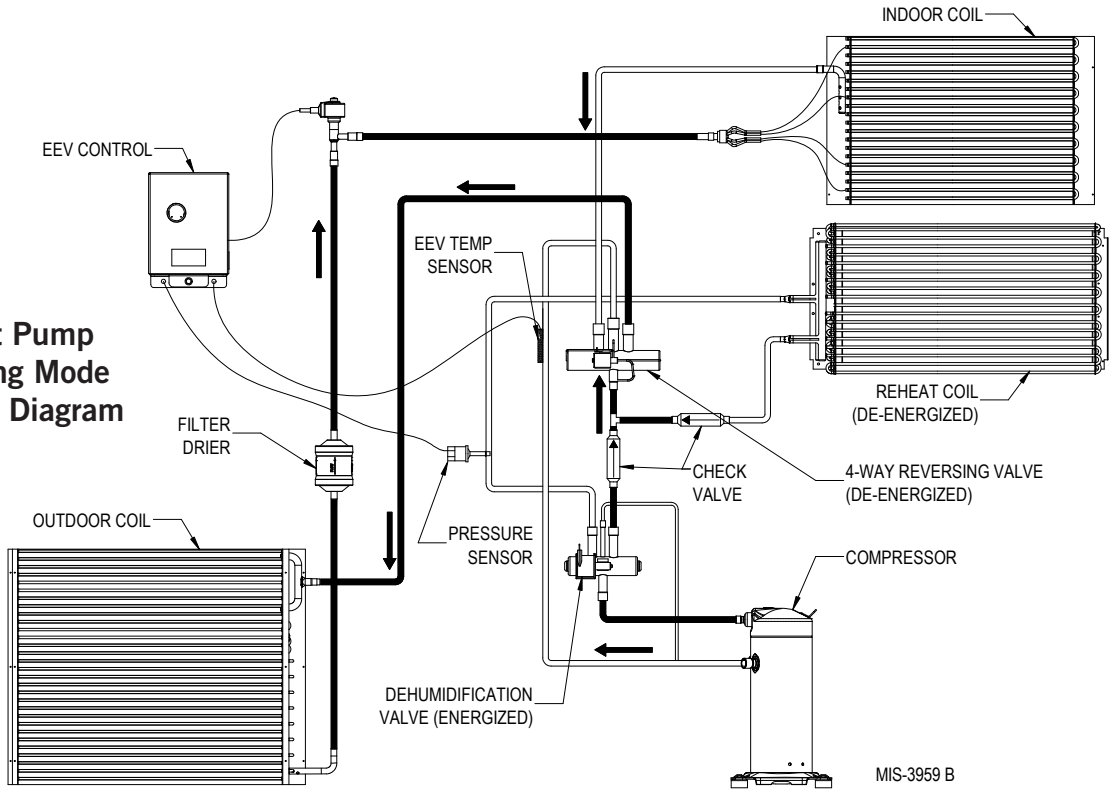
Bard SINCE 1914
Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

www.bardhvac.com

Manual: 7960-949
Supersedes: ***NEW***
Date: 11-28-23

Heat Pump Cooling Mode Circuit Diagram



Heat Pump Dehumidification Mode Circuit Diagram

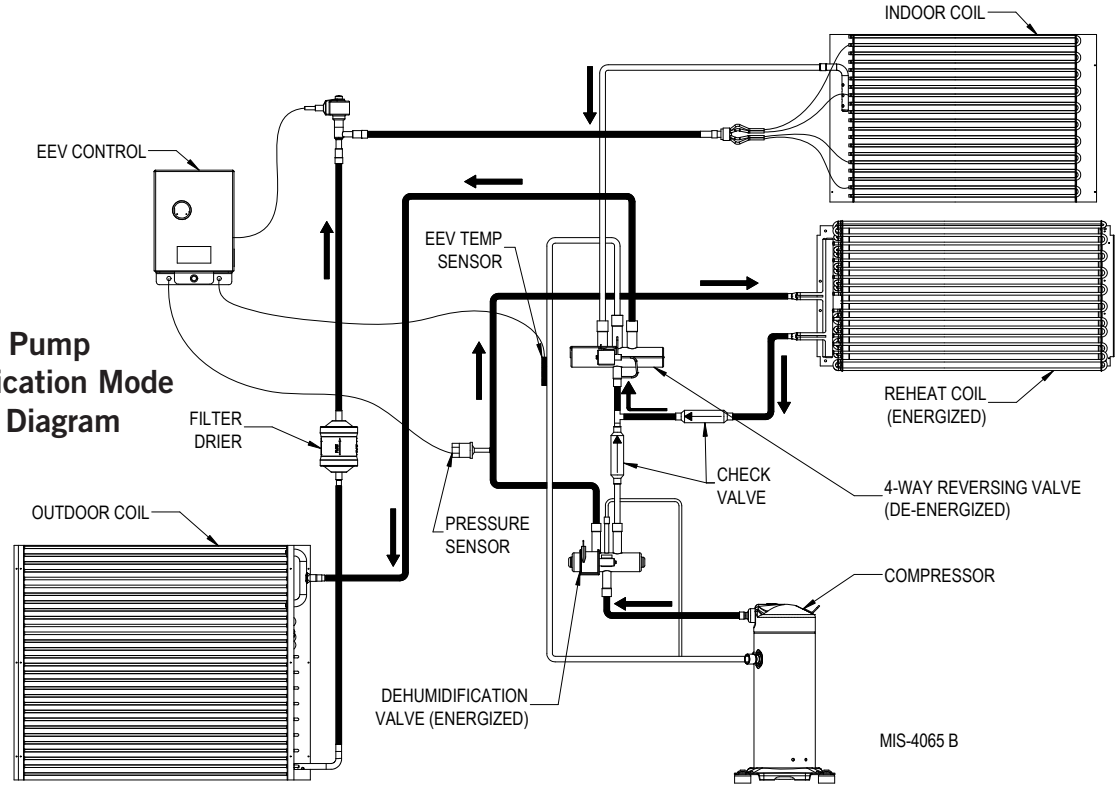


TABLE 1
W3VHYD Cooling and Dehumidification Application Data[1]

DB/WB[2]	OD Temp	65°F[3]		75°F		85°F		95°F	
	Mode	A/C	Dehum	A/C	Dehum	A/C	Dehum	A/C	Dehum
75/64.1 (55% RH)	Total Cooling Btuh	40,800	17,300	38,700	14,700	36,300	10,500	33,800	4,700
	Sensible Btuh	26,900	4,700	26,100	2,200	25,000	(1,100)	23,900	(5,100)
	Latent Btuh	13,900	12,600	12,600	12,500	11,300	11,600	9,900	9,800
	Lbs. H2O/hr	13.1	11.9	11.9	11.8	10.7	10.9	9.3	9.2
	Supply Air DB	51.8	69.7	52.5	72.8	53.4	76.7	54.3	81.5
	Supply Air WB	50.9	56.6	51.6	57.8	52.3	59.7	53.1	62.2
	Suction PSIG[4]	126	250	127	153	129	103	132	100
	Discharge PSIG[4]	259	130	293	252	340	333	401	373
75/65.5 (60% RH)	Total Cooling Btuh	41,600	18,400	39,500	16,500	37,200	11,600	34,700	5,800
	Sensible Btuh	25,600	4,200	24,700	2,300	23,700	(1,500)	22,600	(5,500)
	Latent Btuh	16,000	14,200	14,800	14,200	13,500	13,100	12,100	11,300
	Lbs. H2O/hr	15.1	13.4	14.0	13.4	12.7	12.4	11.4	10.7
	Supply Air DB	53.0	70.3	53.7	72.8	54.6	77.3	55.5	82.1
	Supply Air WB	52.2	57.6	52.9	58.7	53.6	60.7	54.4	63.2
	Suction PSIG[4]	129	252	130	126	132	104	134	102
	Discharge PSIG[4]	261	130	295	274	342	333	403	373
75/66.7 (65% RH)	Total Cooling Btuh	42,500	19,500	40,400	17,500	38,100	12,700	35,500	6,900
	Sensible Btuh	24,300	3,800	23,400	1,900	22,400	(1,900)	21,300	(6,000)
	Latent Btuh	18,200	15,700	17,000	15,600	15,700	14,600	14,200	12,900
	Lbs. H2O/hr	17.2	14.8	16.0	14.7	14.8	13.8	13.4	12.2
	Supply Air DB	54.2	71.0	54.9	73.4	55.8	78.0	56.7	82.8
	Supply Air WB	53.5	58.6	54.2	59.8	54.9	61.7	55.7	64.3
	Suction PSIG[4]	132	253	133	127	135	106	137	103
	Discharge PSIG[4]	263	130	297	275	344	333	405	373
75/68 (70% RH)	Total Cooling Btuh	43,400	20,500	41,300	18,600	39,000	13,800	36,400	8,000
	Sensible Btuh	23,000	3,400	22,100	1,400	21,100	(2,400)	20,000	(6,400)
	Latent Btuh	20,400	17,100	19,200	17,200	17,900	16,200	16,400	14,400
	Lbs. H2O/hr	19.2	16.1	18.1	16.2	16.9	15.3	15.5	13.6
	Supply Air DB	55.4	71.6	56.1	74.1	57.0	78.6	57.9	83.4
	Supply Air WB	54.8	59.7	55.5	60.8	56.2	62.8	57.0	65.3
	Suction PSIG[4]	135	255	136	129	138	107	140	105
	Discharge PSIG[4]	265	130	298	275	346	333	406	373

[1] Values listed are with ventilation package disabled.

[2] Return air temperature °F @ Default airflow (800 CFM) for AC tests and Balanced Climate airflow (560 CFM) for dehumidification tests.

[3] Below 50°F, unit requires a factory- or field-installed low ambient control.

[4] Suction pressure +/- 4 psi, Discharge pressure +/- 10 psi.

TABLE 2
W5VHYD Cooling and Dehumidification Application Data[1]

DB/WB[2]	OD Temp	65°F[3]		75°F		85°F		95°F	
	Mode	A/C	Dehum	A/C	Dehum	A/C	Dehum	A/C	Dehum
75/64.1 (55% RH)	Total Cooling Btuh	60,700	38,600	58,500	26,000	55,600	16,200	52,000	9,000
	Sensible Btuh	40,600	15,200	39,500	8,600	38,200	2,800	36,700	(2,200)
	Latent Btuh	20,100	23,400	19,000	17,400	17,400	13,400	15,300	11,200
	Lbs. H2O/hr	19.0	22.1	17.9	16.4	16.4	12.6	14.4	10.6
	Supply Air DB	52.3	63.3	52.9	68.5	53.6	73.1	54.5	77.1
	Supply Air WB	51.3	54.2	51.9	56.9	52.6	59.3	53.4	61.4
	Suction PSIG[4]	129	120	132	126	135	131	138	134
	Discharge PSIG[4]	263	255	301	286	342	321	387	360
75/65.5 (60% RH)	Total Cooling Btuh	61,800	40,200	59,600	29,400	56,700	17,800	53,100	10,700
	Sensible Btuh	38,400	14,100	37,200	9,000	36,100	1,700	34,600	(3,300)
	Latent Btuh	23,400	26,100	22,400	20,400	20,600	16,100	18,500	14,000
	Lbs. H2O/hr	22.1	24.6	21.1	19.2	19.4	15.2	17.5	13.2
	Supply Air DB	53.6	64.3	54.2	68.1	54.9	74.0	55.8	78.1
	Supply Air WB	52.7	55.2	53.3	57.3	54.0	60.4	54.8	62.5
	Suction PSIG[4]	132	123	135	128	138	134	141	137
	Discharge PSIG[4]	265	258	303	286	344	324	389	363
75/66.7 (65% RH)	Total Cooling Btuh	62,900	41,900	60,700	31,100	57,800	19,400	54,200	12,300
	Sensible Btuh	36,200	13,000	35,000	7,900	33,900	600	32,400	(4,500)
	Latent Btuh	26,700	28,900	25,700	23,200	23,900	18,800	21,800	16,800
	Lbs. H2O/hr	25.2	27.3	24.2	21.9	22.5	17.7	20.6	15.8
	Supply Air DB	54.9	65.3	55.5	69.1	56.2	75.0	57.1	79.1
	Supply Air WB	54.2	56.3	54.7	58.3	55.4	61.4	56.2	63.5
	Suction PSIG[4]	135	126	138	131	141	136	144	140
	Discharge PSIG[4]	267	261	305	288	346	326	390	365
75/68 (70% RH)	Total Cooling Btuh	64,000	43,500	61,800	32,700	58,900	21,100	55,300	13,900
	Sensible Btuh	34,000	11,800	32,800	6,800	31,700	(600)	30,200	(5,600)
	Latent Btuh	30,000	31,700	29,000	25,900	27,200	21,700	25,100	19,500
	Lbs. H2O/hr	28.3	29.9	27.4	24.4	25.7	20.5	23.7	18.4
	Supply Air DB	56.2	66.3	56.8	70.1	57.5	76.0	58.4	80.0
	Supply Air WB	55.6	57.3	56.1	59.4	56.8	62.5	57.6	64.5
	Suction PSIG[4]	139	129	142	133	144	139	147	143
	Discharge PSIG[4]	268	263	306	291	348	329	392	368

[1] Values listed are with ventilation package disabled.

[2] Return air temperature °F @ Default airflow (800 CFM) for AC tests and Balanced Climate airflow (560 CFM) for dehumidification tests.

[3] Below 50°F, unit requires a factory- or field-installed low ambient control.

[4] Suction pressure +/- 4 psi, Discharge pressure +/- 10 psi.

TABLE 3
Optional Accessories

		W3VHYDR	W3VHYDS	W3VHYDT	W5VHYDR	W5VHYDS	W5VHYDT
Heater Kits	EHVH036A-R05	X					
	EHVH036A-R10	X					
	EHCH036A-A15	X					
	EHVH036A-S05		X				
	EHVH036ADS09		X				
	EHVH036A-S15		X				
	EHCH036A-C05			X			
	EHCH036A-C09			X			
	EHCH036A-C15			X			
	EHVH060ADR05				X		
	EHVH060ADR10				X		
	EHVH060ADR15				X		
	EHVH060A-S05					X	
	EHCH060A-B09					X	
	EHCH060A-B15					X	
	EHCH060A-C05						X
	EHCH060A-C09						X
	EHCH060A-C15						X
Circuit Breaker (WMCB)	WMCBC-05A	X					
	WMCBC-04B		X				
	WMCBC-06C			X			X
	WMCBC-08A				X		
	WMCBC-05B					X	

TABLE 4
Electrical Specifications – Dehumidification Models

Model	Rated Volts & Phase	No. Field Power Circuits	Single Circuit		Multiple Circuit			
			① Minimum Circuit Ampacity	② Maximum External Fuse or Circuit Breaker	① Minimum Circuit Ampacity		② Maximum External Fuse or Circuit Breaker	
					Circuit A	Circuit B	Circuit A	Circuit B
W3VHYMA0Z	230/208-1	1	30	35				
A05		1	56	60				
A10		1 or 2	82	90	30	52	35	60
A10		1 or 2	86	90	34	52	35	60
W3VHYMB0Z	230/208-3	1	24	30				
B05		1	39	40				
B09		1	51	60				
B15		1	53	60				
W3VHYMC0Z	460-3	1	14	20				
C05		1	21	25				
C09		1	27	30				
C15		1	27	30				
W5VHYDA0Z	230/208-1	1	40	50				
A05		1 or 2	66	70	40	26	50	30
A10		1 or 2	92	100	40	52	50	60
A15		1 or 2	92	100	40	52	50	60
W5VHYDB0Z	230/208-3	1	29	35				
B05		1	44	45				
B09		1	56	60				
B15		1	56	60				
W5VHYDC0Z	460-3	1	16	20				
C05		1	24	25				
C09		1	30	30				
C15		1	30	30				

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.

NOTE: *The Maximum Overcurrent Protection (MOCP) value listed is the maximum value as per UL 60335 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 60335 allowable MOCP value, but still above the UL 60335 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.*

Bard®
SINCE 1914
Climate Control Solutions

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 or your contractor's invoice, bill of sale, or similar document is sufficient at time of warranty claim. This must be registered within 90 days of installation. 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 Bard; improper installation (including over or under sizing), improper repairs, or servicing; or improper parts and accessories not supplied by Bard.
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, 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 coils and replacement of filters, nozzles and other consumable parts).
2. Ensuring that the instruction manual is followed for care and use of your product.
3. Ensuring that your product is installed by a competent, qualified contractor, following all local and national codes, and industry standards.

What Bard Will Do About A Defect:
Bard 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.

Defective parts must be supplied to a Bard distributor who will then submit a parts warranty claim form. Credits are issued to the Bard distributor.

Bard 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). 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
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.

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

Model Number Series:	— Number of Years from Installation Date ① —			
	Compressor ④	Sealed System Components ②④⑤	All Other Functional Parts ③	Heat Exchangers
AIR CONDITIONERS W12A, W18A, W24A, W30A, W36A, W42A, W48A, W60A, W72A, W090A, W120A, W150, W180A, W18L, W24L, W30L, W36L, W3SA, W4SA, W5SA, Q36A, Q42A, Q48A, I30A, I36A, I42A, I48A, I60A	5	5	5	N/A
AIR SOURCE HEAT PUMPS 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, Q43H, Q48H, I30H, I36H, I42H, I48H, I60H, I36Z, I48Z, I60Z	5	5	5	N/A
ENVIRONMENTAL CONTROL UNITS W6RV, W6LV	5	5	1	N/A
AGRICULTURAL UNITS A36C and all HVAC equipment used in this application.	5	5	1	N/A
EQUIPMENT SHELTER UNITS MULTI-TEC, MEGA-TEC, FUSION-TEC, and all HVAC equipment used in this application.	5	5	1	N/A
GEOTHERMAL/WATER SOURCE HEAT PUMPS QW2S, QW3S, QW4S, QW5S, QC50 (No Compressor)	5	5	5	N/A
GAS/ELECTRIC WALL-MOUNT W24G, W30G, W36G, W42G, W48G, W60G, WG3S, WG4S, WG5S	5	5	5	10
ACCESSORIES Factory/Field Installed Bard Ventilation and Heater Packages, Bard branded Thermostats/ Temperature Controllers, UV-C LED Light Kits, LC6000, LV1000, MC4002, DC3003, TEC40, BG1000, PGD, PGDX, MC5300, MC5600, Humidistats, C02 Controllers, add-on controller/thermostat cards and all other field-installed accessories not listed separately	N/A N/A N/A N/A	N/A N/A N/A N/A	5 5 1 1	N/A N/A N/A 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, agricultural 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, agricultural use, and similar applications. This also applies to all OTR (over the road) applications.

④ 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.

⑤ 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 for additional information regarding warranty and product information.

Bard®
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Climate Control Solutions

Literature Assembly
911-0870-2
BOOK 2 OF 2

Contains the following:

2100-791	Unit Service Instructions
2110-1577	Replacement Parts Manual

SERVICE INSTRUCTIONS

Variable Speed WH Series
Wall Mount Heat Pump

Models:

W3VHY-R	W3VHYDR	W5VHY-R	W5VHYDR
W3VHY-S	W3VHYDS	W5VHY-S	W5VHYDS
W3VHY-T	W3VHYDT	W5VHY-T	W5VHYDT

Bard® SINCE 1914
Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Manual: 2100-791
Supersedes: ***NEW***
Date: 11-28-23

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SAFETY INSTRUCTIONS

READ ALL INSTRUCTIONS BEFORE USE

Your safety and the safety of others are very important.

We have provided many important safety messages in this manual and on your appliance. Always read and follow all safety messages.

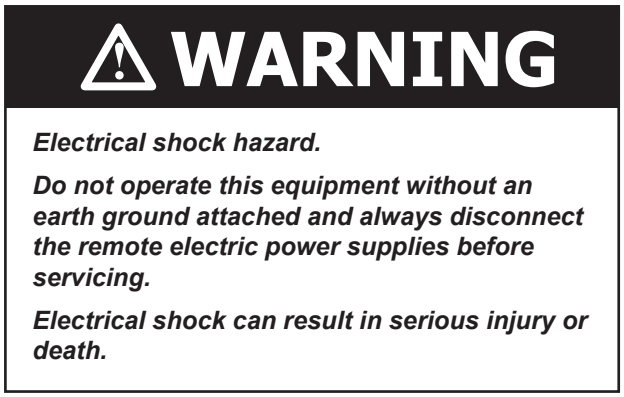
ANSI Z535.5 Definitions:

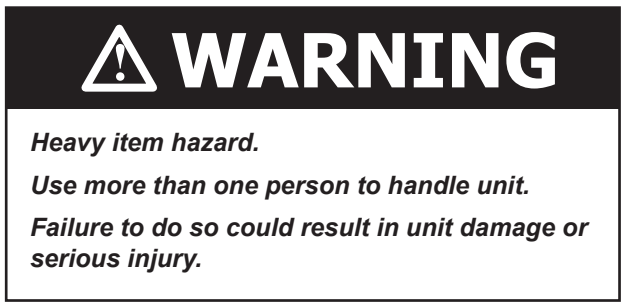
DANGER: Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury. The signal word "DANGER" is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.

WARNING: Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.

CAUTION: Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.

NOTICE: [this header is] preferred to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to "NOTICE" the word "CAUTION" without the safety alert symbol may be used to indicate a message not related to personal injury.





⚠ WARNING

Electrical shock hazard.

Have a properly trained individual perform these tasks.

Failure to do so could result in electric shock or death.

⚠ CAUTION

Sharp metallic edges.

Take care and wear appropriate protective devices to avoid accidental contact with sharp edges.

Failure to do so can result in personal injury.

The following symbols are displayed on units.

This symbol indicates that the Operation Manual should be read carefully.

This symbol indicates that a service personnel should be handling this equipment with reference to the Installation Manual.

This symbol indicates that information is available such as the Operation Manual or Installation Manual.

IMPORTANT SAFETY INSTRUCTIONS

⚠ WARNING

To reduce the risk of explosion, fire, death, electric shock, scalding or injury to persons when using this product, follow basic precautions, including the following:

GENERAL

- The equipment covered in this manual is to be installed by trained, experienced service and installation technicians.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- The refrigerant system is completely assembled and charged. All internal wiring is complete.
- The unit is designed for use with or without duct work. Flanges are provided for attaching the supply and return ducts.
- These instructions explain the recommended method to install the air-cooled 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 "Starting 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 Additional Publications 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 Association for the Installation of Air Conditioning and Ventilating 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.

INSTALLATION

- This product is not intended for use at altitudes exceeding 2,000 meters (6,561 feet). For appliances intended for use at altitudes exceeding 2,000 m (6,561 feet), the maximum altitude of use shall be stated.
- Before use, the appliance must be properly installed as described in this manual.
- Contact the authorized service technician for repair or maintenance of this unit.
- Contact the installer for installation of this unit.
- The air conditioner is not intended for use by young children or invalids without supervision.
- Young children should be supervised to ensure that they do not play with the air conditioner.
- Installation work must be performed in accordance with the National Electric Code by qualified and authorized personnel only.
- Connect to a properly rated, protected, and sized power circuit to avoid electrical overload.
- Adhere to all industry recommended safety procedures including the use of long-sleeved gloves and safety glasses.
- Use care when unpacking and installing. The edges of the product may be sharp.
- Keep packaging materials out of the reach of children. These materials can pose a suffocation risk to children.

OPERATION

- This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Use this appliance only for its intended purpose.
- Never attempt to operate this appliance if it is damaged, malfunctioning, partially disassembled, or has missing or broken parts.
- Do not tamper with controls.

LIRE TOUTES LES INSTRUCTIONS AVANT UTILISATION

Votre sécurité et celle des autres sont très importantes.

Nous avons fourni de nombreux messages de sécurité importants dans ce manuel et sur votre appareil. Lisez et suivez toujours tous les messages de sécurité.

Définitions ANSI Z535.5 :

DANGER : Indique une situation dangereuse qui, si elle n'est pas évitée, entraînera certainement la mort ou des blessures graves. Le mot « DANGER » doit être limité aux situations extrêmes. Les indications « DANGER » ne doivent pas être utilisées pour les risques de dégâts matériels, à moins qu'il n'existe un risque concomitant de blessures corporelles.

AVERTISSEMENT : Indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner la mort ou des blessures graves. Les indications « AVERTISSEMENT » ne doivent pas être utilisées pour les risques de dégâts matériels, à moins qu'il n'existe un risque concomitant de blessures corporelles.

ATTENTION : Indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures à modérées. Les indications « ATTENTION », sans symbole d'avertissement, peuvent être utilisées pour alerter sur des pratiques dangereuses pouvant entraîner des dégâts matériels uniquement.

REMARQUE : cet avis concerne les pratiques n'entraînant aucune blessure corporelle. Le symbole d'avertissement ne doit pas être utilisé avec ce mot. Comme alternative à « AVIS », le mot « ATTENTION » sans symbole d'avertissement peut être utilisé pour indiquer un message non lié à des blessures corporelles.

⚠ AVERTISSEMENT

Risque de choc électrique.

Ces tâches doivent être réalisées par une personne parfaitement qualifiée et formée.

Le non-respect de cette consigne peut entraîner des chocs électriques ou la mort.

⚠ ATTENTION

Arêtes métalliques vives.

Faites attention et portez des dispositifs de protection appropriés pour éviter tout contact accidentel avec des arêtes vives.

Le non-respect de cette consigne peut entraîner des blessures corporelles.

Les symboles suivants sont affichés sur les unités.

Ce symbole indique que le manuel d'utilisation doit être lu attentivement.

Ce symbole indique qu'un membre du personnel de service devrait manipuler cet équipement en se référant au manuel d'installation.

Ce symbole indique que des informations sont disponibles telles que le manuel d'utilisation ou le manuel d'installation.

INSTRUCTIONS DE SÉCURITÉ IMPORTANTES

AVERTISSEMENT

Pour réduire le risque d'explosion, d'incendie, de décès, de choc électrique, d'échaudure ou de blessures pour les personnes lors de l'utilisation de ce produit, suivez les précautions de base, notamment les suivantes :

GÉNÉRALITÉS

- L'équipement couvert dans ce manuel doit être installé par des techniciens de service et d'installation formés et expérimentés.
- Cet appareil n'est pas destiné à être utilisé par des personnes (y compris des enfants) ayant des capacités physiques, sensorielles ou mentales réduites, ou un manque d'expérience et de connaissances, à moins qu'elles n'aient reçu la supervision ou l'instruction concernant l'utilisation de l'appareil par une personne responsable de leur sécurité.
- Le système de réfrigérant est complètement assemblé et chargé. Tout le câblage interne est complet.
- L'unité est conçue pour être utilisée avec ou sans conduits. Des brides sont prévues pour fixer les conduits d'alimentation et de retour.
- Ces instructions expliquent la méthode recommandée pour installer l'unité autonome refroidie à l'air et les connexions de câblage électrique à l'unité.
- Ces instructions et toutes les instructions emballées avec tout équipement distinct requis pour constituer l'ensemble du système de climatisation doivent être lues attentivement avant de commencer l'installation. Notez en particulier « Procédure de démarrage » et les étiquettes et / ou étiquettes attachées à l'équipement.
- Bien que ces instructions soient conçues comme un guide général recommandé, elles ne remplacent en aucune façon les codes nationaux et/ou locaux. Les autorités compétentes devraient être consultées avant que l'installation ne soit effectuée. Voir d'autres publications pour obtenir des renseignements sur les codes et les normes.
- La taille de l'unité pour une installation proposée devrait être basée sur le calcul de la perte de chaleur effectué selon les méthodes de Air Conditioning Contractors of America (ACCA). Le conduit d'air devrait être installé conformément aux Normes de la National Fire Protection Association for the Installation of Air Conditioning and Ventilating Systems of Other Than Residence Type, NFPA No. 90A, et aux Systèmes de chauffage et de climatisation d'air chaud de type résidence, NFPA No. 90B. Lorsque les réglementations locales sont en contradiction avec les instructions, l'installateur doit respecter les codes locaux.

L'INSTALLATION

- Ce produit n'est pas destiné à être utilisé à des altitudes supérieures à 2 000 mètres (6 561 pieds). Pour les appareils destinés à être utilisés à des altitudes supérieures à 2 000 m (6 561 pieds), l'altitude maximale d'utilisation doit être indiquée.
- Avant utilisation, l'appliance doit être correctement installée comme décrit dans ce manuel.
- Communiquez avec le technicien d'entretien autorisé pour la réparation ou l'entretien de cette unité.
- Contactez le programme d'installation pour l'installation de cet appareil.
- Le climatiseur n'est pas destiné à être utilisé par de jeunes enfants ou des invalides sans surveillance.
- Les jeunes enfants devraient être surveillés pour s'assurer qu'ils ne jouent pas avec le climatiseur.
- Les travaux d'installation doivent être effectués conformément au Code national de l'électricité par du personnel qualifié et autorisé uniquement.
- Connectez-vous à un circuit d'alimentation correctement évalué, protégé et dimensionné pour éviter les surcharges électriques.
- Respectez toutes les procédures de sécurité recommandées par l'industrie, y compris l'utilisation de gants à manches longues et de lunettes de sécurité.
- Faites attention lors du déballage et de l'installation. Les bords du produit peuvent être tranchants.
- Gardez les matériaux d'emballage hors de la portée des enfants. Ces matériaux peuvent poser un risque d'étouffement pour les enfants.

OPÉRATION

- Cet appareil n'est pas destiné à être utilisé par des personnes (y compris des enfants) ayant des capacités physiques, sensorielles ou mentales réduites, ou un manque d'expérience et de connaissances, à moins qu'elles n'aient reçu une supervision ou une instruction concernant l'utilisation de l'appareil par une personne responsable de leur sécurité.
- Utilisez cet appareil uniquement aux fins prévues.
- N'essayez jamais de faire fonctionner cet appareil s'il est endommagé, défectueux, partiellement démonté ou s'il a des pièces manquantes ou cassées.
- Ne pas altérer les contrôles.

GENERAL INFORMATION

General

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

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

The refrigerant system is completely assembled and charged. All internal wiring is complete.

The unit is designed for use with or without duct work. Flanges are provided for attaching the supply and return ducts.

These instructions explain the recommended method to install the air cooled 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 "Starting 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 **Additional Publications** 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 Association for the Installation of Air Conditioning and Ventilating 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.

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.

Additional Publications

These publications can help when installing the heat pump. 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.

National Electrical Code .....ANSI/NFPA 70

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

Load Calculation for Winter and Summer Air Conditioning
..... ACCA Manual J Residential

Duct Design for Residential Winter and Summer Air Conditioning and Equipment Selection
..... ACCA Manual D

For more information, contact these publishers:

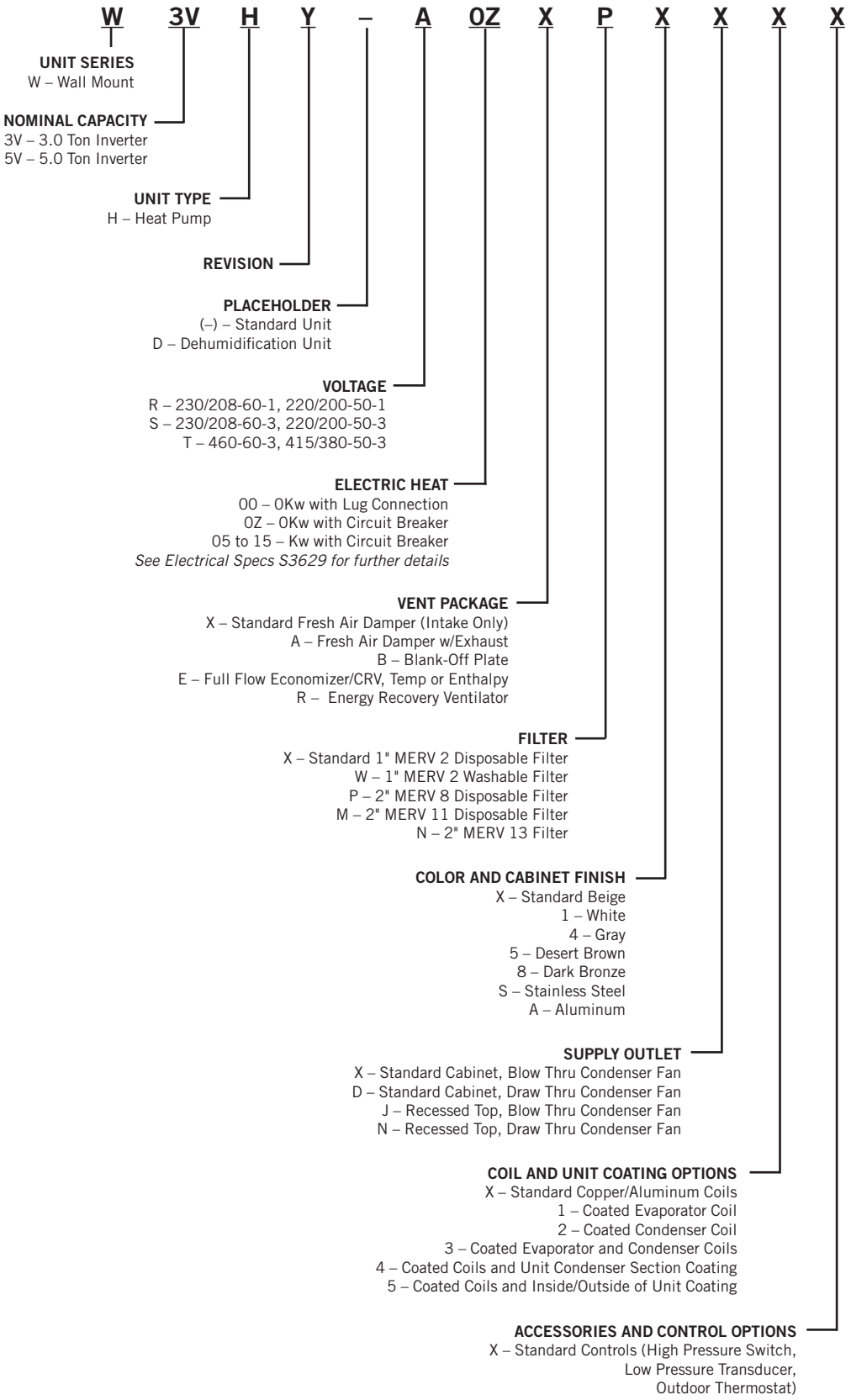
ACCA **Air Conditioning Contractors of America**
1712 New Hampshire Ave. N.W.
Washington, DC 20009
Telephone: (202) 483-9370
Fax: (202) 234-4721

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

Variable Speed Heat Pump Wall Mount Model Nomenclature



REFRIGERANT INFORMATION

NOTICE

These units require R-410A refrigerant and polyol ester oil.

General

1. Use separate service equipment to avoid cross contamination of oil and refrigerants.
2. Use recovery equipment rated for R-410A refrigerant.
3. Use manifold gauges rated for R-410A (800 psi/250 psi low).
4. R-410A is a binary blend of HFC-32 and HFC-125.
5. R-410A is nearly azeotropic—similar to R-22 and R-12. Although nearly azeotropic, charge with liquid refrigerant.
6. R-410A operates at 40-70% higher pressure than R-22, and systems designed for R-22 cannot withstand this higher pressure.
7. R-410A has an ozone depletion potential of zero, but must be reclaimed due to its global warming potential.
8. R-410A compressors use polyol ester oil.
9. Polyol ester oil is hygroscopic; it will rapidly absorb moisture and strongly hold this moisture in the oil.
10. A liquid line dryer must be used—even a deep vacuum will not separate moisture from the oil.
11. Limit atmospheric exposure to 15 minutes.
12. If compressor removal is necessary, always plug compressor immediately after removal. Purge with small amount of nitrogen when inserting plugs.

Topping Off System Charge

If a leak has occurred in the system, Bard Manufacturing recommends reclaiming, evacuating (see criteria above) and charging to the nameplate charge. If done correctly, topping off the system charge can be done without problems.

With R-410A, there are no significant changes in the refrigerant composition during multiple leaks and recharges. R-410A refrigerant is close to being an azeotropic blend (it behaves like a pure compound or single component refrigerant). The remaining refrigerant charge in the system may be used after leaks have occurred. "Top-off" the charge by utilizing the pressure charts on the inner control panel cover as a guideline.

REMEMBER: *When adding R-410A refrigerant, it must come out of the charging cylinder/tank as a liquid to avoid any fractionation and to insure optimal system performance. Refer to instructions for the cylinder that is being utilized for proper method of liquid extraction.*

Safety Practices

1. Never mix R-410A with other refrigerants.
2. Use gloves and safety glasses. Polyol ester oils can be irritating to the skin, and liquid refrigerant will freeze the skin.
3. Never use air and R-410A to leak check; the mixture may become flammable.
4. Do not inhale R-410A—the vapor attacks the nervous system, creating dizziness, loss of coordination and slurred speech. Cardiac irregularities, unconsciousness and ultimately death can result from breathing this concentration.
5. Do not burn R-410A. This decomposition produces hazardous vapors. Evacuate the area if exposed.
6. Use only cylinders rated DOT4BA/4BW 400.
7. Never fill cylinders over 80% of total capacity.
8. Store cylinders in a cool area, out of direct sunlight.
9. Never heat cylinders above 125°F.
10. Never trap liquid R-410A in manifold sets, gauge lines or cylinders. R-410A expands significantly at warmer temperatures. Once a cylinder or line is full of liquid, any further rise in temperature will cause it to burst.

Important Installer Note

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

R410-A Refrigerant Charge

This wall-mount unit was charged at the factory with the quantity of refrigerant listed on the serial plate. AHRI capacity and efficiency ratings were determined by testing with this refrigerant charge quantity.

Tables 1A and 1B show nominal pressures for the units. Since many installation specific situations can affect the pressure readings, this information should only be used by certified technicians as a guide for evaluating proper system performance. They shall not be used to adjust charge. If charge is in doubt, reclaim, evacuate and recharge the wall-mount unit to the serial plate charge.

Pressure Service Ports

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressures are shown in Tables 1A and 1B.

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. See the replacement parts manual for replacement core part numbers.

TABLE 1A
Cooling Pressure – Rated Airflow

Air Temperature Entering Outdoor Coil °F

Model	Return Air Temp (DB/WB)	Pressure	75	80	85	90	95	100	105	110	115	120	125
W3VHY	75/62	Low Side	128	130	131	133	134	136	137	138	139	141	142
		High Side	298	320	343	367	391	416	442	468	495	523	551
	80/67	Low Side	137	139	140	142	143	145	146	148	149	150	152
		High Side	306	329	352	376	401	427	453	480	508	536	565
	85/72	Low Side	142	143	145	147	148	150	152	153	154	156	157
		High Side	316	340	364	389	415	442	469	497	525	555	585
W5VHY	75/62	Low Side	128	130	131	132	133	134	135	136	137	138	138
		High Side	314	333	353	374	397	421	446	472	500	529	560
	80/67	Low Side	137	139	140	141	143	144	145	146	147	147	148
		High Side	322	342	362	384	407	432	457	485	513	543	574
	85/72	Low Side	142	143	145	146	148	149	150	151	152	153	153
		High Side	334	354	375	397	421	447	473	502	531	562	594

Low side pressure ± 4 psig
High side pressure ± 10 psig

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operating charge being in the system, the charge should be removed and system evacuated and recharged to serial plate charge weight.

IMPORTANT: *This system is variable speed. Unit must be in test mode with overrides set according to service instructions. Unit must run at steady output to confirm pressures accurately. Set overrides to optimal demand settings as shown in Table 2.*

TABLE 1B
Heating Pressure – Rated Airflow

Air Temperature Entering Outdoor Coil °F

Model	Indoor	Heating	0	5	10	15	20	25	30	35	40	45	50	55	60	65
W3VHY	70	Low Side	33	41	48	55	63	71	78	86	94	102	110	118	126	135
		High Side	328	333	339	343	348	353	358	362	367	371	376	380	384	388
W5VHY	70	Low Side	41	46	51	56	62	68	74	81	88	95	103	110	118	127
		High Side	303	309	315	320	326	331	337	342	347	352	356	361	365	370

IMPORTANT: *This system is variable speed. Unit must be in test mode with overrides set according to service instructions. Unit must run at steady output to confirm pressures accurately. Set overrides to optimal demand settings as shown in Table 2.*

TABLE 2
Optimal Demand Settings

	W3HY-*	W3HYD*	W5HY-*	W5HYD*
Cooling	38%	38%	40%	40%
Heating	33%	33%	49%	49%

Mechanical Cooling

When the indoor temperature rises above the cooling setpoint, a cooling call is triggered. The PID algorithm within the PLC regulates the compressor, fan and blower based on the demand generated by the thermostat. In cooling mode, the indoor fan speed is correlated to the compressor output and the outdoor fan changes speed to maintain a discharge pressure setpoint. (See blower and fan sections for more information.)

Mechanical Heating (Heat Pump Mode)

When the indoor temperature falls below the heating setpoint, a heating call is triggered. The PLC board then sends a signal to the 24V solenoid coil on the reversing valve, which controls the heat cycle operation within the unit. The reversing valve will be energized anytime the unit is in heating mode and will remain energized until power is lost, a defrost cycle is initiated or the mode is changed to cooling. The PID algorithm within the PLC regulates the compressor, fan and blower based on the demand generated by the thermostat. In heat pump mode, the indoor fan changes speed to maintain a discharge setpoint and the outdoor fan is set to a specific speed based on the outdoor temperature. (See blower and fan sections for more information.)

Auxiliary Heat

If a heating demand rises above 95% and persists for more than 30 minutes, the unit will drop the heat pump output to rated speed—if boost mode is enabled. The first stage of electric heat (auxiliary heat) will then be engaged alongside the heat pump at rated speed to bring the indoor temperature up to the setpoint. Auxiliary heat will continue to run until the heating call is satisfied. If electric heat is not installed in the unit, the heat pump output will continue to run in cohesion with the demand in the space if boost mode is enabled. Otherwise, the unit will continue to run at rated speed.

Electric Heat

If the compressor is locked out by an alarm and mechanical heat is not available for a heating call, emergency heat will be available to warm the space instead. Emergency heat can also be enabled in the custom room controller (Brightstat) menu, which will disable the compressor during a heating call.

When the heating demand reaches 30% in emergency heat, the first stage of electric heat is used to warm the space. If the demand continues to climb and reaches 50%, the second stage of electric heat is used in conjunction with the first stage of electric heat if applicable. Both stages of electric heat remain on until the heating demand is satisfied. If only one stage of electric heat is available, the electric heat will continue to run until the heating demand is satisfied.

NOTE: *Emergency heat does not turn off unless it is disabled at the thermostat or there is a power cycle.*

Boost Mode

Boost mode allows for use of compressor capacity beyond the rated capacity of the unit. When boost mode is enabled, the compressor will be allowed to increase to its maximum RPM. This will allow for more cooling and heating capacity; however, the sound levels will also increase. This feature is disabled by default to keep the sound levels low.

Quiet Mode

Quiet mode will limit the RPM range of the compressor in an attempt reduce noise to minimal levels but allow for more compressor capacity if the space temperature cannot be achieved. When enabled, the compressor will be limited to approximately 50% of the rated cooling/heating capacity until the space demand either satisfies or the reaches 70%. If the demand reaches 70% before the space temperature is satisfied, the compressor will ramp up to rated capacity (boost disabled) or 70% (boost enabled) to satisfy the demand. Once the compressor has ramped up above the initial limitation, it will not return to quiet mode until the space temperature setpoint has been reached or the unit is turned off.

Mitigation and Foldbacks

The inverter drive in this unit has built in protections to prevent damage to the compressor or drive due to excessive compressor current, drive current, drive temperature, and head pressure. There are also additional protections that are built into the software to prevent the drive from folding back and locking out. If the compressor current, inverter drive current, head pressure or outdoor temperature exceeds internal thresholds (not adjustable), the software compressor demand to keep the drive from locking out. During foldback, the unit will run at a reduced capacity which will be displayed as “Reduced Capacity” in the status while active. The most common reduced capacity operation (under normal conditions) will be in response to outdoor air temperature. If the outdoor air temperature exceeds 90°F the compressor capacity will be limited to 77.5%, this percentage is not measured by the overall capacity of the unit but is a percentage of the available compressor RPM. The limitation is handled differently for the current and pressure

mitigation loops. In these situations, as the current or pressure rises, the percentage cap will be reduced. These mitigation loops can reduce the compressor output down as low as 6%.

The mitigation loop works by targeting a setpoint and using a PID loop to reduce output until the setpoint is reached or exceeded. These loops act as a cap for compressor output to keep the compressor and inverter operating in a safe range. This allows for cooling, heating or dehumidification to continue at a reduced capacity when conditions are excessive, or the unit is compromised. In many, but not all circumstances, frequent reduced capacity operation could indicate a need for service on the unit. For example, it would be normal for the unit to operate in reduced capacity when there is a high outdoor ambient condition. It would be abnormal for the unit to operate regularly in reduced capacity when there is a low cooling demand, and the outdoor temperature is below the high ambient threshold.

The current target limitation for the compressor changes with compressor output and is not intended to be measured in the field so it is not listed here. The overall current limitation setpoint is 20.5 amps for the 3-ton unit and 32.5 amps for the 5-ton unit. The head pressure limitation setpoint is 575 psi. These limits may be beneficial for diagnosis of a problem or cause for a reduced capacity operation event. A qualified service technician should be consulted if there is concern about unit operation.

BACnet Set Up

Once the unit is powered the room controller (Brightstat) and unit will need to be configured for BACnet communication. The default communication address (BACnet instance) the unit will look for is 86127. This will need to be configured in the room controller (Brightstat) or if another address is used will need to be configured in the room controller (Brightstat) and unit. The room controller (Brightstat) can be configured by either changing the communication address value or the BACnet instance number (see 2100-681). The unit can be configured by pressing enter on the home screen when the lower right corner shows the “BAC” icon. In the unit there are two configurable points for the BACnet communication. The “Controller Instance” is the address that must match the address in the room controller (Brightstat). This tells the unit which room controller (Brightstat) to communicate with. The “BARD Unit Instance” is the address of the unit and only needs to be changed if there are multiple units and room controller (Brightstat) s on the same network. When there are multiple units and room controllers on the same network, they all must have a unique address/instance. All unit and room controller (Brightstat) addresses/instances should be configured prior to connecting the communication wiring to prevent communication issues or uncontrolled unit operation.

Defrost

When the unit is operating in heat mode with the compressor, the temperature of the outdoor coil will be monitored. If the outdoor coil temperature falls below 28°F, a timer will begin. If the time accumulated exceeds the time setting (60 min. default), a defrost cycle will be triggered (minimum defrost cycle time 1 minute). If the coil temperature exceeds the exit temperature (57°F), the compressor is utilized for cooling, or a defrost cycle is completed, the accumulated time will be reset to 0. In the event that the outdoor coil temperature sensor fails, time will be accumulated anytime the compressor is used for heating.

During a defrost cycle, the compressor will operate at or close to unit rated capacity, the outdoor fan motor will stop, the indoor fan will ramp to Aux. heat speed and the first stage of electric heat will be turned on (if equipped). If the discharge pressure exceeds 500 psi, the outdoor fan will be turned on until the pressure falls below 425 psi. The defrost cycle will continue until the outdoor coil reaches the exit temperature for 1 minute, the call is satisfied or the defrost cycle has run for 8 minutes. After a defrost cycle, all defrost timers will be reset.

The time setting for triggering a defrost cycle is adjustable. It is not recommended that this time be change unless evaluated by a qualified service provider. The setting is available on screen B7 and requires a technician level password to be provided for adjustment. The range of adjustment is 30 to 120 minutes.

Electric Heat

Auxiliary and emergency heating will be available for units equipped with electric heat. If the demand for heating is above 95% for more than 30 minutes, auxiliary heat will be provided. In auxiliary heat mode, the compressor will operate at the rated capacity, the first stage of electric heat will turn on and the blower will operate at the rated speed for electric heat usage. Auxiliary heat will continue until the call is satisfied or terminated.

Emergency heat mode will be activated when selected by a user on the room controller (Brightstat) or the compressor is locked out by an alarm and there is a heat demand. When emergency heating is active, the first stage of electric heat (if equipped) will turn on at 30% heating demand and the blower will ramp to the rated electric heat speed. The second stage of electric heat (if equipped) will turn on at 50% demand. Once active, the electric heat will remain on until the call is satisfied or terminated. If emergency heat is selected on the room controller (Brightstat), the compressor will not be used for heating. The emergency heat toggle can be found in the custom menu of the room controller (Brightstat).

Dehumidification

If the unit is equipped with dehumidification capability, the unit will operate in dehumidification mode when space humidity is above the dehumidification setpoint. Cooling or heating will take priority over dehumidification. Dehumidification mode will begin only in the absence of a heating or cooling call and will end if a heating or cooling demand becomes present during the dehumidification operation. When the unit is in dehumidification mode, a reheat coil will be utilized to reheat the supply air after it passes through the evaporator coil to remove moisture from the air. This process provides a supply air temperature close to the return air temperature of the unit. If the temperature drifts to the heating or cooling setpoints, demand will build and the unit will move to heating or cooling mode to maintain space temperature and then if needed return to dehumidification mode.

If unit is equipped with dehumidification, the room controller (Brightstat) has a configuration option that allows for dehumidification to be disabled (see BrightStat manual 2100-681). This toggle will be defaulted to "enable" (locked out) by default on non-dehumidification equipped units and to "disable" on equipped units.

Variable Speed Compressor Control

With the many modes of operation, various methods are utilized to determine the speed of the variable speed compressor. The compressor has a range of 0-100%. This information is displayed on the information screens (EEV Compressor) that can be found on the home screen of the PLD Pro display mounted in the control panel. The compressor output percentage may match the cooling/heating demand percentages at times, but they are different calculations. In some scenarios, the cooling/heating demand percentage may be directly tied to the compressor output depending on the application, but often this will probably not be the case. Additionally, there are mitigation calculations that alter the compressor output when necessary (see **Mitigation and Foldbacks** on page 14.

In cooling mode, the demand percentage can be scaled in one of two ways. When freecooling is available, the first 30% of the cooling demand will be reserved for the economizer and the remaining 70% of the demand will be scaled to a 0-100% compressor demand. Note this is not the compressor output percentage; the compressor output percentage will be determined after additional considerations and may vary greatly from the demand. In heating mode, the heating demand is directly proportional to the compressor demand except when emergency heat is active. Again, this does not necessarily mean that the compressor output will match the heating demand percentage. In these modes, the compressor demand is scaled and varies as conditions change.

In other modes, such as dehumidification or defrost, the compressor will be commanded to a fixed percentage. In dehumidification and defrost mode, the percentage will be at or around the rated capacity of the unit. The compressor output may still be adjusted by the mitigation calculations or other factors that may limit the compressor output to safely maintain operation.

When evaluating the unit charge or operation, it is important to remember that the compressor is variable and has a broad range of operation that may impact temperatures and pressures in the unit devices. When necessary, there are overrides available to assist with troubleshooting and/or evaluation of the unit functionality. These overrides should only be utilized by qualified service technicians. The settings to override the heating or cooling demand can be found on screen C21 and require a technician level password to operate.

Default Settings

The table below outlines the default settings in the PLC for the product.

Name	Default	Range	Screen
System Configuration			
Boost Mode	OFF	ON-OFF	A4
Quiet Mode	ON	ON-OFF	A4
Dehumidification	ON (if equipped)	ON-OFF	A5
UOM	USA	USA, SI	A1
Economizer			
Control Type	Drybulb	Drybulb, TempHum, Enthalpy, None	A2
OD Temp Set	70°F	0-75°F	A2
Off Diff.	5°F	5-10°F	A2
Humidity Set	80%	10-100%	A2
Off Diff.	5%	0-20%	A2
Dew Pt. Set	55°F	0-100°F	A2
Off Diff.	5°F	5-10°F	A2
Mixed Air Temp.	55°F	45°F-OAT SP	A3
Min. Pos.	0%	0-100%	A3
Max Pos.	100%	0-100%	A3
Self Test			
Enable	OFF	ON-OFF	A6
Econ Time	120s	120-500s	A6
Heat/Cool Time	60s	60-500s	A6
Advanced System Configuration			
Compressor Safety Timers			
Min. On	120s	120-600s	B2
Min. Off	120s	120-600s	B2
Cooling Lockout	-40°F	-40-95°F	B3
Heating Lockout	-12°F	-40-95°F	B3
Damper Alr. Open Delay	60s	60-600s	B4
Damper Alr. Close Delay	180s	180-600s	B4
Low Pressure Alarm			
Delay	120s	120-300s	B5
Two Count Delay	3600s	3600-7200s	B5
Defrost Time Pin	60min	30-120min	B7
Defrost Reset	OFF	ON-OFF	B7
Freeze Alarm			
Alarm Setpoint	28°F	28-35°F	B6
Alarm Delay	600s	30-600s	B6
Hold Delay	300s	60-900s	B6
Date & Time			
Timezone	New York/Indianapolis	All timezones	Setting Menu: Date/Time

The table below shows defaults sent to the room controller (BrightStat) via BACnet.

Setpoint	Default	Min.	Max
Occupied Heat	68	40	90
Occupied Cool	73	54	100
Standby Heat	65	40	90
Standby Cool	75	54	100
Unoccupied Heat	62	40	90
Unoccupied Cool	80	54	100
Quiet Mode	(ON) 1	(OFF) 0	(ON) 1
Emergency Heat	(OFF) 0	(OFF) 0	(ON) 1
Boost Mode	(OFF) 0	(OFF) 0	(ON) 1
Temp. Sensor	Wired	**	**
Cool Lockout	-40°F	-40°F	95°F
User HMI	0	0	12
HMI Color	2(green)	**	**
Units	Imperial	**	**
Network Units	Imperial	**	**
RH display	Enable	**	**
CO2 display	Enable	**	**
Setpoint Function	Dual	**	**

Blower

The blower in this unit has a wide range of speed at which it can operate. Some speeds are fixed minimums and others are variable.

The unit is equipped with a blower that is driven by a variable electronically commutated motor (ECM). This blower is controlled by a 0-10vdc signal provided from the PLC.

If at any time the blower is commanded off (blower speed 0%), the previous blower speed is held for 1 minute before turning off.

If required, the blower output can be manually set in the Blower Override C17 screen for troubleshooting purposes (must have technician level password or higher). The override will last for 5 minutes or until the Enable value is set to OFF.

Cooling Mode

The indoor fan speed is correlated to the compressor output. As the compressor RPMs increase, the blower output increases and vice versa. See Graph 1 for the scaling of the blower output in relation to the compressor RPM.

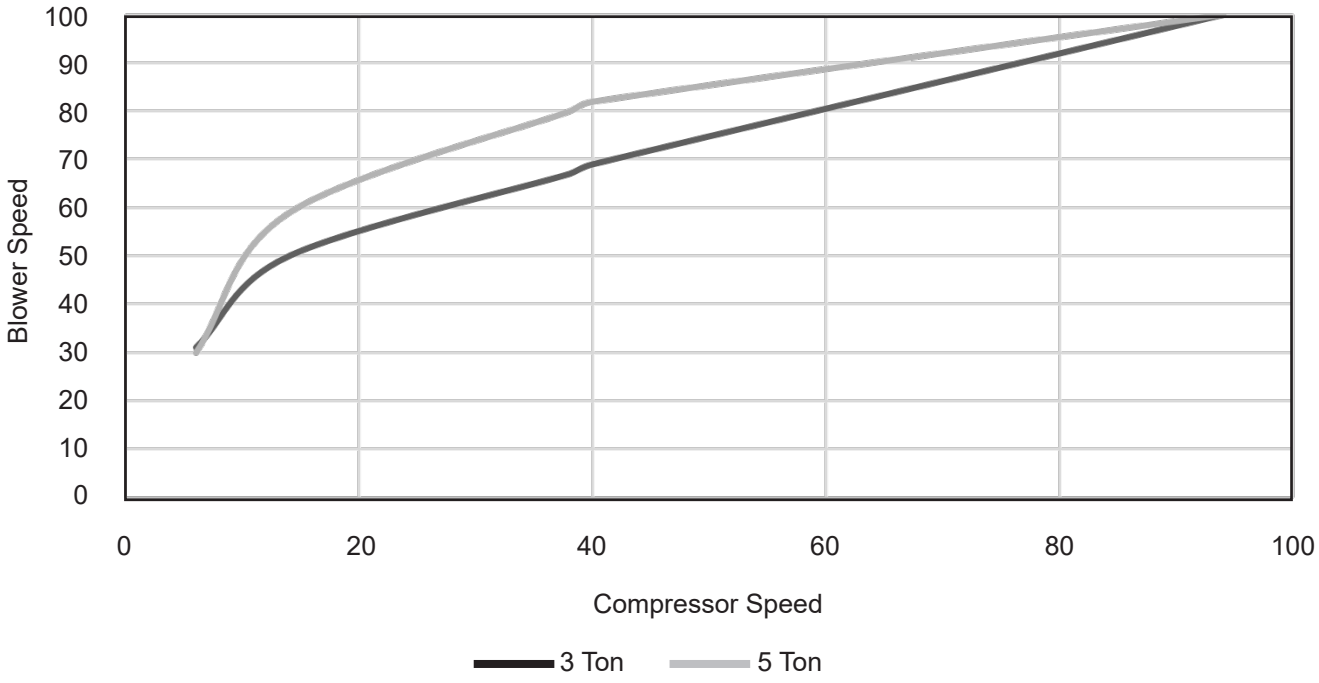
Heating Mode

The blower speed is adjusted to maintain a set discharge pressure during heating operation. A PID is used to target a specified head pressure, and a deadband of 8 psi is added to limit hunting. If the discharge pressure is above the setpoint, the blower increases in speed. Likewise, if the discharge pressure is below the setpoint, the blower decreases in speed. See the Table 3 for the target discharge pressure.

TABLE 3
Blower Target Heating (psi)

	Standard
W3VHY*	370
W5VHY*	360

GRAPH 1
Cooling Blower Speeds



Minimum Blower Speeds

In certain modes, the blower has a minimum speed at which it can run. While the unit is operating in a mode requiring a minimum speed, the blower speed may increase over the minimum speed but will be blocked from operating lower than the minimum speed. If multiple minimum speeds are active, the highest speed is considered the minimum speed.

TABLE 4
Blower Minimum Speeds

Mode	W3VHY	W5VHY
Ventilation	51%	45%
Continuous Blower	51%	45%
Dehumidification	43%	64%
Freecooling	67%	90%
Freeze	67%	90%
Defrost	70%	84%
Electric Heat 1	70%	84%
Electric Heat 2	70%	84%

Blow-Thru or Draw-Thru Condenser Fan

The variable speed products offer the condenser section in two configurations: The condenser discharge airflow can either be blow-thru or draw-thru.

Blow-Thru

Blow-thru models come with a condenser fan blade that "pulls" air in from the condenser section side grilles and "pushes" it through the condenser coil, to be discharged out the front of the unit.

Draw-Thru

The draw-thru option utilizes an alternative condenser fan blade that "pulls" air through the front of the condenser coil/front grille. The condenser air is then discharged out of the condenser side grilles. This option is not available with the energy recovery vent (ERV) option.

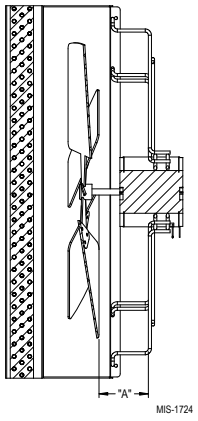
The unit is equipped with a condenser fan that is driven by a variable electronically commutated motor (ECM). This fan is controlled by a 0-10vdc signal provided from the PLC.

If required, the condenser fan output can be manually set in the Cond. Override C19 screen for troubleshooting purposes (must have technician level password or higher). The override will last for 5 minutes or until the Override value is set to "OFF".

The maximum output for the fan is limited to 73% to protect the fan blades from damage due to excessive RPM.

Due to design considerations of the condenser section of the wall-mount unit, placement/clearance of the motor/fan blade is critical to heat dispersal. Should a change of motor or fan blade be necessary, see Figure 1 for proper clearance adjustment.

FIGURE 1
Fan Blade Setting



Model	Dimension A
W3VHY W5VHY	1.5"

Cooling Mode

Discharge pressure is monitored to determine the speed of the condenser fan motor during cooling operation. As the outdoor temperature increases, the target discharge pressure will also increase. A PID is used to determine the speed of the outdoor fan motor to achieve the target discharge pressure setpoint. A deadband of 8 psi is added to prevent rapid oscillations of the outdoor fan motor. See Table 5 for the scaling of the fan output in relation to the discharge psi.

TABLE 5
Outdoor Fan Cooling

	W3VHY	W5VHY
Outdoor Temp	Discharge Target Pressure	Discharge Target Pressure
95°	405	400
82.5°	308	322
72°	260	260
69°	260	260

Heating Mode

The outdoor temperature is monitored to determine the speed of the condenser fan. The outdoor fan runs at a set speed in correlation to a specific range. As the air temperature goes down, the outdoor fan speed increases until it hits the upper limit and vice versa. See Table 6 for the fan speeds at set temperatures.

TABLE 6
Outdoor Fan Heating

OD Temp	Fan %
72°F	41%
47°F	48%
17°F	73%

LAC Sequence

At low ambient outdoor air temperatures, the fan motor will cycle as a means of controlling the system's head pressure to protect the system from evaporator coil freeze conditions. The process for this system is as follows: If the discharge pressure falls below 250 psi, the condenser fan will turn off. The fan will remain off while the compressor remains running, allowing the head pressure to build up. Once the head pressure reaches 350 psi, the fan will then turn back on at the appropriate speed. At lower ambient outdoor temperatures, this may cycle regularly as normal operation. In some cases, in higher wind prone areas, the condenser fan may stay off for prolonged durations due to low liquid pressures.

Electronic Expansion Valve (EEV)

The electronic expansion valve is a stepper motor that is controlled with a step output from the PLC. The valve is capable of 480 steps represented by a 0-100% signal on the PLC. The motor drives a needle valve that regulates the flow of refrigerant.

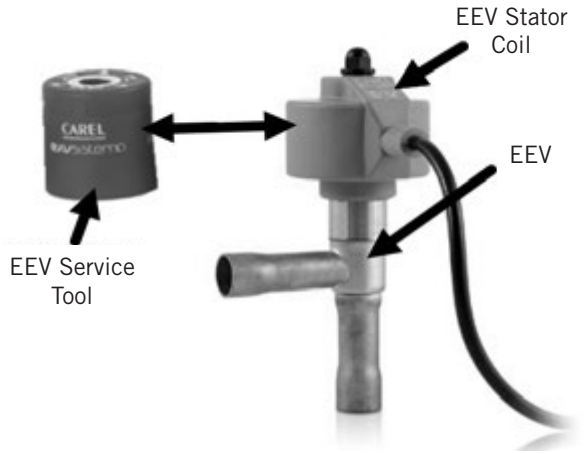
EEV Instructions for Vacuum, Reclaim, Charge Unit

The electronic expansion valve moves to the 40% open position when the unit is not actively cooling. The valve may need to be manually positioned for service or troubleshooting. The valve can be positioned by using a menu override (see ***EEV Override C20*** on page 40). Once the valve is placed into override, the EEV will remain in the Service Position Override for 5 minutes.

After the service or troubleshooting is completed, use PLD Pro to disable the EEV manual positioning override and turn unit back on. If EEV manual position override is not turned off, once 5 minutes has elapsed from the time the valve was placed into override, the override will expire and the valve will return to normal operation.

The valve can also be opened or closed using the EEV service tool (Bard Part # 2151-021). This magnetic EEV service tool (shown in Figure 2) is used to manually open the EEV. To do this, remove the EEV stator coil (red color with retaining nut on top), slide the magnetic tool over the shaft where the stator was removed and turn in a clockwise direction to open the valve to the full open position (directional arrows are provided on the tool). Opening the valve to the full open position will aid in the refrigerant reclamation and evacuation processes.

FIGURE 2
Electronic Expansion Valve (EEV) and Service Tool



With the stator removed, the resistance should be 40 ohms +/- 10%. There are sets of wires that will have this resistance (see Table 7).

TABLE 7
EEV Stator Connector

Contact Meter Lead Wire Colors		Resistance
White	Red	40Ω ±10%
Yellow	Purple	40Ω ±10%
Green	Red	40Ω ±10%
Blue	Purple	40Ω ±10%
White	Green	80Ω ±10%
Yellow	Blue	80Ω ±10%

Reapply the EEV stator coil and retaining nut. Upon powering the unit back up, the control board will automatically drive the EEV back to the fully shut position, and then back to the 40% open position prior to starting the compressor back up. Once the compressor starts, the control board will again modulate the EEV position to control the system superheat.

EEV Superheat Control

The electronic expansion valve (EEV) will open or close to maintain the superheat setpoint while the compressor is running (see Table 8 on page 22). When the compressor is not running, the valve will close to the 40% open default position.

TABLE 8
Superheat Targets

	W3VHY	W5VHY
Cooling	13°F	9°F
Heating	13°F	11°F

Low superheat protection will be active once the superheat value is at or below 5°F. At this point, the control will aggressively close the valve so that superheat is maintained.

Low Superheat Alarm

This alarm will become active when the calculated superheat goes below 5°F. This alarm will clear itself when the condition is no longer present.

This alarm cannot be adjusted.

Suction Pressure Transducer

The unit has a pressure transducer installed on the suction line between the evaporator coil and compressor. The transducer is used for system monitoring of suction system pressures. The sensor is used with the suction temperature sensor to provide a real time superheat calculation that determines the EEV position.

Troubleshooting the Suction Pressure Transducer

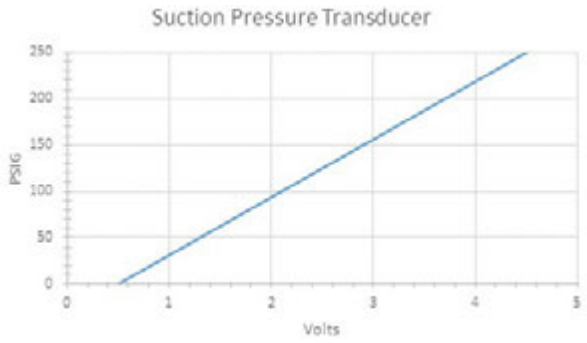
0-250 psig
-5 Vdc Nominal .5 – 4.5 Vdc Actual
4 Vdc/250 psig = .016 Vdc per 1 psig

Example: 125 psig x .016 + .5 Vdc = 2.5 Vdc

Formula for Tech:
Measured Pressure x .016 + Sensor Offset = Expected Transducer Signal Voltage (see Figure 3)

Refer also to pressure/DC voltage table on page 76.

FIGURE 3
Voltage to Pressure: Suction Pressure Transducer



Suction Pressure Alarm

When the suction pressure transducer value is out of range (0-250 psig) and the compressor is running, the controller will generate a sensor failure alarm to indicate the sensor is not working properly.

This alarm cannot be adjusted.

Suction Temperature Sensor

The suction temperature sensor is used to calculate superheat. The EEV uses this value to control the EEV. The temperature is measured with a 10k ohm NTC thermistor.

Suction Temperature Alarm

When the suction temperature sensor value is out of range (-41.0 to 303.0°F), the controller will generate a sensor failure alarm to indicate the sensor is not working properly.

This alarm cannot be adjusted.

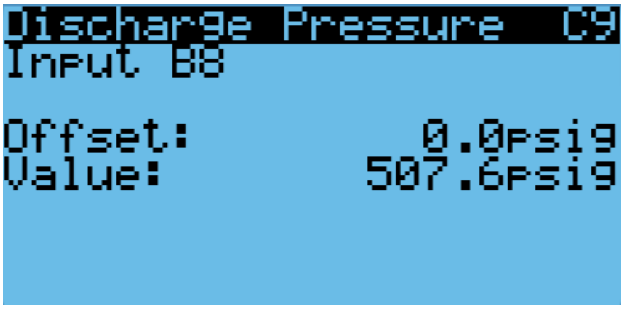
Discharge Line Pressure Transducer

The unit has a pressure transducer installed on the discharge line between the compresser and reversing valve. The transducer is used for system monitoring of the discharge pressure. The sensor is also used to adapt the condenser fan speed for high and low ambient conditions.

The discharge pressure sensor input can be verified and adjusted by:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **I/O Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Discharge Pressure C9**.
5. Verify the measurement displayed on screen is accurate (see Figure 4).
6. If the measurement needs to be adjusted, apply an offset value by pressing the ENTER key to scroll to **Offset**.
7. Press UP or DOWN keys to adjust the offset. The update will not take effect until the cursor is moved out of the offset parameter.
8. Once adjusted, press the ESCAPE key several times to return to Main Menu screen.

FIGURE 4
Adjusting Discharge Pressure Transducer Values



Troubleshooting the DIscharge Pressure Transducer

0-650 psig
0-5 Vdc
4 Vdc/650 psig = .00615 Vdc per 1 psig

Example: 325 psig x .00615 + .5 Vdc = 2.5 Vdc

Formula for Tech:
Measured Pressure x .00615 + Sensor Offset =
Expected Transducer Signal Voltage (see Figure 5).

FIGURE 5
Voltage to Pressure:
Discharge Pressure Transducer

Discharge Pressure Transducer Alarm

When the discharge line pressure sensor value is out of range (0-650 psig), the controller will generate a sensor failure alarm to indicate the sensor is not working properly.

This alarm is fixed and cannot be adjusted.

Inverter Drive

Description/Operation

The inverter drive has been developed specifically for variable speed compressors utilizing non-flammable refrigerants. The drive will power the compressor, control the compressor running speed, provide compressor and drive protection and communicate with the master controller. The drive requires cooling through the use of its heatsink and is typically installed in a system near the compressor.

The primary purpose of the drive is to convert the 50/60 Hz AC input voltage into a variable frequency/ variable voltage output to power the variable speed scroll compressor. The drive conditions the AC input voltage through a series of conditioning processes to arrive at the desired output. The drive first converts the AC input voltage into a DC voltage. The DC voltage is then pulse-width modulated to replicate a sinusoidal current at the desired frequency and voltage.

Drive Protections

High Pressure Cut Out

CN610 is a 2-port connector. The output is a 3.3VDC signal. The high-pressure cutout switch must be normally closed. If the switch is open, the drive will not operate. The output current range for the high-pressure contact will range from 5mA – 10mA. To ensure correct functionality of the high pressure switch for the system's lifetime, typically gold-plated contacts are recommended. This port is hardware Protected Electronic Circuit (PEC) according to IEC 60335-1 and software is Class B.

Drive Cooling

Because of the power electronics used in the drive and the associated heat generation, drive cooling is required to keep the drive components in their design temperature range. The allowable temperature range of the drive (the ambient air surrounding the drive) is –13°F to 150°F. Drive temperature should be monitored during system development at system extreme conditions to ensure that the maximum allowable drive temperature isn't exceeded. The highest drive temperature will typically occur during high load conditions or during high drive ambient.

The minimum recommended thermal capacity removal should be approximately 270 watts and a maximum components temperature of 85˚C.

Drives cooled by the aluminum air cooled heat exchanger are designed to be in the air flow stream of the condenser. The air-cooled heat exchanger must be installed so that the heat exchanger fins are parallel to the cooling air flow. The airflow must be a minimum of 3 meters/secs measured at the outlet of the heat sink in the direction of airflow.

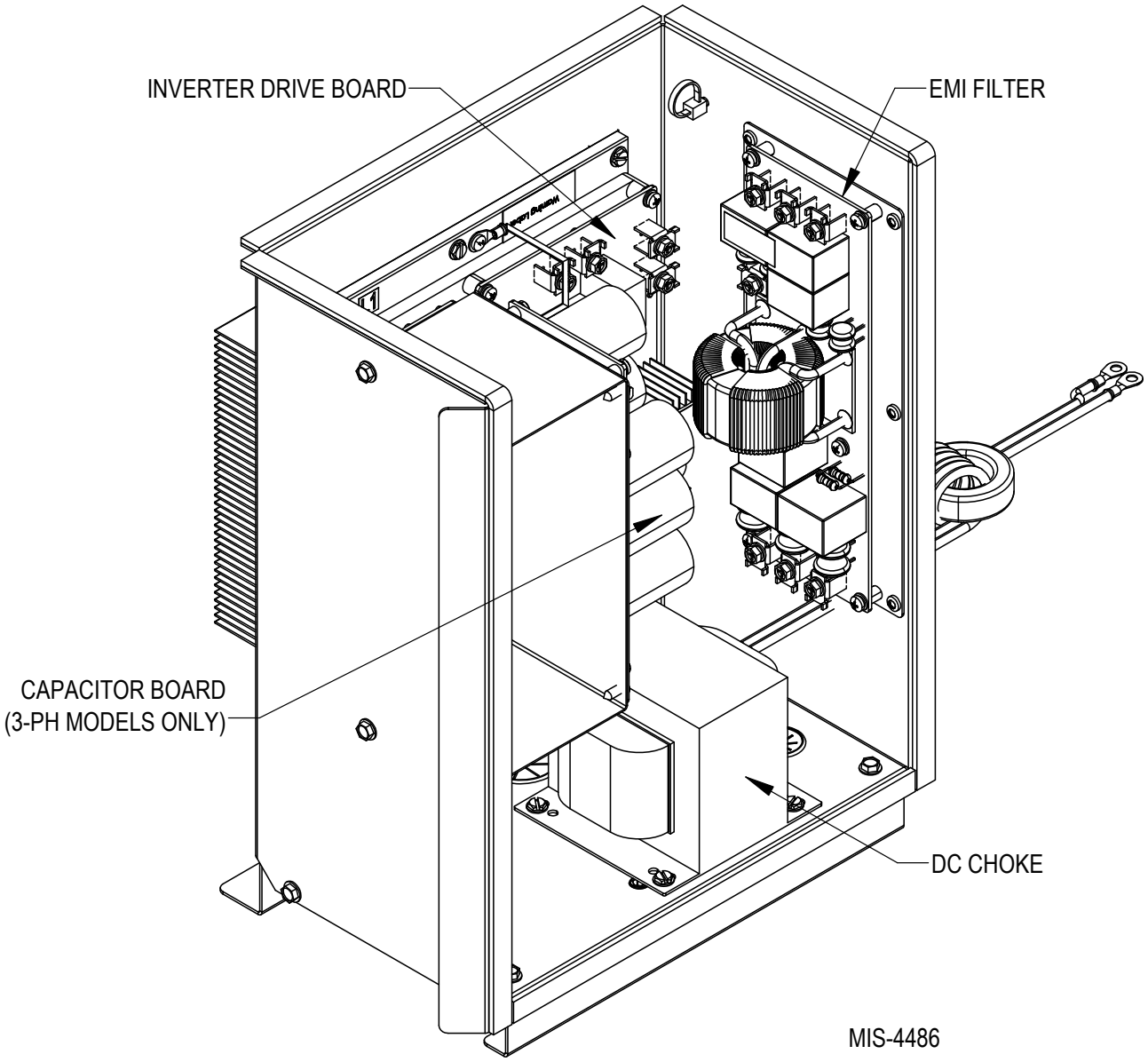
Drive Over Temperature Protection

The drive is self-protected against high internal temperatures. There are different modes of protection (temperature high and foldback). For temperature high, refer to Table 16 in **Drive Troubleshooting** (page 58). For foldback protection, see below.

Foldback

To protect the drive components and the compressor, the compressor speed will 'foldback' or slow down to help reduce risk to components. The foldback event(s) will be flagged in the drive's Modbus registers. This will

FIGURE 6
Inverter Assembly



allow the unit controller to respond and mitigate the conditions causing foldback.

Lockout Faults

There are specific faults that will cause the drive to 'lockout' after 10 consecutive occurrences. These faults are noted in Table 16 on page 58. These faults will not clear unless the power to the drive is fully cycled.

DC Choke

With the use of variable frequency drives (VFDs), inductors can also be placed after the drive's input diodes, between the input rectifier and the DC link. In this configuration, the inductive device is referred to as a DC choke.

The DC chokes is an impedance device on the input side of a variable frequency drive. The choke limits the peak value of the line (supply) current, which mitigates harmonics transmitted from the line. Certain harmonics that are not filtered out can impact proper control of the VFD. The benefit to using a DC choke is its ability to attenuate these harmonics without causing a noticeable drop in voltage. The DC choke also protects against the effects of voltage disturbances.

EMI Filter

Description/Operation

Component that receives incoming AC power and filters out electromagnetic interference. The electromagnetic interference (EMI) filter prevents disruption of functionality and communication between devices.

EMI filters protect sensitive electronics from damage caused by high levels of radiation emitted by other electronic equipment. They extract unwanted current conducted through wiring or cables that can interfere with signal and power lines, while allowing desirable currents to flow without restriction.

Purpose(s) of the EMI Filter

Minimize radiated and conducted noise on the input or output of the power supply

Minimize the effects of voltage transients applied to the input or output of the power supply

Minimize the input surge current when voltage is first applied to the input of the power supply

Protect the input power source and conductors if there is a failure of the power supply

Capacitor Board

Description/Operation

The inverter receives a 3 phase AC signal from the main grid and gives output in the form of a DC signal. This DC signal is stabilized by a DC bus which comprises a capacitor and a filter. Stable DC signal-output of DC-link or DC bus is fed to the inverter input terminals.

The inverter converts DC into AC which runs three phases electric motor. Control logic is developed in the controller part. Signals, generated from the controller, control switches both in the rectifier as well as an inverter.

Purpose(s) of Capacitor Board

As drive systems are used for motion applications (related to position and speed) and motion of the motor is controlled by varying input frequency and voltage to the inverter. So, frequency and voltage are control parameters. The voltage input to the motor is given by three phases of the inverter. As the inverter gets its input voltage from the DC link (voltage across the capacitor) so capacitor voltage is the reference voltage for the last stage (before it is fed to the motor) which needs to be stabilized for better performance of the motor.

Variable Speed Compressor

Description/Operation

Variable speed scroll compressors have a speed range of 900 to 7000 revolutions per minute and are intended for use in air conditioning, air-source heat pump and geothermal applications. The scroll compression technology is based on the ZP*K5 Copeland Scroll platform. The variable speed scrolls use a three-phase brushless permanent magnet (BPM) motor. The variable speed scroll and Emerson Motor Control drive combination has been designed for maximum efficiency and reliability.

Purpose(s) of Variable Compressor

The variable technology of the compressor allows for a broad range of heating or cooling BTUs based on demand in the space. If higher load is present in the space, the compressor will increase output in response to the load. Also, if demand is lower the compressor can run at a much lower output. This capability provides temperature stability, balance response and excellent efficiency.

Copper Vibration Absorbers

Vibration absorbers are designed to be installed on suction and discharge lines of a HVAC system to dampen the transmission of compressor vibration. This helps to isolate the compressor frequency from being transferred directly into the copper, coils and chassis of the unit mounted to the building.

Charge Compensator

The charge compensator is used to store extra refrigerant during heat pump operation to improve efficiency. The charge compensator is located on the suction line between condensing coil and reversing valve. During cooling operation, the refrigerant is returned to the system to improve cooling performance.

Discharge Limit Temperature (DLT) Sensor

The DLT sensor is used to monitor discharge line temperature during system operation. The senor is located on the discharge line. The sensor returns the temperature resistance value to the inverter drive board. If discharge temperature reaches 120°C/250°F, the drive will terminate compressor operation to protect the compressor components.

High Pressure Switch

The high-pressure switch is found on the discharge line and connected to the inverter drive. The switch is designed to trip when the discharge pressure reaches (635-665 psi). If the pressure switch is tripped, the drive immediately shuts down the system.

Filter Drier

The purpose of a refrigerant drier is to ensure the refrigerant system stays clean and dry. It removes contaminants including moisture, dirt, acid and solder flux, beads and filings.

Whenever the refrigerant system is opened for repair or to replace a component, always replace the filter drier. Filter drier must be replaced with the same model since the drier must be sized appropriately. A bi-directional filter drier must also be used in heat pump products to allow refrigerant flow in both directions.

Discharge Muffler

Discharge line mufflers are used to reduce the noise in the discharge line created from the high velocity flow of refrigerant. They are designed to be installed directly after the compressor discharge outlet of the pump.

Reversing Valve

The reversing valve is used in HVAC systems that offer heat pump operation. This valve allows for a mechanical AC unit to utilize the evaporator coil as a condenser to provide heating BTUs to the space. The valve re-directs refrigerant flow so that hot discharge gas can be routed to the evaporator coil. With the evaporator coil now acting as a condenser coil, heat is rejected into the supply.

Dehum Valve and Reheat Coil

For models equipped with mechanical dehumidification, there will be a dehumidification valve and reheat coil. The dehumidification valve is a 3-way valve that functions like the reversing valve. The dehumidification valve redirects refrigerant to a reheat coil that is in the evaporator section. The reheat coil now has hot discharge gas in it, and acts as a small condenser coil. The unit remains in cooling mode which allows the evaporator to remove moisture from the space without providing too much cooling. The air passes through the evaporator first which creates a cooling effect, then the reheat coil which warms the air and reduces sensible cooling.

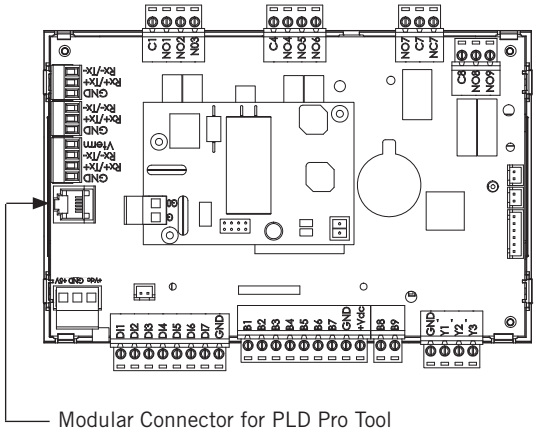
PLD Pro Display

The microprocessor control used in these wall-mount heat pumps allows for complete control and monitoring through the use of the provided PLD Pro hand-held monitor.

The menu driven interface provides users the ability to scroll through two menu levels: Quick Menu and Main Menu. The menus permit the user to easily view, control and configure the unit.

The PLD Pro connects to the wall-mount unit control board via an RJ11 modular connector as shown in Figure 7.

FIGURE 7
PLD Pro Connection to Unit Control



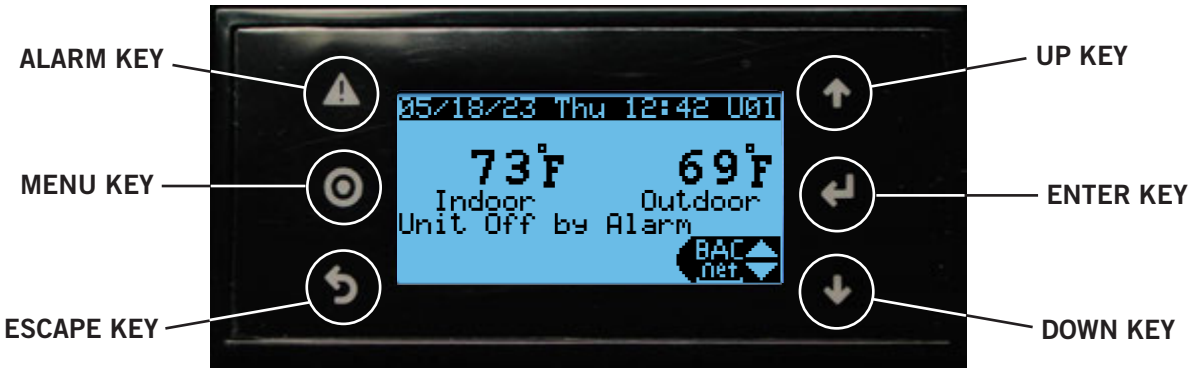
PLD Pro Main Screen

The Main screen is the default start-up screen and also the return screen after 5 minutes of no activity. The screen can be accessed any time by pressing the ESCAPE key repeatedly.

The Main screen shows the current date, day, time, indoor temperature, outdoor temperature and unit status (see Figure 8). See Table 9 on page 28 for wall-mount unit status messages.

NOTE: *Screenshots shown in this manual reflect default settings (when applicable).*

FIGURE 8
PLD Pro Display and Interface (Main Screen Shown)



ALARM KEY
Allows viewing of active alarms
Silences audible alarms
Resets active alarms

MENU KEY
Allows entry to Main Menu

ESCAPE KEY
Returns to previous menu level
Cancels a changed entry

UP KEY
Steps to next screen in the display menu
Changes (increases) the value of a modifiable field

ENTER KEY
Accepts current value of a modifiable field
Advances cursor

DOWN KEY
Steps back to previous screen in the display menu
Changes (decreases) the value of a modifiable field

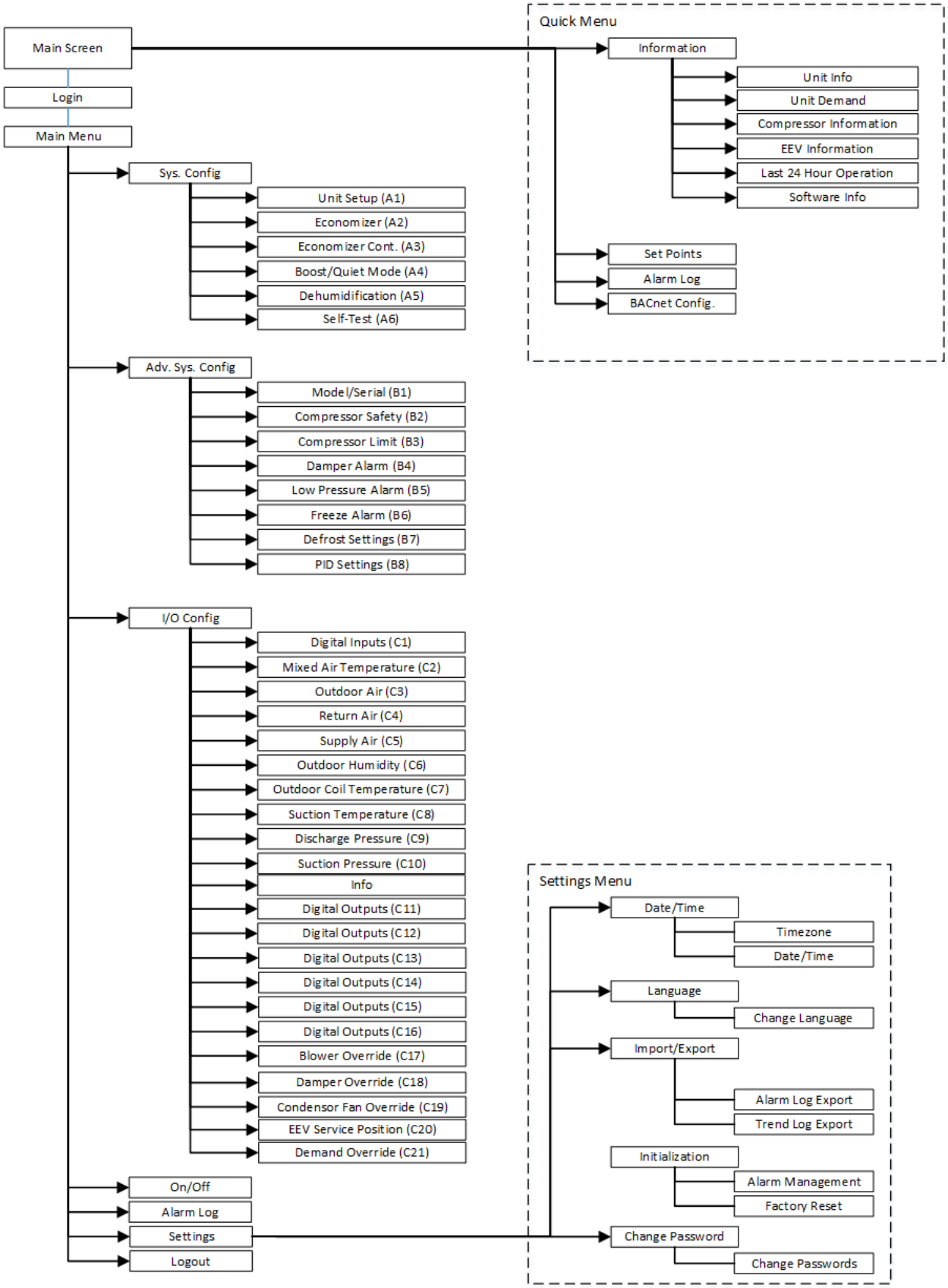
TABLE 9
Unit Status Messages

Message	Description
Standby	Unit has no commands and is online
Invalid Model Number	Unit is off due to invalid model number
Unit Off by Keypad	Unit is off due to PLD display setting
Unit Disable Active	Unit is off due to unit disable terminal activation
Unit Off by BMS	Unit is off due to command via BMS system (BACnet)
Unit Off by Alarm	Unit is off due to an active alarm
Cooling	Unit is operating compressor to cool the space
Freecooling	Unit is operating damper to cool space
Optimized Cooling	Unit is operating both the damper and compressor to cool the space
Heating HP	Unit is operating compressor to heat the space
Electric Heat Active	Unit is operating the first stage of electric heat to heat the space
Heating HP & Aux. Heat	Unit is operating both the compressor and the first stage of electric heat to heat the space
Emergency Heat	Either the compressor is disabled or by command of the room controller (Brightstat) only electric heat (all stages) is being used to heat the space
Defrost Active	Unit is defrosting the outdoor coil. Compressor and 1 stage of electric heat (if equipped) are active.
Dehumidification Active	Unit compressor and reheat coil are active
CO2 High	CO2 level has exceeded the Max. CO2 setpoint
Ventilation Alarms Present	Damper alarm(s) are active
Unit Alarm(s) Present	Any alarm is presently active
Override Active	An override has been set and is active
Self Test Active	Self test is in progress

TABLE 10
PLD Pro Passwords (Defaults)

User	2000
Technician	1313
Engineer	9254
Use UP or DOWN keys and ENTER key to enter password. The passwords listed above are the default passwords. End users can change these passwords if additional security is desired.	

FIGURE 9
PLD Pro Screen Map



The Quick Menu is accessible from the Main screen. BACnet, alarm log, setpoints and unit info screens are available through the Quick Menu. Pressing the UP or DOWN keys while on the main screen will change the Quick Menu icon displayed. Press the ENTER key when the desired icon is displayed.

Quick Screens

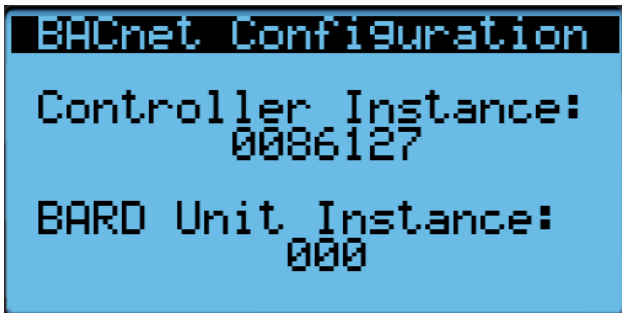
BACnet

Controller Instance: This is the address for the room controller (Brightstat). The Controller Instance needs to match the BACnet Instance on the room controller (Brightstat) to communicate (default is 86127). If more than one unit/controller combination is utilizing the same RS-485 line, they will need a unique instance number assigned.

BARD Unit Instance: This is the address for the unit communication. The Unit Instance is the address that is used to tell the room controller (Brightstat) which device it is communicating back to. The default is 000. If more than one unit/controller combination is utilizing the same RS-485 line, they will need a unique number assigned.

For more information, see **BACnet Set Up** on page 15.

FIGURE 10
Quick Screen: BACnet



Info

The information screens are used as a quick reference to show unit A/C circuit measurements and program version.

Unit Information

RAT: Return Air Temperature

MAT: Mixed Air Temperature

SAT: Supply Air Temperature

OAT: Outdoor Air Temperature

OAH: Outdoor Air Humidity

ODP: Outdoor Dew Point

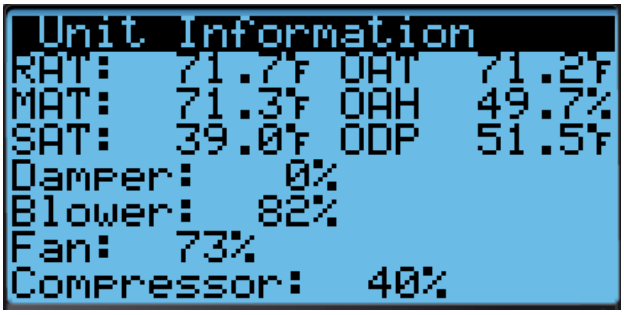
Damper: Displays the % demand the damper blade is opened to

Blower: Displays the % demand the blower is receiving from the PLC

Fan: Displays the % demand the fan is receiving from the PLC

Compressor: Displays the % demand the compressor is commanded to run

FIGURE 11
Quick Screen: Info



Unit Demand

FC Available: Displays whether freecooling is available or not

FC Status: Displays whether freecooling is active (ON) or inactive (OFF)

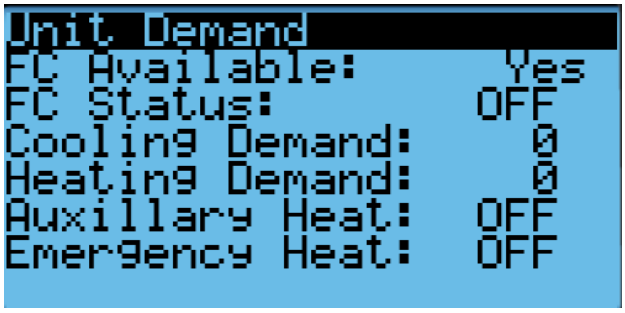
Cooling Demand: Displays the amount of cooling demand (0-100) in the space. This is based on the indoor sensor and setpoint at the thermostat.

Heating Demand: Displays the amount of heating demand (0-100) in the space. This is based on the indoor sensor and setpoint at the thermostat.

Auxiliary Heat: Displays whether the first stage of electric heat is active (ON) or inactive (OFF)

Emergency Heat: Displays whether the second stage of electric heat is active (ON) or inactive (OFF)

FIGURE 12
Quick Screen: Unit Demand



EEV Compressor

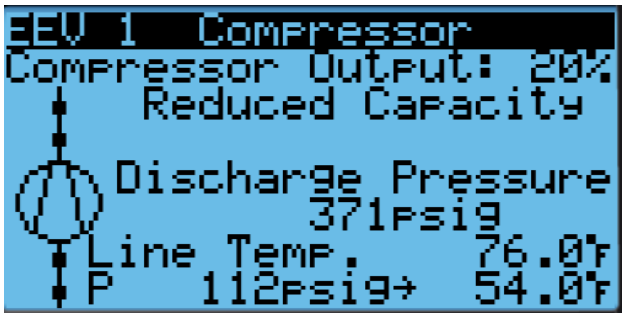
Compressor Output: Displays the % demand the compressor is running after foldback limitations are taken into consideration. This may not always be the same as the compressor demand.

Discharge Pressure: Displays the pressure of the discharge line

Line Temp: Displays the temperature of the suction line at the compressor

P: Displays the pressure of the suction line at the compressor. The temperature to the immediate right of the pressure is the converted saturated suction temperature of the refrigerant.

FIGURE 13
Quick Screen: EEV Compressor



EEV Circuit

The EEV has a pin inside that moves in small increments called steps to open and close the pathway between the high side and low side of the system. The top of this screen (see Figure 14) shows how many steps out of 480 the EEV has opened and converts the steps to a percentage opened (0-100%). The step position is communicated to the EEV by the PLC.

Status: Displays the current action of the EEV. The status messages are as shown in Table11.

Protection: The EEV has protective sequences in place for special circumstances to keep the system operating smoothly. The protective measures are as shown in Table 12.

Super Heat: Displays current ° of superheat in the system

FIGURE 14
Quick Screen: EEV Circuit

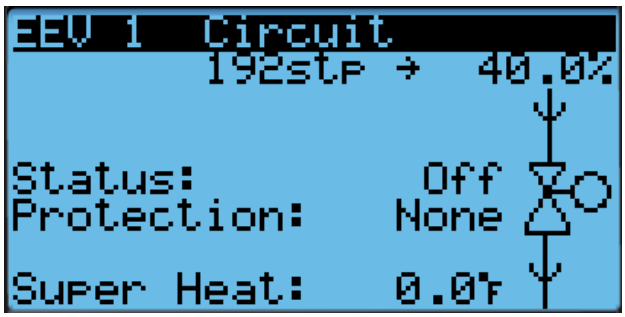


TABLE 11
EEV Status

Status	Description
Closing	The EEV has been commanded to close
Off	The EEV is offline and is not communicating with the PLC
Pos	The EEV is repositioning the pin to verify correct orientation is communicated to the PLC
Wait	The EEV is in the process of gaining communication with the PLC
On	The EEV is connected and communicating with the PLC
Standby	The EEV is conducting a “homing sequence” to verify step calibration

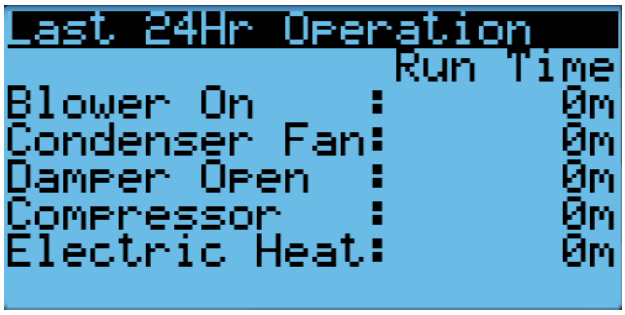
TABLE 12
EEV Protection

Protection	Description	Action
None	No protection	No special circumstances to trigger protection measures have been detected
LowSH	Low superheat	Immediate and intense closing of pathway
LOP	Low evaporation pressure	Immediate and intense opening of pathway
MOP	High evaporation pressure	Controlled moderate closing of pathway
HiTcond	High evaporator temperature conditions	Action is based on the evaporation pressure

Last 24 Hour Operation

This screen shows how long each component listed has been running in the past 24 hours.

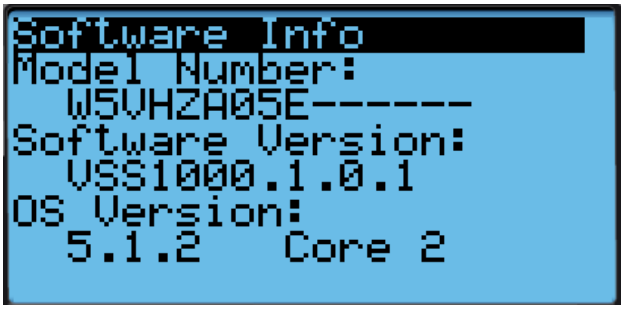
FIGURE 15
Quick Screen: Last 24Hr Operation



Software Info

This screen displays the model number the unit is currently set to, the software and OS version currently installed and what version PLC board is installed in the unit (only Core 2 available for variable speed units).

FIGURE 16
Quick Screen: Software Info



NOTICE

It is important to check the software version during installation to ensure that the latest version has been installed. Current software versions and installation instructions are available on the Bard website at http://www.bardhvac.com/software-download/

Setpoints

The setpoints screen shows the cooling and heating setpoints set at the thermostat. These cannot be adjusted at the PLD Pro and must be set at the thermostat.

FIGURE 17
Quick Screen: Setpoints

Alarm Log

Data Logger: Log of alarms unit has had in the past. Can also be accessed through the Alarm button (top left button on PLD Pro) and through the Main menu.

FIGURE 18
Quick Screen: Alarms

Executing a Self Test

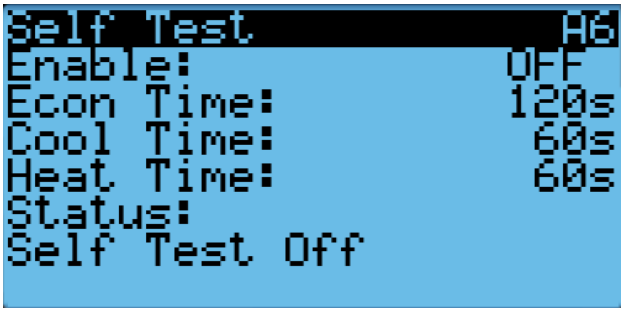
After a unit and room controller (Brightstat) has been installed, a self-test mode is available to check/verify the unit functionality. Self-test mode will open and close the damper (if equipped), operate the unit in cooling mode and operate the electric heat. The indoor blower and outdoor fan will operate as required throughout the test. If the unit is not equipped with electric heat, or a damper, or if the compressor is locked out, those portions of the test will be skipped. The self-test can be activated on screen A6. At the bottom of the screen a status will show what operation is active at that time. See ***Self Test A6*** on page 35 for more information.

Some unit parameters are adjustable.

To execute a self test:

1. Press MENU key to access the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Self Test A6** screen.
5. Press ENTER key to scroll to **Enable** parameter (see Figure 19).
6. Press UP or DOWN key to change value to ON. The self test will begin and the screen will display the status of the self test.

FIGURE 19
Executing Self Test



Self Test Parameter Descriptions

Econ Stage Time: Amount of time (in seconds) allowed for damper blade movement in each direction.

Cool Stage Time: Amount of time (in seconds) allowed for each stage of cooling.

Heat Stage Time: Amount of time (in seconds) allowed for heating stage.

Reset to Factory Defaults

To reset to factory default settings:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter ENGINEER password 9254.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Initialization**; press ENTER key.
5. Press UP or DOWN keys to scroll to the **Default Installation** screen.
6. Press ENTER key to scroll to **Reset to Factory Defaults** (see Figure 20).
7. Press UP or DOWN key to change value to **YES**; press ENTER key.
8. System will restart with default values.

FIGURE 20
Restoring Factory Default Settings

Screens

NOTE: *Screenshots shown in this manual reflect default settings (when applicable).*

Press MENU key to access the Main Menu screen.

Main Menu Structure
System Configuration (A1 - A6)
Advance System Configuration (B1 - B7)
I/O Configuration (C1 - C21)
On/Off
Alarm Logs
Settings
Logout

System Config Menu

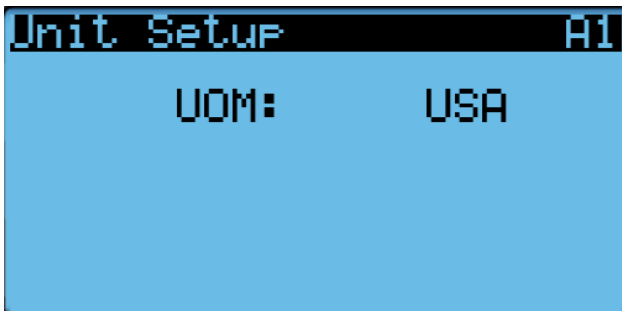
Unit Setup A1

The unit of measure (UOM) displayed for temperature and pressure can be set to USA, SI, CAN or UK.

TABLE 13
Unit of Measure

Name	Temperature	Pressure
USA	°F	psig
SI	°C	pag
CAN	°C	psig
UK	°C	barg

FIGURE 21
Screens: Unit Setup A1



Economizer A2

Control Type: Freecooling modes include none, dry bulb, temp/humidity and enthalpy. These modes are user selectable. Each mode has a setpoint and a differential, which can be adjusted.

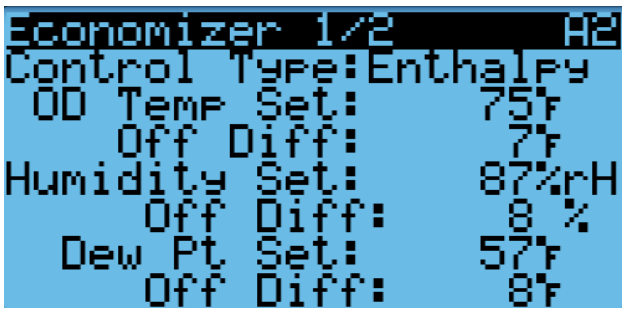
When the mode is set to none, freecooling will be disabled. However, the damper will still be available for ventilation.

When the mode is set to dry bulb, the outdoor air temperature is considered for freecooling availability. If the outdoor air temp is below the OD Temp setpoint, freecooling will be enabled. If the outdoor air temperature is above the OD Temp setpoint plus the off differential, freecooling will be disabled until the outdoor temperature falls below the OD Temp setpoint. Both OD Temp Setpoint and Off Differential are user adjustable.

When the mode is set to temp/humidity, both outdoor temperature and humidity will be considered for freecool availability. If the parameters for dry bulb are met and the outdoor relative humidity is below the humidity setpoint, freecooling will be enabled. If the outdoor air humidity is above the setpoint plus the off differential or if dry bulb parameters are not met, freecooling will be disabled. Both Humidity Setpoint and Off Differential are user adjustable.

When the mode is set to Enthalpy, the program will consider dry bulb and temp/humidity availability as well as dew point for freecooling availability. If parameters for both dry bulb and temp/humidity are met and the dew point is below the Dew Point setpoint, freecooling will be enabled. If the parameters for either dry bulb or temp/humidity are not met or the dew point is above the dew point setpoint plus the off differential, freecooling will be disabled. Both Dew Point setpoint and Off Differential are user adjustable.

FIGURE 22
Screens: Economizer A2



Economizer A3

Mixed Air Temp: Desired temperature of the MAT. This setpoint is only used during freecooling and is user adjustable.

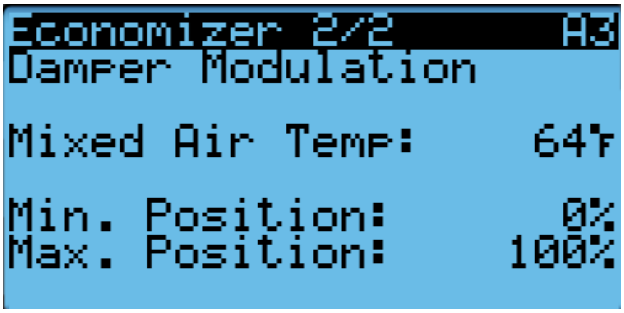
In optimized cooling (compressor and freecooling) the Mixed Air Temp setpoint is adjusted to 65°F (18°C) to prevent the indoor coil from freezing.

The damper also has a user-adjustable minimum and maximum position.

Min. Position: The minimum position prevents the damper blade from adjusting below the minimum setpoint in freecooling and ventilation operation.

Max. Position: The maximum position prevents the damper blade from adjusting above the maximum setpoint in ventilation. This limitation does not apply to freecooling or the ERV.

FIGURE 23
Screens: Economizer A3



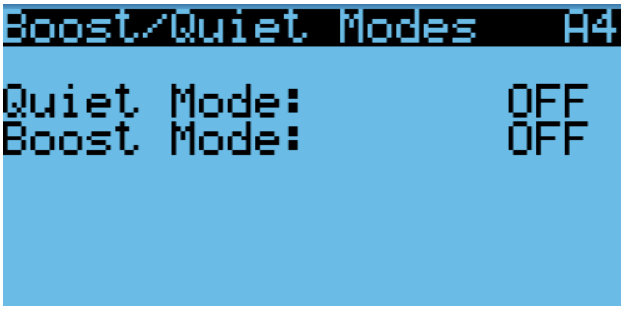
Boost/Quiet Modes A4

Quiet Mode: Enables and disables Quiet mode. This is enabled by default and can be disabled at the PLD Pro or the thermostat.

Boost Mode: Enables and disables Boost mode. This is optional and can be enabled at the PLD Pro or the thermostat.

See page 14 for more information on Quiet Mode and Boost Mode.

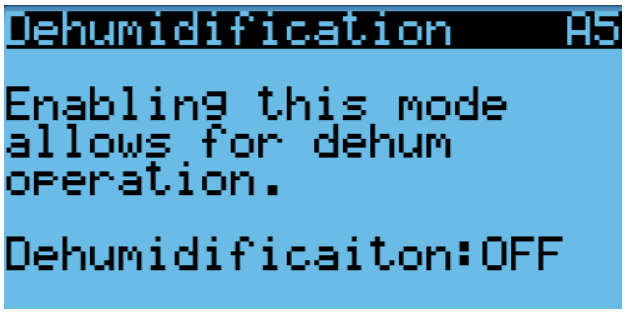
FIGURE 24
Screens: Boost/Quiet Modes A4



Dehumidification A5

Dehumidification: Availability is determined by the model number. When dehumidification is available, it can be enabled or disabled on this screen. See page 16 for more information on dehumidification.

FIGURE 25
Screens: Dehumidification A5



Self Test A6

Self Test runs through a series of functions to verify all components of the system are working properly. All functionality running outside of the test (e.g., ventilation, cooling call, etc.) will cease for the duration of the self test. All alarm functionality is retained for the duration of this test.

While the test is running, the status of the test will be displayed on the bottom of the screen (see Figure 26).

Enable: Toggle ON or OFF to start or stop the Self Test sequence. The value will remain ON for the duration of the test. When self test is complete, the value will change to OFF automatically. The Self Test can be terminated at any time by changing this value from "ON" to "OFF" during the test.

Econ Time: The damper blade is set to open 100% for the user-adjusted set of time. During this time, the status on the bottom of the screen reads "Opening Damper".

After the set time has lapsed, the damper is set to close (0%) for the same amount of time. During this time, the status on the bottom of the screen reads "Closing Damper". This is to verify the functionality of the damper blade.

If the model indicates no economizer is present, this step is skipped.

Cool Time: The compressor, fan and blower are set to run in cooling mode at two set speeds. The first speed is the rated speed and the second is at ½ rated speed. Each speed runs for the user-adjusted set of time. During this time, the status on the bottom of the screen reads "Comp. Cool Rated" and "Comp. Cool ½ Rated" respectively. This is to verify the functionality of all components related to cooling. When this section of testing is complete, the unit will transition directly over to heating mode.

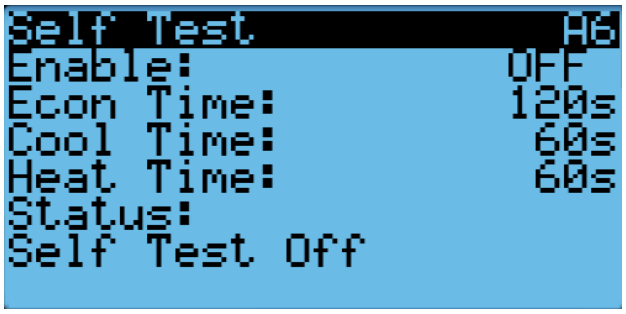
Heat Time: While the compressor, fan and blower are still running from the cooling portion of the self test, the reversing valve is engaged to flip the unit into heating mode. The unit continues to run at ½ rated for the user-adjusted set of time. During this time, the status reads "Comp. Heat ½ Rated". After this portion of testing, the compressor, fan and reversing valve disengage and are set to 0.

The blower continues to run and ramps up to electric heat speed and the first stage of electric heat is engaged (aux. heat) for the user-adjusted set of time. The status on the bottom of the screen reads "Electric Heat 1 (Aux.)". Then, the second stage of electric heat is engaged (emergency heat) for the same amount of time. The status on the bottom of the screen reads "Electric Heat 1&2 On". After this portion of the test is complete, the electric heat is disengaged and the blower continues to run for 1 minute afterwards to evacuate residual heat.

If the model indicates no electric heat is present, the electric heat portion of this test is skipped.

Self test will terminate automatically once all tests have been completed and the status will read "Self Test Off" once again.

FIGURE 26
Screens: Self Test A6

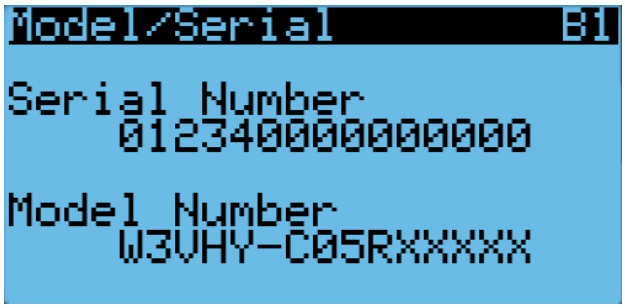


Adv. System Config Menu

Model/Serial B1

The serial number and model number can be modified as needed on this screen. Certain circumstances will require an update; for example, if an electric heat package was purchased after the original unit purchase to add or upgrade the current electric heat package. An Engineer level password must be entered in order to modify this page.

FIGURE 27
Screens: Model/Serial B1



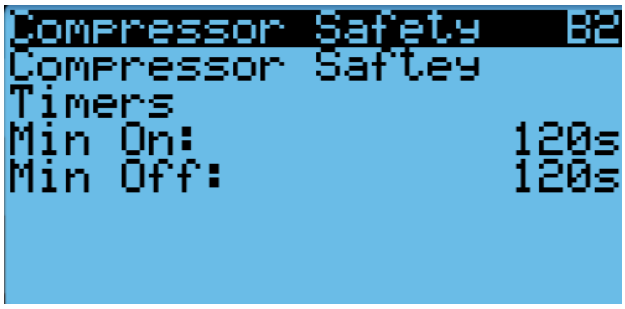
Compressor Safety B2

Min on/off times prevent the compressor from short cycling and prolongs the life of the compressor.

Min On: Minimum amount of time that the compressor is required to run before turning off again. Time is user adjustable.

Min Off: Minimum amount of time that the compressor is required to stay off before it can be demanded on again. Time is user adjustable.

FIGURE 28
Screens: Compressor Safety B2



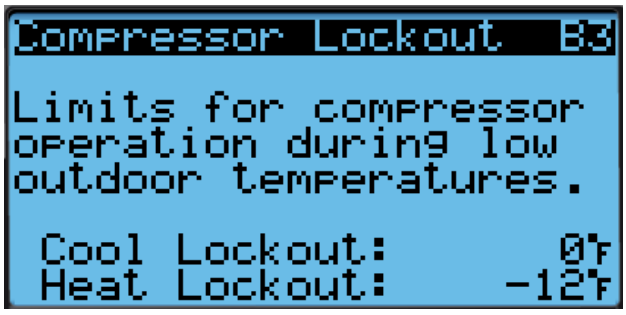
Compressor Lockout B3

Limits the operation of the compressor in low/high ambient conditions.

Cool Lockout: When the outdoor temperature falls below the cool lockout temperature (user adjustable), the compressor operation is limited.

Heat Lockout: When the outdoor temperature goes below the heat lockout temperature (user adjustable), compressor operation is turned off and unit runs electric heat, if equipped.

FIGURE 29
Screens: Cooling Lockout B3



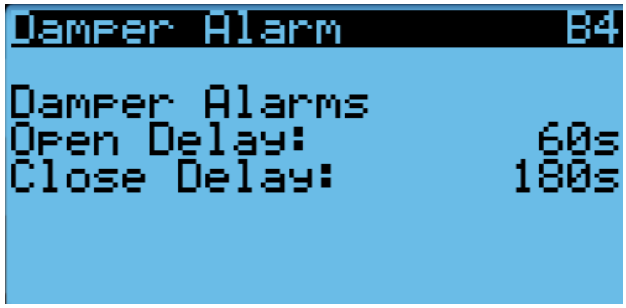
Damper Alarm B4

The damper blade can be adjusted to a N/O or a N/C relay to trigger an alarm (digital Inputs screen). Default is N/C.

Open Delay: A "Damper fail to open" alarm is delayed for a user-adjustable time to prevent false alarms. The damper must be commanded to a position greater than 40% and the damper switch doesn't open within the set time before an alarm is triggered. The relay must be set to N/C for this alarm to trigger. No functionality is blocked by the damper alarm.

Close Delay: A "Damper fail to close" alarm is delayed for a user-adjustable time to prevent false alarms. The damper must be commanded to 0% (closed) and the damper switch doesn't close within the set time before an alarm is triggered. The relay must be set to N/O for this alarm to trigger. No functionality is blocked by the damper alarm.

FIGURE 30
Screens: Damper Alarm B4



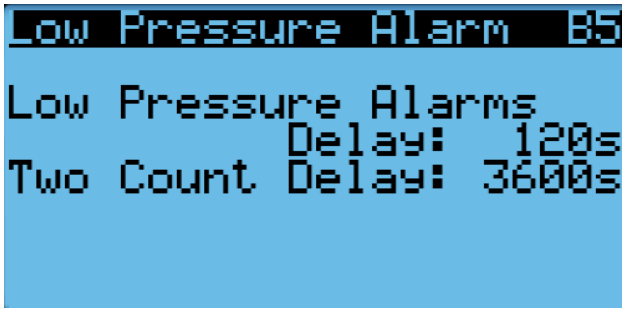
Low Pressure Alarm B5

Low Pressure Alarms Delay: The control has a configurable low pressure bypass time delay to ignore the low pressure input during the first 120 - 300 seconds of compressor operation.

If the suction pressure falls below the low pressure setpoint (40 psi) after the bypass time delay has elapsed, the compressor will turn off and a low pressure alarm will be triggered. Once the pressure rises above the low pressure setpoint, the alarm will auto reset and the unit will be able to resume normal functionality.

Two Count Delay: If the suction pressure falls below the low pressure setpoint (40 psi) twice within the user-adjustable time (1-2 hours), the compressor will turn off and will remain off until the pressure rises above the low pressure setpoint and the alarm is manually reset.

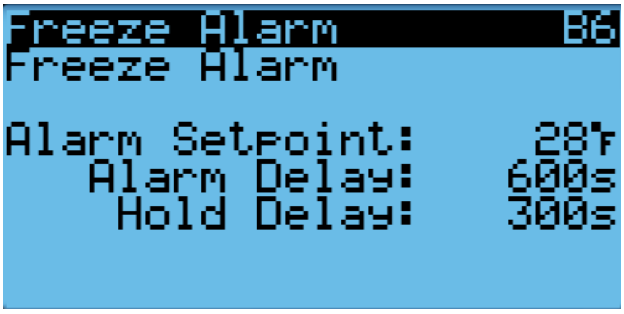
FIGURE 31
Screens: Low Pressure Alarm B5



Freeze Alarm B6

If the SAT falls below the user-adjustable temperature setpoint (Alarm Setpoint) for the user-adjustable time (Alarm Delay), a freeze condition is generated. The blower runs during the freeze condition for the user-adjusted time (Hold Delay) or when the freeze condition alarm is reset.

FIGURE 32
Screens: Freeze Alarm B6



Defrost Settings B7

The outdoor temperature sensor reads the temperature of the outdoor coil at the coldest part of the line. The unit begins to count how long the sensor reads a temperature below the Trigger Temp in the Time Accumulated. If the temperature rises above the Trigger Temp at any point, the Time Accumulated will reset back to 0. The Time Accumulated can also be reset to 0 manually by changing the Reset value from OFF to ON. After the Time Accumulated reaches the user-adjusted time set in the Time Pin, the unit enters a defrost cycle. See page 15 for more information on defrost.

Defrost Cycle: Shows if the unit is currently in a defrost cycle (ON) or not (OFF)

Time Pin: User-adjustable time between the temperature falling below the Trigger Temp and the beginning of a defrost cycle

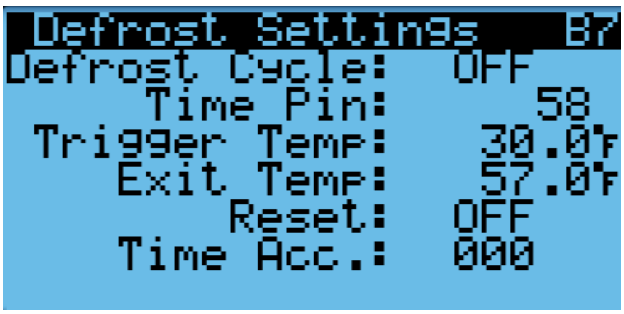
Trigger Temp: Temperature outdoor coil temp sensor must fall below before time is accumulated to trigger a defrost cycle

Exit Temp: Temperature outdoor coil temp sensor must rise above to exit defrost mode

Reset: Manual reset of time accumulated

Time Acc.: displays how long the temperature has been below the Trigger Temperature

FIGURE 33
Screens: Defrost Override B7



PID Settings B8

A PID loop is a calculation that continuously adjusts to provide a correction to a deviation from the desired condition. In this case, the PID is used to calculate how much output is required from the unit to control the space temperature. Three values are used: Proportional, integral and derivative and are commonly labeled as P, I and D respectively. The perfect values for any given application and environmental conditions can be difficult to determine. Because of the various applications of the unit, the PID parameters are available for adjustment by a qualified technician. Each of these values results in a calculated output that is then combined to determine the final output of the loop. If a parameter is not desired, it can be set to 0, essentially eliminating its contribution to the output. While a PID loop is available for this product, the default values limit it to a PI loop for this product out of the box. This resembles the configuration of multiple thermostats seen in the market today; however, the option is there for full functionality of the loop if desired. Below is a brief explanation of the values and the effects adjustments will have on the output of the product. Tuning should be done by a qualified technician and operation should be closely monitored following any adjustment of the PID values. The default values are provided on the adjustment screen.

Proportional (P)

The proportional value is used to determine how much output will be applied to a deviation from the target. The target is the setpoint and the deviation is the actual temperature above or below the setpoint for cooling or heating, respectively. The larger the deviation, the more the output is increased. Increasing the proportional value results in a larger output response and decreasing the proportional value results in a lower response to the same deviation.

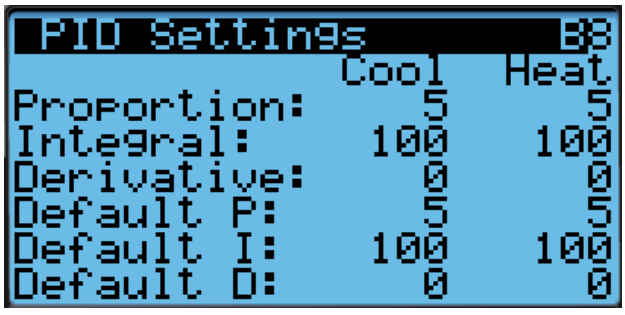
Integral (I)

The integral value is used to determine how much output will be applied to a deviation that persists for a given amount of time. The longer the deviation is present, the more output generated. Integral is sometimes looked at as the amount of time in which to consider a deviation. If the same deviation exists for a set time considered, the output is large; conversely, if the same deviation only exists for half that time, the output is less. Increasing the integral value slows the rate at which the output builds in respect to the amount of time the deviation is present. Decreasing the integral value means that a smaller amount of time will be considered, and the output will increase faster. An important consideration for integral values is that if the value is too small, oscillations will occur and if value is too large, the change in output will be slow.

Derivative (D)

The derivative value is used to compensate for the rate of change and dampen the output to not cause an overshooting of the target. The derivative value is sometimes looked at as the predictor or anticipator. Increasing derivative value increases the reduction in the output as the deviation shrinks. Decreasing the derivative value will lower the reduction in the output as the deviation shrinks at the same rate. Increasing the derivative value will reduce overshooting of the target, but if the derivative is too large it can cause oscillations. If overshooting is an issue, increasing the derivative value may help, but it will be beneficial to start small and increase as needed.

FIGURE 34
Screens: PID Settings B8



I/O Config Menu

When discussing inputs and outputs, it's important to have a common reference point. If this is not well defined, it could easily become confusing what value is considered an input and an output. For example, a sensor sends information to the PLC, so the value could be considered an output if the sensor was the reference point. Likewise, the PLC is receiving information from the sensor, so that same value could be considered an input if the PLC board is the reference point.

To reduce confusion, the PLC board will be used as the reference point as it contains all the logic to control the unit. Any information sent to the board is considered an input, and any information sent from the board is considered an output.

Analog & Digital I/O

The PLC can receive and send both digital and analog values. Digital values only consider if the value is On or Off. Analog values consider a range of values. The I/Os on the PLC are as follows:

Digital Inputs: DI1-DI7

Digital Outputs: NO1-NO9 & NC7

Analog Inputs: B1-B7

The screens in the I/O Config menu are used primarily for testing the functionality of components within the unit. **If a change has been made on screens C1-C10, they must be reverted back to their original values before leaving.** These offsets will not reset on their own and must be changed manually. **Screens C11-C21 contain overrides that do not retain the adjusted value and will revert back to the original value after 5 minutes.** These screens are used primarily for testing and troubleshooting components within the unit.

Digital Inputs C1

This screen shows the digital inputs used for the system (see Figure 35).

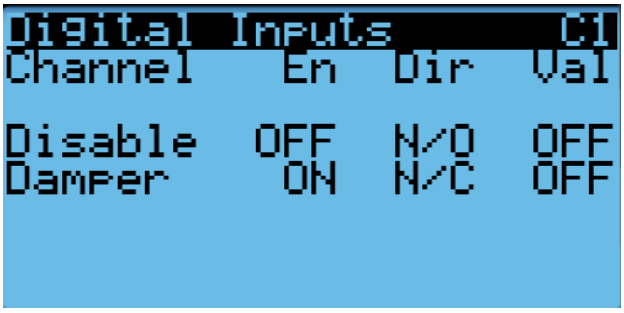
Channel: Lists the name of the input used on a specific channel

En: Displays whether the channel is enabled (ON) or disabled (OFF) by searching for continuity at the PLC input. This value can be adjusted for testing purposes.

Dir: Displays the direction of the relay as normally open (N/O) or normally closed (N/C). This value can be adjusted for testing purposes. Both Unit Disable and Damper are wired as N/O.

Val: Displays the value of the output as either enabled (ON) or disabled (OFF). This value is informative only and cannot be adjusted directly.

FIGURE 35
Screens: Digital Inputs C1



Screens C2-C10 display the input of various sensors. The following will be found on each of these screens:

Input: The input location on the PLC each sensor is connected to.

Offset: Additional °, % or pressure amount added to the sensor reading.

Value: Displays the value of the sensor reading + the offset applied. For example, if the sensor reading is 67.2°F, and the offset is adjusted to 3.8°F, the value would display 71°F. Likewise, if the sensor reading is 67.2°F, and the offset is adjusted to -2.5°F, the value would display 64.7°F. Once a value has been offset, all screens displaying the sensor reading, including the Main screen and Information screens, will display the adjusted value.

C2: Mixed Air Temp
C3: Outdoor Air
C4: Return Air
C5: Supply Air
C6: Outdoor Humidity
C7: Outdoor Coil Temp
C8: Suction Temp
C9: Discharge Pressure
C10: Suction Pressure

Screens C11-C16 display the digital outputs used in the system. The following will be found on each of these screens:

The output location on the PLC and name of the output channel

Current State: The current output value at the PLC

OV Value: The value that overrides the Current State output value. The OV Value must be enabled to affect the Current State.

Enable: Enables the OV Value. If the Enable value is "ON", the OV Value overrides the Current State. If the Enable value is "OFF", then the OV Value doesn't affect the Current State output value.

C11: D01 Reversing Valve
C12: D03 Reheat Valve
C13: D04 Electric Heat 1
C14: D05 Electric Heat 1
C15: D07 Unit Fail Relay
C16: D09 ERV Relay

Blower Override C17

Output: The location on the PLC that the output demand is generated

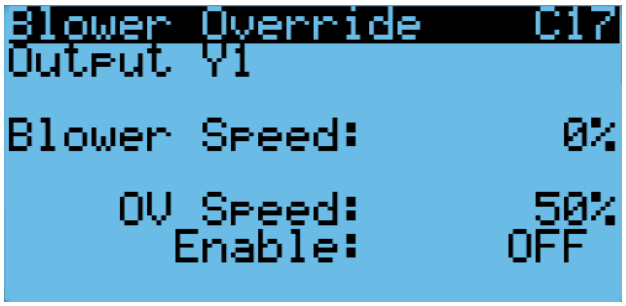
Blower Speed: Displays the % demand (0-100%) the blower is currently running. This output can be affected by the OV Speed.

OV Speed: The % value that overrides the Blower Speed output value. The OV Speed must be enabled to affect the Blower Speed.

Enable: Enables the OV Speed. If the Enable value is "ON", the OV Speed overrides the Blower Speed. If the Enable value of "OFF", the OV Speed doesn't affect the Blower Speed value.

Overrides must be disabled to return unit to normal operation and will time out and revert back to the original value after 5 minutes.

FIGURE 36
Screens: Blower Override C17



Damper Override C18

Output: The location on the PLC that the output demand is generated

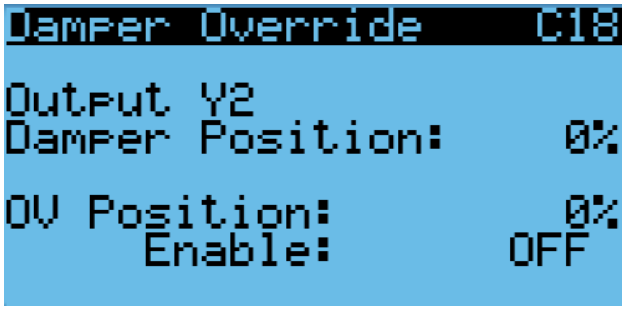
Damper Position: Displays the % demand (0-100%) the damper blade is currently set. This output can be affected by the OV Position.

OV Position: The % value that overrides the Damper Position output value. The OV Position must be enabled to affect the Damper Position.

Enable: Enables the OV Position. If the Enable value is "ON", the OV Position overrides the Damper Position. If the Enable value of "OFF", the OV Position doesn't affect the Damper Position value.

Overrides must be disabled to return unit to normal operation and will time out and revert back to the original value after 5 minutes.

FIGURE 37
Screens: Damper Override C18



Condenser Fan Override C19

Output: The location on the PLC that the output demand is generated

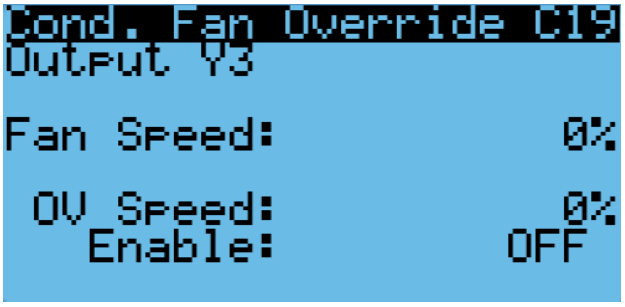
Fan Speed: Displays the % demand (0-100%) the fan is currently running. This output can be affected by the OV Speed.

OV Speed: The % value that overrides the Fan Speed output value. The OV Speed must be enabled to affect the Fan Speed.

Enable: Enables the OV Speed. If the Enable value is "ON", the OV Speed overrides the Fan Speed. If the Enable value of "OFF", the OV Speed doesn't affect the Fan Speed value.

Overrides must be disabled to return unit to normal operation and will time out and revert back to the original value after 5 minutes.

FIGURE 38
Screens: Cond. Fan Override C19



EEV Override C20

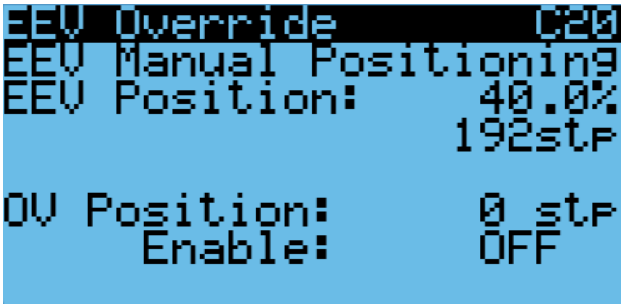
EEV Position: Displays the % demand (0-100%) the electronic expansion valve (EEV) is currently set. This output can be affected by the OV Position.

OV Position: The % value that overrides the EEV Position output value. The OV Position must be enabled to affect the EEV Position.

Enable: Enables the OV Position. If the Enable value is "ON", the OV Position overrides the EEV Position. If the Enable value of "OFF", the OV Position doesn't affect the EEV Position value.

Overrides must be disabled to return unit to normal operation and will time out and revert back to the original value after 5 minutes.

FIGURE 39
Screens: EEV Override C20



Demand Overrides C21

Mode: Toggles the unit demand override to either cooling mode or heating mode.

Cooling PI: The % of cooling demand on the unit

NOTE: *The cooling PI will not be considered unless the Mode is set to cooling and the override is enabled.*

Heating PI: The % of heating demand on the unit.

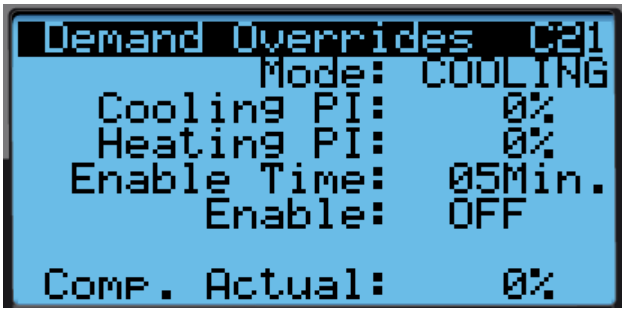
NOTE: *The heating PI will not be considered unless the Mode is set to heating and the override is enabled.*

Enable Time: The duration of time the override is enabled. The enable time is not considered until the override is enabled.

Enable: Enables the Demand Override. If the Enable value is "ON", the Demand Override is adjusted to the selected Mode and corresponding PI. Once the override has run for the duration of the Enable Time, the Demand Override is disabled. If the Enable value is "OFF", the demand is not affected by the overrides on this screen.

Overrides must be disabled to return unit to normal operation and will time out and revert back to the original value after 5 minutes.

FIGURE 40
Screens: Demand Overrides C21

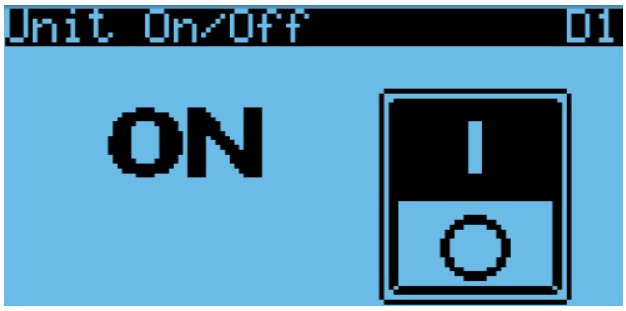


Unit On/Off

Unit On/Off D1

This screen allows the unit to be toggled “ON” or “OFF” by pressing either arrow on the right side of the screen. When the toggle is set to “ON”, it allows the unit to operate. When the toggle is set to “OFF”, all function of the unit is turned off and the unit status will read “Off by keypad” on the Main screen. The value does not automatically reset and must be manually toggled back to “ON” to resume unit operation.

FIGURE 41
Screens: Unit On/Off D1



Alarm Logs

Data Logger

Data Logger: Log of alarms unit has had in the past. This screen can also be accessed through the Alarm button (top left button on PLD Pro) and through the Quick Screens.

FIGURE 42
Screens: Data Logger

Settings

Date/Time

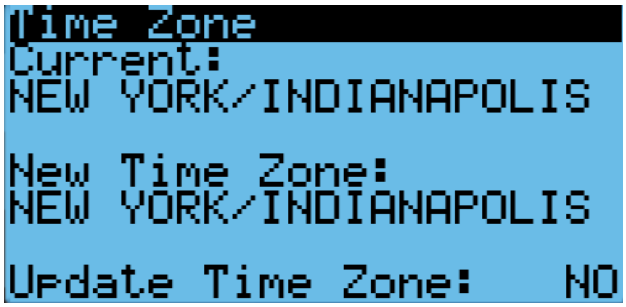
Time Zone

Current: Displays a location that is in the current time zone selected

New Time Zone: Provides a list of locations to scroll through to select the location that is closest and best represents the local time zone.

Update Time Zone: Change value from “NO” to “YES” to make the New Time Zone the Current Time Zone.

FIGURE 43
Screens: Time Zone



Date/Time

Time: Allows the time to be adjusted in hours, minutes and seconds.

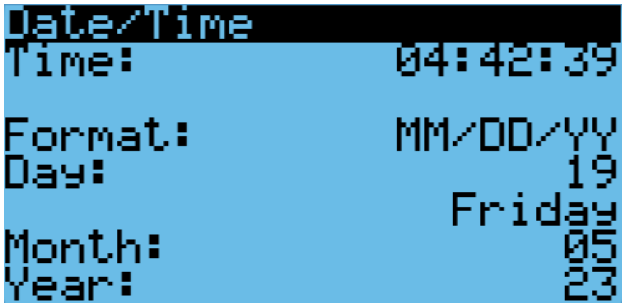
Format: Allows how the date is displayed to be adjusted in month (MM), day (DD) and year (YY).

Day: Allows the day of the month to be adjusted. The corresponding day of the week will adjust automatically.

Month: Allows the month of the year to be adjusted. The corresponding day of the week will adjust automatically.

Year: Allows the year to be adjusted. The corresponding day of the week will adjust automatically.

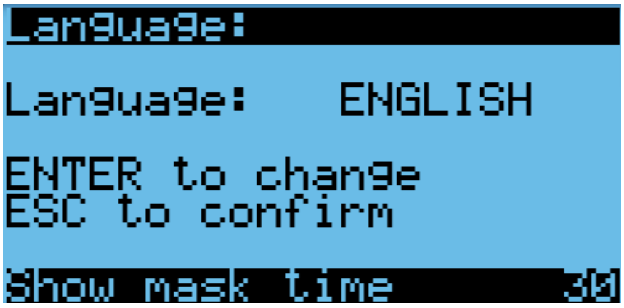
FIGURE 44
Screens: Date/Time



Language

The language displayed on the screen is the one selected. When the Enter button is pressed, the language selected is changed. Continue pressing the Enter button to scroll through the language selections. When the desired language is displayed on the screen, press the Escape button to confirm the language selection.

FIGURE 45
Screens: Language



Import/Export

Alarm Log Export

This screen allows a log of past alarms to be exported onto an Excel sheet.

File name: Name of the exported Excel file. If two files with the same name are exported, the most recent file exported will replace the old file. To prevent this, the numbers at the end of the file name can be incremented. Change the "Confirm?" value to "YES" to confirm the file name and to begin exporting the file.

For a more detailed explanation to export alarm logs, see the most recent version of supplemental manual 7960-825 (see Appendix section of this manual).

FIGURE 46
Screens: Alarm Log Export 1/2

3 Day Log Export

This screen allows a log of data for the past 3 days to be exported. Data points are logged every 30 seconds.

File name: Name of the exported Excel file. If two files with the same name are exported, the most recent file exported will replace the old file. To prevent this, the numbers at the end of the file name can be incremented. Change the "Confirm?" value to "YES" to confirm the file name and to begin exporting the file.

For a more detailed explanation to export 3 day logs, see the most recent version of supplemental manual 7960-826 (see Appendix section of this manual).

FIGURE 47
Screens: 3 Day Log Export 2/2

Initialization

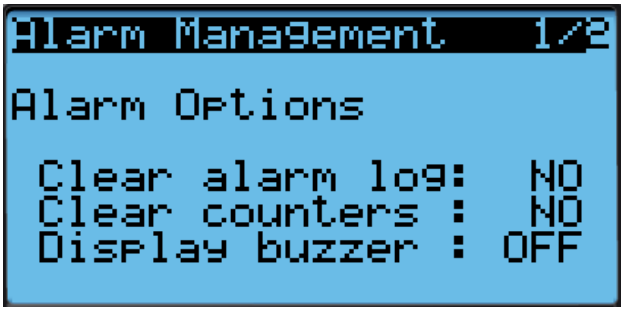
Alarm Management

Clear alarm log: Deletes log of alarms stored in the system. This will also affect the alarm export.

Clear counters: Clears the count for alarms that require more than one trip.

Display buzzer: Turns on and off the alarm noise.

FIGURE 48
Screens: Alarm Management 1/2



Factory Reset

Resets all configurable values to defaulted settings.

FIGURE 49
Screens: Factory Reset 2/2

Change Passwords

This screen allows the defaulted passwords to be changed, if desired.

User: User password level allows access to basic level material. This has the most limited access of all the password levels. When logged in as a User, only the User password will be displayed and is the only password that can be changed.

Technician: Technician password level allows more access than the User but is still limited in some areas. When logged in as a Technician, both the User and Technician passwords will be displayed and can be changed.

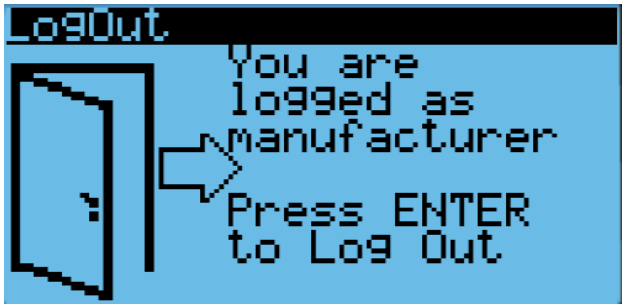
Engineer: Engineer password level allows access to all material displayed. This has the most access of all password levels. When logged in as a Technician, the User, Technician, and Engineer passwords will be displayed, and all password levels can be changed.

FIGURE 50
Screens: Change Passwords

Log Out

When done working with the PLD Pro display, log out of the password protected menus, if desired. Doing this will require log in again to gain access to the menus. If there is no activity for 5 minutes, log out is automatic and a password will be required to log back in.

FIGURE 51
Screens: LogOut



Alarms (General Functionality)

Name	Type
Return Air Temperature Sensor Alarm	User reset
Mixed Air Temperature Sensor Alarm	User reset
Mixed Air High Temperature	Auto reset
Mixed Air Low Temperature	Auto reset
Supply Air Temperature Sensor Alarm	User reset
Outdoor Air Temperature Sensor Alarm	User reset
Outdoor Air Humidity Sensor Alarm	Auto reset
Discharge Pressure Sensor Alarm	User reset
Suction Temperature Sensor Alarm	User reset
Suction Pressure Sensor Alarm	Auto reset
Low Pressure Alarm	Auto reset until counter
High Pressure Alarm	User reset
Damper Failed to Open	Auto reset
Damper Failed to Close	Auto reset
Freeze Condition	Auto reset
Unit Disable Alarm	Auto reset
Low SuperHeat	Auto reset
Outdoor Coil Temperature sensor out of range	Auto reset
EV2 Compressor Phase Over Current	Auto reset
EV2 AC Input Over Current	Auto reset
EV2 DC Bus Over Voltage	Auto reset
EV2 DC Bus Under Voltage	Auto reset
EV2 AC Input Over Voltage	Auto reset
EV2 AC Input Under Voltage	Auto reset
EV2 HPS Open	Auto reset
EV2 Power Module Over Temp	Auto reset
EV2 Lo st Rotor Position	Auto reset
EV2 DC Bus Voltage Low	Auto reset
EV2 Intermediate Compressor Phase Overcurrent	Auto reset
EV2 Compressor Phase Current Fold Back Timeout	Auto reset
EV2 Auto Config Communication Timeout	Auto reset
EV2 Thermistor High Temp	Auto reset
EV2 Power Module Temp High	Auto reset
EV2 Comms to DSP Lost	Auto reset
EV2 Compressor Phase Overcurrent	Auto reset
EV2 AC Input Over Current	Auto reset
EV2 DC Bus Over Voltage	Auto reset
EV2 DC Bus Undervoltage	Auto reset
EV2 AC Input Over Voltage	Auto reset
EV2 AC Input Under Voltage	Auto reset

Name	Type
EV2 HPS Open	Auto reset
EV2 Power Module Over Temp	Auto reset
EV2 Lost Rotor Position	Auto reset
EV2 DC Bus Voltage Low	Auto reset
EV2 Compressor Phase Current Imbalance	Auto reset
EV2 Drive EEPROM Fault	Auto reset
EV2 Compressor Model Config Error	Auto reset
EV2 High Pressure Sensor Config Error	Auto reset
EV2 Thermistor Low Temp	Auto reset
EV2 Power Module Temp Low	Auto reset
EV2 Fault Limit Lockout	Auto reset
EV2 Power module foldback time out	Auto reset
EV2 AC Input current foldback time out	Auto reset
EV2 Modbus Communication Lost	Auto reset
EV2 Communication Error	Auto reset
Standalone Device Offline	Auto reset

Standalone Device Offline Alarm

Description

- The standalone offline alarm will be triggered when the unit loses communication with the room controller (BrightStat).

Sequence

- If a BACnet error is present for more than 30 seconds, it will be assumed that the room controller (BrightStat) is no longer communicating properly with the unit.
- The standalone offline alarm will be triggered when this occurs.

Low Pressure Alarm

Description

- The low pressure alarm looks for low pressure conditions to protect against a loss of charge in the unit.

Sequence

- If the suction pressure falls below the low pressure setpoint 3 (40 psi) for more than 2 minutes (adjustable), a low pressure alarm will be triggered.
- The low pressure alarm will automatically reset once the pressure increases above the low pressure setpoint on the first trip.
- If two trips occur within a 1-hour period (adjustable), the alarm will require a manual reset.
- Low pressure alarms will disable the compressor while active.

High Pressure Alarm

Description

- The high pressure alarm protects the refrigeration system from excessive pressure.

Sequence

- If the HPS (high pressure switch) connected to the EV2 drive opens, notification will occur via Modbus.
- If notification of the HPS open is present for more than 5 seconds, a high pressure alarm will be triggered.
- High pressure alarms will disable the compressor while active.

Damper Fail to Open Alarm

Description

- The damper fail to open alarm is intended to provide notification of malfunctioning damper.

Sequence

- If the damper is commanded to a position of greater than 40% and the damper switch doesn't open within the damper open delay time, a damper fail to open alarm will be triggered.
- No functionality will be blocked by the damper fail to open alarm.

Damper Fail to Close Alarm

Description

- The damper fail to close alarm is intended to provide notification of malfunctioning damper.

Sequence

- If damper is commanded to 0% (closed) and the damper switch doesn't close within the damper close delay time, a damper fail to close alarm will be triggered.
- No functionality is blocked by the damper fail to close alarm.

Evaporator Freeze Protection Alarm

Description

- Evaporator coil will be monitored in cooling for freezing. If freezing is detected, then an alarm will be generated and the compressor will be disabled until the condition is cleared.

Sequence

- Freeze protection will utilize the saturated suction pressure to determine the evaporator coil temperature. If this temperature falls below the freezing point (28°F) for more than 10 minutes consecutively, the compressor will be disabled, an alarm will be generated and the blower will run. The blower and alarm will remain active until the alarm is reset or a 5-minute timer has expired.

Sensor Alarms

Description

- Alarms will be triggered when a sensor fails where possible.

Sequence

- When a sensor reads open, shorted or out of range, a sensor alarm will be triggered.

EV2 Alarms

Description

- When the drive is faulted, the fault will be communicated back to the PLC via Modbus.

Sequence

- When a drive fault is communicated, a corresponding alarm will be triggered.
- The alarm text will begin with EV2 to indicate that the alarm is a drive alarm with the exception of an open HPS. (See **High Pressure Alarm** sequence above)
- See Table 16 beginning on page 58 for a list of EV2 alarms.

NOTE: *Screenshots shown in this manual reflect default settings (when applicable).*

Unit On/Off

The wall-mount unit can be turned on and off from the PLD Pro. Turning the unit off with the following instructions will disable all unit operation.

To turn the unit on or off:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **On/Off**; press ENTER key.
4. Press UP or DOWN keys to change value from On to Off or from Off to On.
5. Press ESCAPE key several times to return to Main Menu screen.

The wall-mount unit may also be turned off by certain alarms. Below is a list of conditions that will disable unit operation to prevent damage to unit or property:

- Unit Disable Input
- Invalid Model Number Size

NOTE: *The unit will operate if overrides are activated even when the unit is set to off.*

Alarm Adjustment

Acknowledging Alarms

Alarm conditions activate a red LED indicator that backlights the ALARM function key. As an option, an alarm condition may also be enunciated by an audible alarm signal. An alarm is acknowledged by pressing the ALARM key. This calls up alarm display screen(s) that provide a text message detailing the alarm condition(s).

Clearing Alarms

Alarms can only be cleared after the alarm condition has been corrected. To clear a single alarm, press and hold the ALARM key for 3 seconds while viewing a specific alarm screen. To clear all alarms, navigate to the screen at the end of the alarm list (shown in Figure 52) and press and hold the ALARM key for 3 seconds.

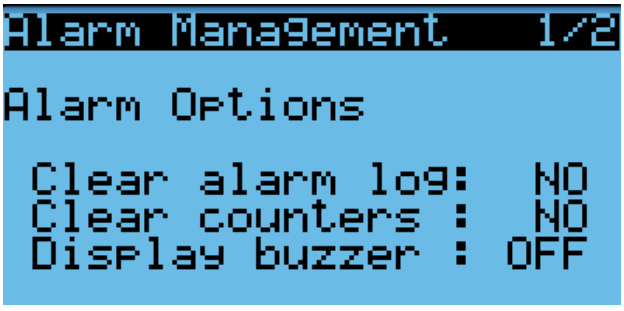
FIGURE 52
Clearing All Alarms

Clearing Alarm Logs and Counters

To clear the alarm log and alarm counters:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Initialization**. (**Alarm Management 1/2** screen will be displayed.)
5. Press ENTER key to scroll to **Clear Alarm Log** (see Figure 53).
6. Press UP or DOWN key to change value to **YES**; press ENTER key.
7. Press ENTER key to scroll to **Clear Counters**.
8. Press UP or DOWN key to value to **YES**; press ENTER key.

FIGURE 53
Clearing Alarm Logs and Counters



Exporting Alarm Logs

See latest version of Supplemental Instructions manual 7960-825 for information on exporting alarm logs (see Appendix).

Exporting 3 Day Logs

See latest version of Supplemental Instructions manual 7960-826 for information on exporting 3 day I/O logs (see Appendix)..

Freecooling

If the unit is equipped with an economizer, and conditions are acceptable for economizer operation, the variable speed wall-mount unit will utilize freecooling operation before the use of any cooling operation requiring compressor operation to reduce the energy required to cool the indoor space.

Economizer Disable

There are three methods to disable the economizer if the use of freecooling is restricted. The first method is to select None as the economizer type within the **Sys Config** menu. The second method requires changing the model number within the **Adv Sys Config** menu to reflect a model installed with a blank-off plate (see model nomenclature on page 11). Changing the wall-mount unit model number to reflect a unit with a blank-off plate will not allow for an economizer type to be selected therefore defaulting to a disabled state, along with all sensors/alarms associated with it. The third method can be utilized via the room controller (Brightstat). If ventilation is required but economizing is not, the user can change the mode for the damper from economizer to CRV in the custom menu. The custom menu is accessed by pressing the Gear button on the room controller (Brightstat) home screen.

Economizer Enable

The economizer will be enabled for cooling operation if the model number reflects a wall-mount unit with an economizer installed, an economizer type other than None and the conditions for the economizer type are met. The following list explains the economizer types and the parameters required for operation. See also Figures 54 and 55.

FIGURE 54
Economizer A2 Screen

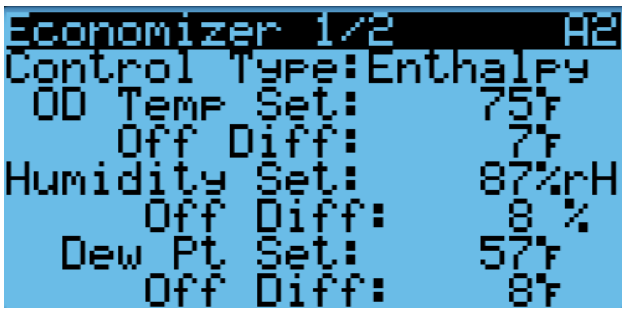
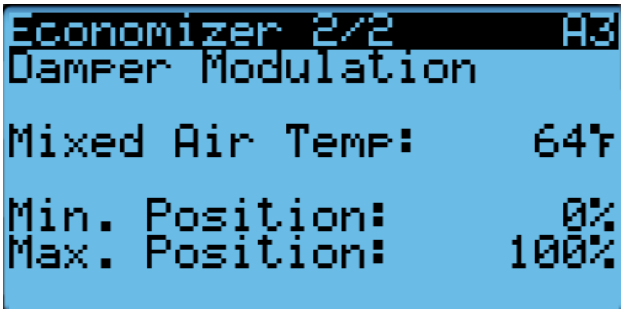


FIGURE 55
Economizer A3 Screen



None

Economizer will not be enabled for freecooling operation.

Drybulb Only

1. Outdoor air temperature is below the Outdoor Set outdoor temperature setpoint listed within the **Sys Config** menu. (Outdoor Set temperature setpoint is 70°F by default.)

Temperature and Humidity

1. Outdoor air temperature is below the Outdoor Set outdoor temperature setpoint listed within the **Sys Config** menu. (Outdoor Set temperature setpoint is 70°F by default.)
2. Outdoor relative humidity is below the OA Humid Set outdoor humidity setpoint listed within the **Sys. Config** menu. (OA Humid Set humidity setpoint is 80% RH by default.)

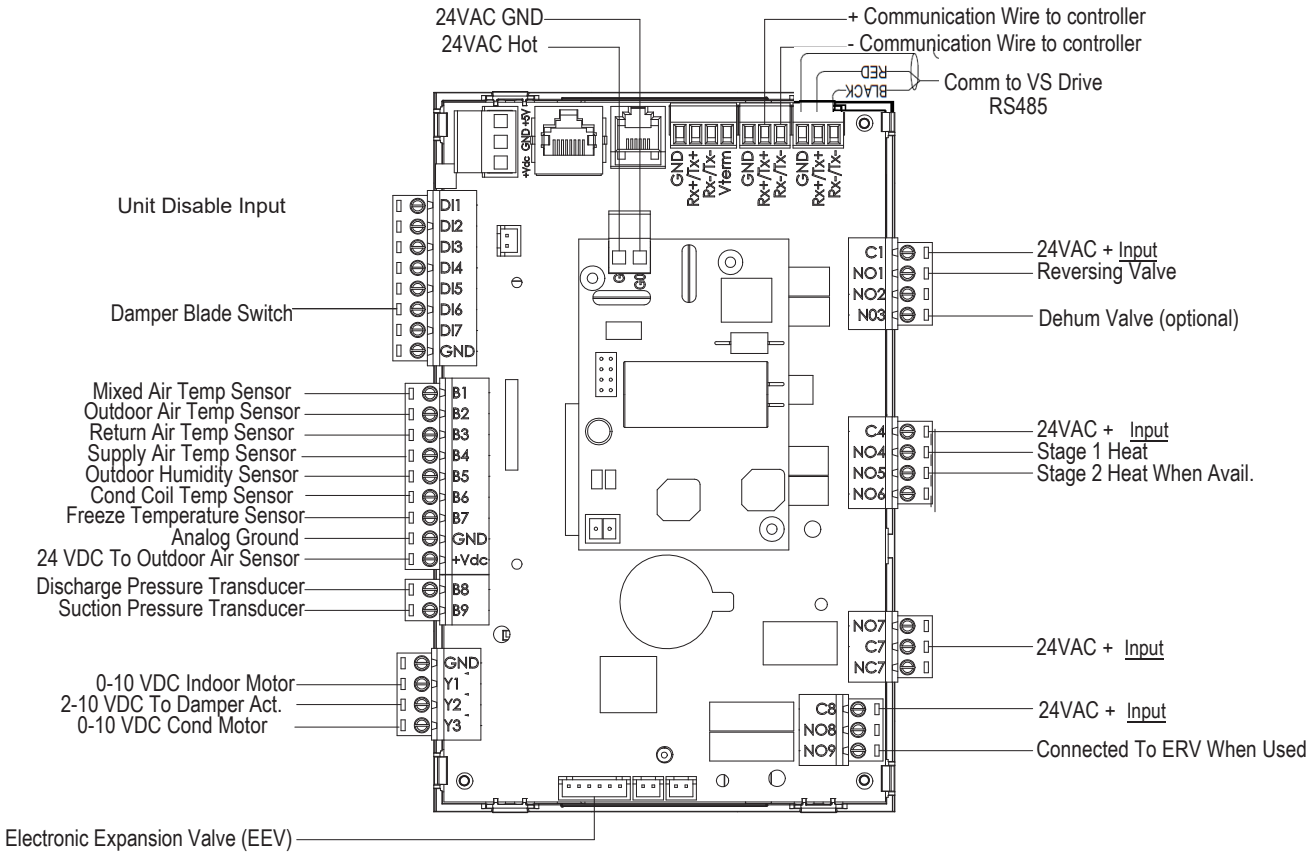
Enthalpy

1. Outdoor air temperature is below the Outdoor Set, outdoor temperature setpoint, listed within the **Sys Config** menu. (Outdoor Set temperature setpoint is 70°F by default.)
2. Outdoor relative humidity is below the OA Humid Set outdoor humidity setpoint listed within the **Sys. Config** menu. (OA Humid Set humidity setpoint is 80% RH by default.)
3. The outdoor air dewpoint is below the OA Dew Pt Set outdoor dewpoint setpoint, listed within the **Sys Config** menu. (OA Dew Pt Set dewpoint setpoint is 55°F by default.).

Unit Disable

The wall-mount unit can be disabled by opening the dry set of contacts connected to Input DI1 on the PLC board (low voltage strip terminal #5). This feature is disabled by default and must be enabled before the input will affect unit operation. When the input detects open contacts, all unit operation will stop and the dampers will close. This is an automatic reset feature that will resume operation as soon as the unit detects the contacts are closed again.

FIGURE 56
W*VHY Control Board I-O Use/Values



See Table 14 on page 50 for information on control board terminal functions.

TABLE 14
W*VHY Wall-Mount Unit Control Board Terminal Use

Terminal	Function	Type	Form
Rx+/Tx+ #1	Terminal Strip/Room Controller (Brightstat)	Analog I-O	Communication
Rx-/Tx- #1	Terminal Strip/Room Controller (Brightstat)	Analog I-O	Communication
DI1	Unit Disable	Digital	
DI2	Not Used		
DI3	Not Used		
DI4	Not Used		
DI5	Not Used		
DI6	Damper Blade Switch	Digital	N/C
DI7	Not Used		
GND	Not Used		
B1	Mixed Air Temperature Sensor	Analog Input	10K Ohm Curve J
B2	Outdoor Air Temperature Sensor	Analog Input	10K Ohm Type
B3	Return Air Temperature Sensor	Analog Input	10K Ohm Curve J
B4	Supply Air Temperature Sensor	Analog Input	10K Ohm Curve J
B5	Outdoor Humidity Sensor	Analog Input	4-20 mA
B6	Condenser Coil Temperature	Analog Input	10K Ohm Curve J
B7	Freeze Temperature Sensor	Analog Input	10K Ohm Curve J
GND	Analog Ground		
+VDC	24VDC to Outdoor Air Sensor		
B8	Discharge Pressure Transducer	Analog Input	0-5 Vdc
B9	Suction Pressure Transducer	Analog Input	0-5 Vdc
Y1	Indoor Blower Speed Signal	Analog Output	0-10 Vdc
Y2	Damper Actuator	Analog Output	2-10 Vdc
Y3	Condenser Fan Motor Speed Signal	Analog Output	0-10 Vdc
GND	Ground		
C1	24VAC+	Power	
NO1	Reversing Valve	Relay Output	24VAC
NO2	Not Used		
NO3	Reheat Valve	Relay Output	24VAC
C4	24VAC+	Power	24VAC
NO4	Stage 1 Heating	Relay Output	24VAC
NO5	Stage 2 Heating	Relay Output	24VAC
NO6	Not Used		
NO7	Not Used		
C7	24VAC+	Power	24VAC
NC7	Not Used		
C8	24VAC+	Power	24VAC
NO8	Not Used		
NO9	Connect to ERV when Used	Relay Output	24VAC
GO	24VAC Ground		
G	24VAC Hot	Power	

Standard Maintenance Procedures

⚠ WARNING

Electrical shock hazard.

Disconnect all power supplies before servicing.

Failure to do so could result in electric shock or death.

⚠ CAUTION

Cut hazard.

Wear gloves to avoid contact with sharp edges.

Failure to do so could result in personal injury.

1. Turn off AC breakers at wall-mount units.
2. Coils need to maintain proper airflow. Check condenser section inlet grilles for obstructions/ debris—clean grilles and remove debris. Inspect return and supply grilles to ensure evaporator coil isn't obstructed.
   - Condenser coil: Clean if necessary, using a quality manufactured coil cleaning product.
     - Access panel can be removed from the side of fan shroud (See Figure 57 on page 52) to allow for improved access.
     - Blow-thru models: Remove front condenser grille and clean through front of coil. Check back of coil.
     - Draw-thru models: Remove side condenser grilles and clean through back of coil.

     Follow the coil cleaner manufacturer's directions for necessary safety gear and precautions, as well as for application and use. More than one application may be necessary. Rinse thoroughly.
   - Evaporator coil: Clean if necessary, using a quality manufactured coil cleaning product.
     - Open filter access panels and remove filters. Apply specific evaporator cleaner directly to the inlet side of coil, being very careful not to overspray into insulation or surrounding panels and wiring. For outlet-side cleaning, remove the supply grille and clean from that direction. The residual cleaner and dissolved debris should drip into the drain pan and leave the unit through the condensate hose. More than one application may be necessary. Rinse thoroughly.

     Follow the coil cleaner manufacturer's directions for necessary safety gear and precautions, as well as for application and use. More than one application may be necessary. Rinse thoroughly.
     - Inspect evaporator drain hose for blockage that would prevent drainage from evaporator drain pan
3. Manually spin the fan and blower motors to ensure they turn freely. All motors are permanently lubricated, so no oil is necessary.
4. Inspect vent package (Econ/CRV, ERV, FAD) linkage, actuator and damper.
5. Install new air filters.
6. Inspect unit control panel.
   - Look for insect or rodent activity and remove nesting materials.
   - Check field and factory wiring for tightness and look for signs of overheating (discoloration of terminals or wire insulation)
7. Inspect inverter drive assembly.
   - Inspect aluminum heatsink fins that are facing outdoor fan assembly for dust/dirt. Airflow across heatsink is important for performance so fins must be cleaned out as needed. Assembly/drive does not need removed, cleaning can be done with a brush and cleaning solution that is safe for aluminum services.
8. Inspect outdoor temperature sensor (tube) extending below unit base.
   - Check outdoor air temp sensor (tube) for insects or any debris that may prevent accurate temp reading.
9. Re-assemble wall-mount unit.

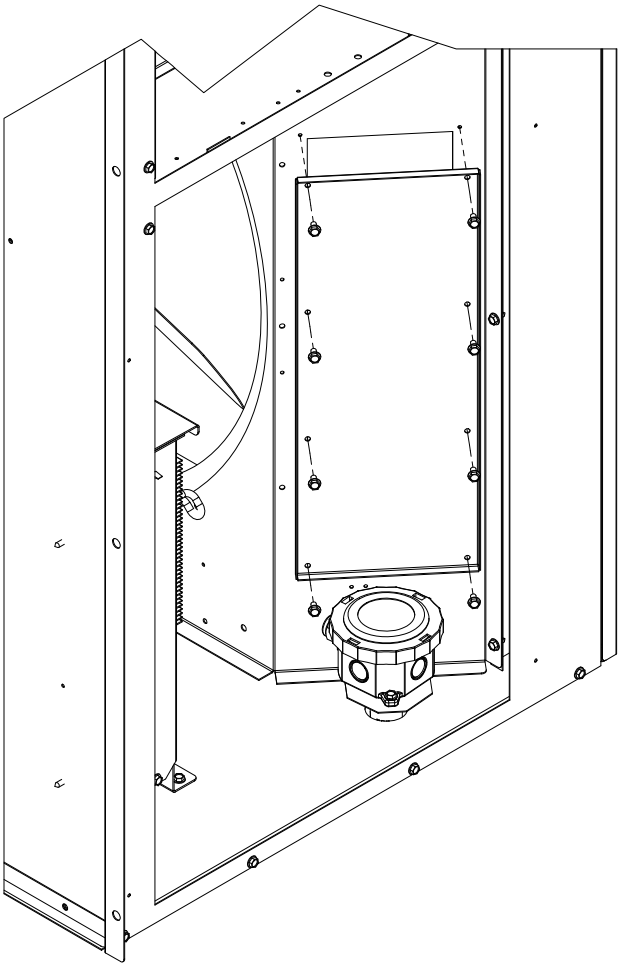
Repeat steps for additional wall-mount units.

Condenser Coil Access

Description

This model provides a removable access panel to clean the condenser coil surface (see Figure 57). The access panel can be found on the left side of the fan shroud (facing front of unit). The panel can be removed by taking out six (6) screws. ***CAUTION:*** *Be careful with any exposed sheet metal edges during service.*

FIGURE 57
Condenser Coil Access



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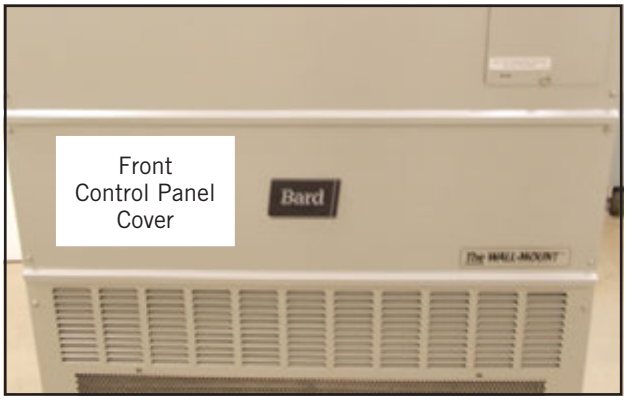
Service Hints

1. Caution owner/operator to maintain clean air filters at all times and also not to needlessly close off supply and return air registers. This reduces airflow through the system, which shortens equipment service life as well as increasing operating costs.
2. Check all power fuses or circuit breakers to be sure they are the correct rating.
3. Periodic cleaning of the outdoor coil to permit full and unrestricted airflow circulation is essential.

Filters

The filters can be serviced from the outside by removing the front control panel cover (see Figure 58). Two (2) 20" x 20" x 1" throwaway filters come standard with each unit. Additional 1" and 2" filter options are available as optional accessories.

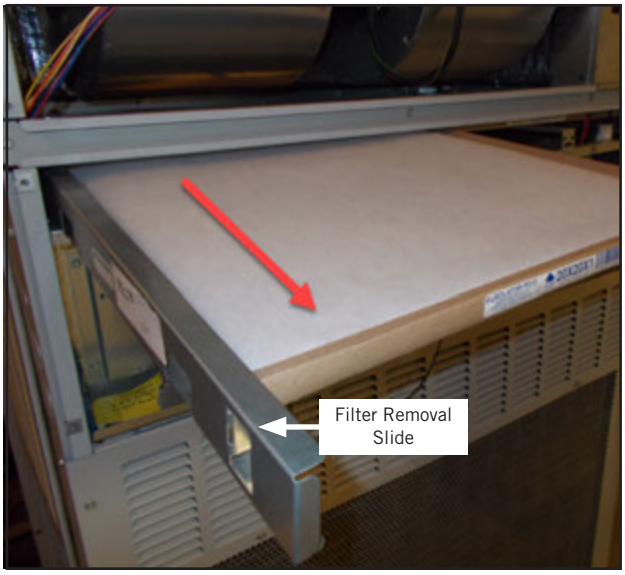
FIGURE 58
Front Control Panel Cover



Filter Removal/Installation

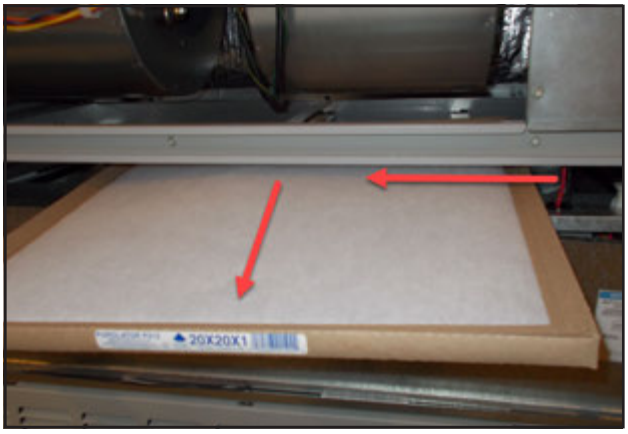
1. Remove left filter first by pulling filter removal slide out (see Figure 59).

FIGURE 59
Removing Left Filter



2. Slide second filter to the left around the wires and pull the filter out (see Figure 60).

FIGURE 60
Removing Second Filter



3. Reverse the order for new filter installation.

NOTE: *When installing new filters, make sure that airflow arrows on filters point up.*

Switching Filter Sizes

1. To switch from 1" to 2" filters, start by removing the filter slide and bend the tabs down out of the way (see Figures 61 and 62).

FIGURE 61
Filter Tabs in Up Position

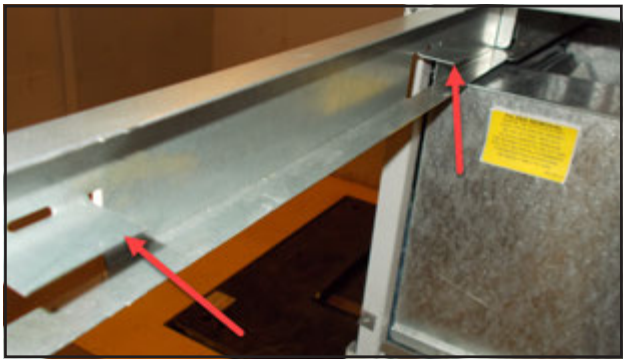
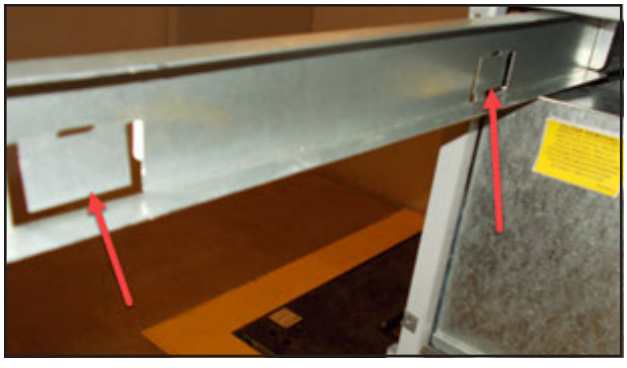


FIGURE 62
Bend Filter Tabs Down

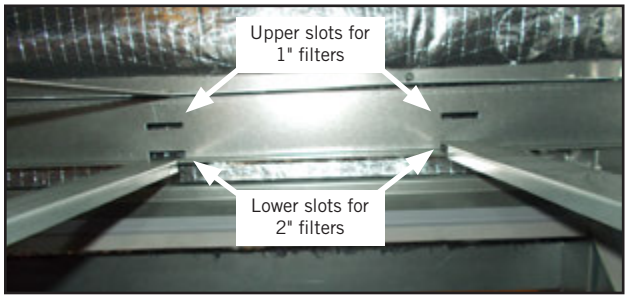


2. Locate the filter support brackets and remove the four (4) screws holding them to the top of the control panel (see Figure 63).

FIGURE 63
Remove Four Screws

3. Pull the brackets out towards the front of the unit. The back of the bracket will slip out of the upper slots at the back of the filter tray.
4. Re-install the filter support brackets into the lower slots at the back of the filter tray (see Figure 64).

FIGURE 64
Re-Install Filter Support Brackets into Lower Slots



5. Re-install the four (4) hex head screws into the upper screw holes on the filter support brackets. Then bend the tab up out of the way (see Figure 65).

FIGURE 65
Re-Install Screws and Bend Tabs Up

6. Install the right 2" filter first followed by the left filter (see Figures 66 and 67).

NOTE: *When installing new filters, make sure that airflow arrows on filters point up.*

7. Reverse the steps above to switch from 2" to 1" filters.

FIGURE 66
Install Right 2" Filter

FIGURE 67
Install Left 2" Filter

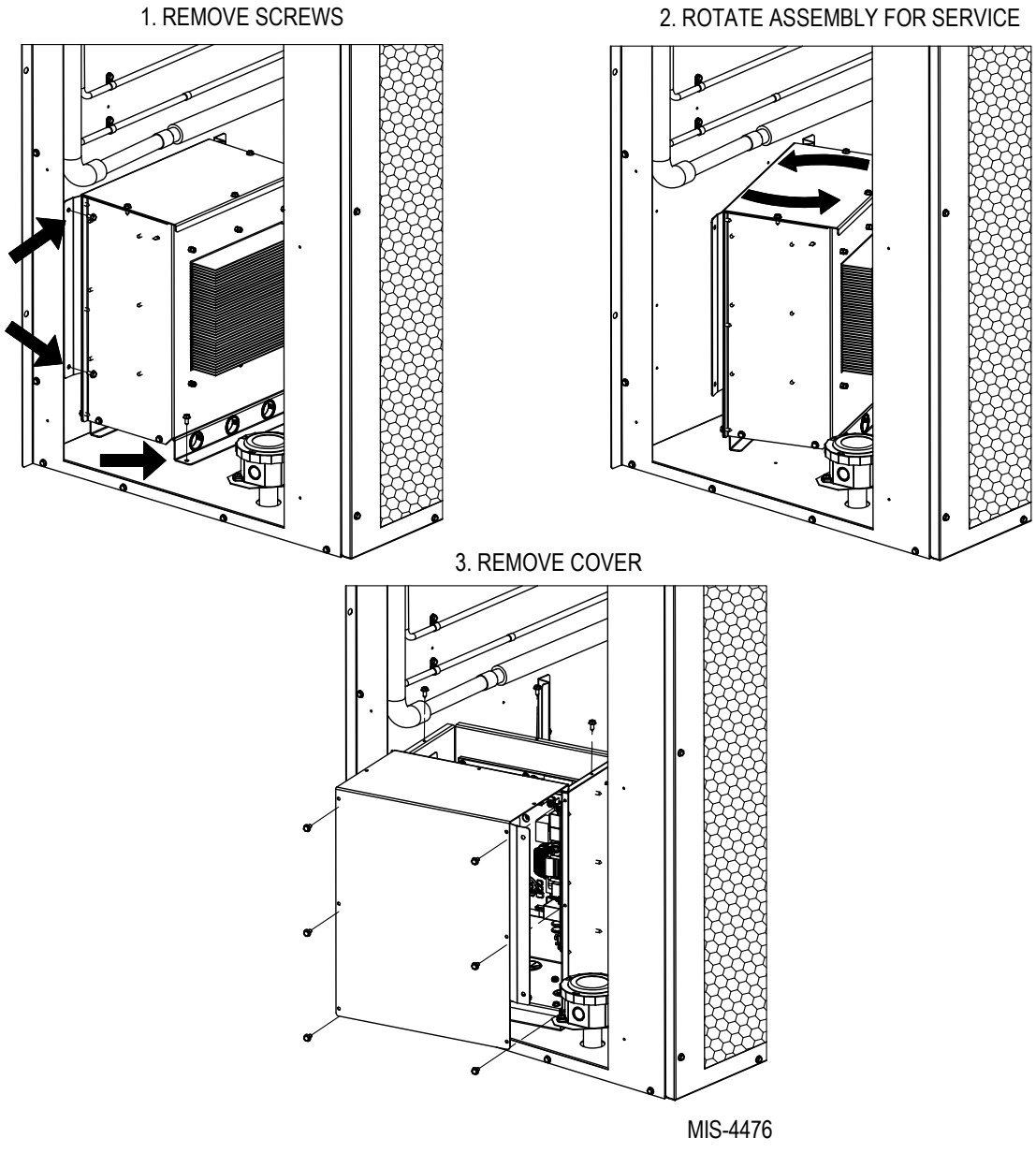
Inverter Drive Enclosure Service Access

The inverter drive assembly is located in the condenser section of the unit (opposite side of compressor). The inverter drive assembly includes inverter, choke, EMI filter and capacitor board (3 phase models only). The drive assembly is installed with cover towards unit back and heatsink towards condenser fan for airflow and heat exchange.

To service the drive components, the assembly must be removed from unit back. To remove the drive assembly:

1. Remove two (2) screws securing drive assembly to unit back (see Figure 68). Remove one (1) screw securing lower flange to unit base.
2. Assembly can now be rotated out from offset securing other side of drive assembly.
3. Rotate drive with heatsink facing compressor and cover facing out. Remove cover.

FIGURE 68
Inverter Drive Assembly Access



Variable Speed Drive Assembly

Prior to checking drive assembly components:

1. Ensure power to unit is OFF.
2. Allow 2 minutes for capacitors to discharge and LED board light to turn off.
3. Multimeter must be rated at 1,000-V CAT III (for diode checks)

Diagnosing drive:

1. VFD Rectification Input Check (Diode Forward Bias)
   A. Set multimeter to diode check ().
   B. Contact + (red) lead to input terminal (R/L1) and the – (black) lead on the DC (+) OUT terminal (see Figure 69).
   C. Meter should read around .5 Vdc.
   D. Move the + (red) lead to input terminals (S/L2) and (T/L3) while leaving the – (black) lead on the DC (+) OUT bus terminal.
   E. Meter should read around .5 Vdc for both (S/L2) and (T/L3).
2. VFD output check (diode forward bias)
   A. Set multimeter to diode check ().
   B. Contact + (red) lead to output terminal (U/T1) and the – (black) lead to the DC (+) IN terminal.
   C. Meter should read around .4 Vdc.
   D. Move the + (red) lead to output terminals (V/T2) and (W/T3) while leaving the – (black) lead on the DC (+) IN terminal.
   E. Meter should read around .4 Vdc for both (V/T2) and (W/T3).

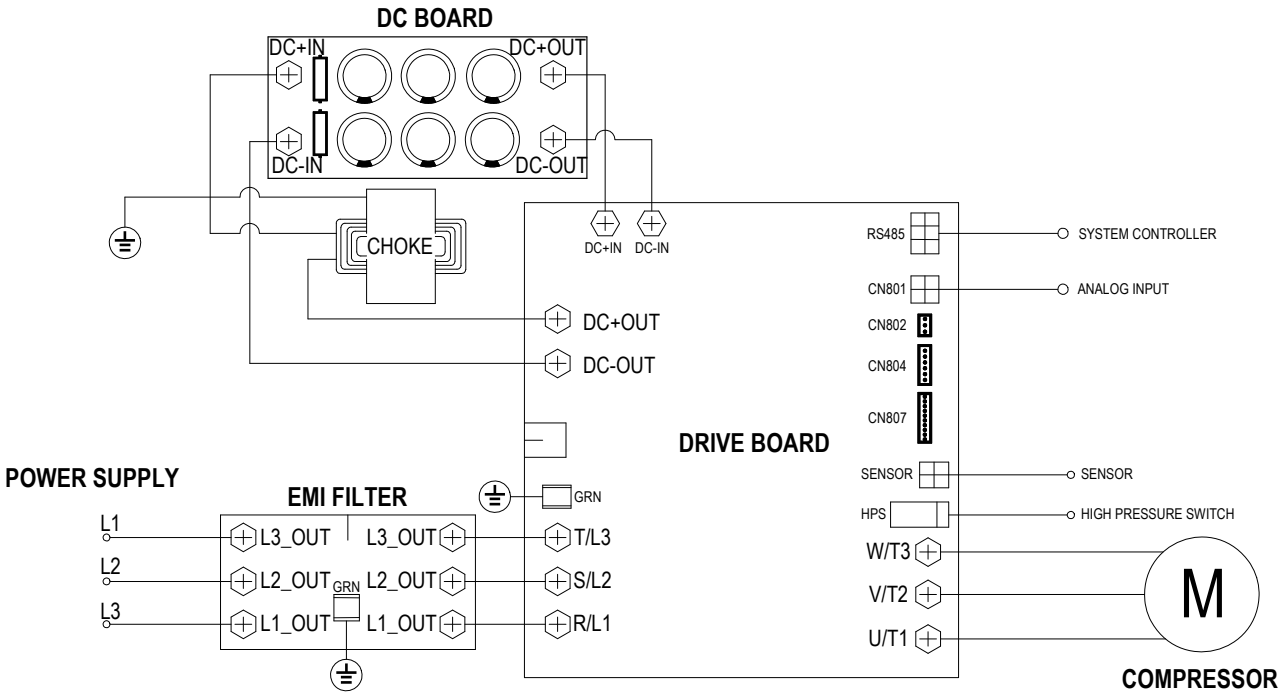
If any of these checks fail, that indicates the diodes may be shorted or damaged and the drive should be replaced.

3. Diagnosing capacitor board
   A. Capacitor troubleshooting is primarily a visual check for physical damage, leaking electrolytic fluid from the capacitors. Sometimes it is possible to smell if the capacitor is bad as the smell would be a strong scent.
      i. Replace capacitor board.
4. Diagnosing choke
   A. Using a meter set for continuity, contact both leads of the DC choke. If meter displays “OL”, this indicates short, open line and the choke is likely damaged.
      i. Replace choke.
5. Diagnosing EMI filter
   A. Using a meter set for continuity, contact T(IN) to T(OUT). (Start with R then S then T so single and three phase covered in order.)
   B. If meter displays “OL”, this indicates short, open line and the filter is likely damaged.
   C. Repeat for S(IN), S(OUT) and then R(IN), R(OUT).
      i. Replace EMI filter.

TABLE 15
Meter Check Table

Step	(+) Meter Lead	(–) Meter Lead	Meter Reading Diode Check
1	R/L1, S/L2, T/L3	DC (+) OUT	.5 Vdc
2	DC (+) IN	R/L1, S/L2, T/L3	"OL"
3	U/T1, V/T2, W/T3	DC (+) OUT	.5 Vdc
4	DC (+) IN	U/T1, V/T2, W/T3	"OL"

FIGURE 69
Inverter Drive Wiring Diagram



MIS-4493

Drive Troubleshooting

All alarms associated with the inverter drive will have a prefix of "EV2". The "EV2 Modbus Communication Loss" alarm has an auto retry feature and will reset itself within 2 minutes under normal circumstances. This alarm is expected after a software update or loss of power. Additional EV2 alarms will often require a power cycle if they do not reset after the compressor has stopped and 2 minutes has passed. Information on troubleshooting these specific alarms can be found in Table 16.

TABLE 16
EV2 Alarms

Alarm	
EV2 Compressor Phase Over Current	1. Check Connections from drive to compressor. 2. Check the compressor motor windings. 3. Verify unit/compressor is operating within specified parameters. 4. Replace the drive.
EV2 AC Input Over Current	1. Check line voltage. 2. Verify the unit is operating within specified parameters. 3. Replace Drive
EV2 DC Bus Over Voltage	1. Verify the unit is operating within specified parameters.
EV2 DC Bus Under Voltage	1. Verify the unit is operating within specified parameters.
EV2 AC Input Over Voltage	1. Verify the unit is operating within specified parameters.
EV2 AC Input Under Voltage	1. Verify the unit is operating within specified parameters.
EV2 HPS Open	1. Verify the unit is operating within specified parameters.
EV2 Power Module Over Temp	1. Verify proper airflow over drive. Clear any obstruction. 2. Replace drive.
EV2 Lost Rotor Position	1.Check Connections from drive to compressor. 2. Check the compressor motor windings. 3. Verify unit/compressor is operating within specified parameters. 4. Replace the drive.
EV2 DC Bus Voltage Low	1. Check line voltage. 2. Verify the unit is operating within specified parameters. 3. Restart drive (cycle power).
EV2 Intermediate Compressor Phase Overcurrent	1. Verify the unit is operating within specified parameters.
EV2 Compressor Phase Current Fold Back Timeout	1. Verify the unit is operating within specified parameters.
EV2 Auto Config Communication Timeout	1. Restart drive (cycle power).
EV2 Thermistor High Temp	1. Verify the unit is operating within specified parameters. 2. Check DLT connections to drive.
EV2 Power Module Temp High	1. Verify proper airflow over drive. Clear any obstruction. 2. Replace drive.
EV2 Comms to DSP Lost	1. Restart drive (cycle power). 2. Check communication cable connections to drive. 3. Contact Technical Service or replace drive.
EV2 Compressor Phase Current Imbalance	1. Check connections from drive to compressor. 2. Check the compressor motor windings. 3. Verify unit/compressor is operating within specified parameters. 4. Replace the drive.
EV2 Drive EEPROM Fault	1. Restart drive (cycle power). 2. If problem persists, contact Technical Service or replace drive.

Continued on page 60

TABLE 16 (cont.)

EV2 Compressor Model Config Error	1. Restart drive (cycle power). 2. If problem persists, contact Technical Service.
EV2 High Pressure Sensor Config Error	1. Restart drive (cycle power). 2. If problem persists, contact Technical Service.
EV2 Thermistor Low Temp	1. Verify the unit is operating within specified parameters. 2. Check DLT connections to drive.
EV2 Power Module Temp Low	1. Verify proper airflow over drive. Clear any obstruction. 2. Contact Technical Service or replace drive.
EV2 Fault Limit Lockout	1. Restart Drive (cycle power).
EV2 Power module foldback time out	1. Verify proper airflow over drive. Clear any obstruction. 2. Contact Technical Service or replace drive.
EV2 AC Input current foldback time out	1. Verify line voltage. 2.Verify the unit is operating within specified parameters. 3. Restart drive (cycle power). 4. Contact Technical Service or replace drive.
EV2 Modbus Communication Loss	This alarm is normal after a software update or cycle of power. Wait 2 min. to see if alarm persists before troubleshooting. 1. Restart drive (cycle power). 2. Check communication cable connections to drive. 3. Contact Technical Service or replace drive.
EV2 HPS Configuration Error	1. Restart drive (cycle power).
EV2 Communication Error	1. Restart drive (cycle power). 2. Check communication cable connections to drive. 3. Contact Technical Service or replace drive.

FIGURE 70
Wiring Diagram – 230V 1-Phase

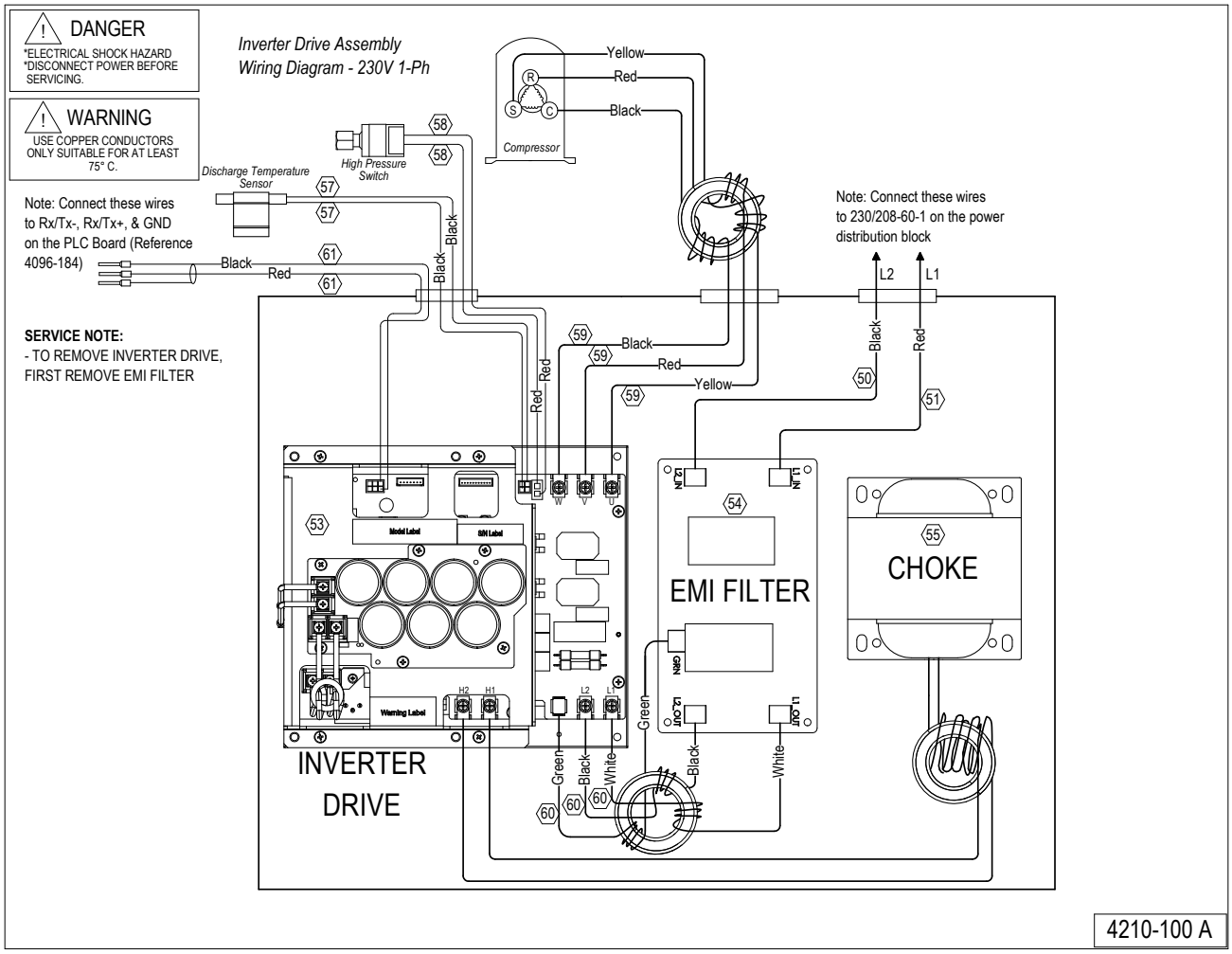


FIGURE 71
Wiring Diagram – 230V 3-Phase

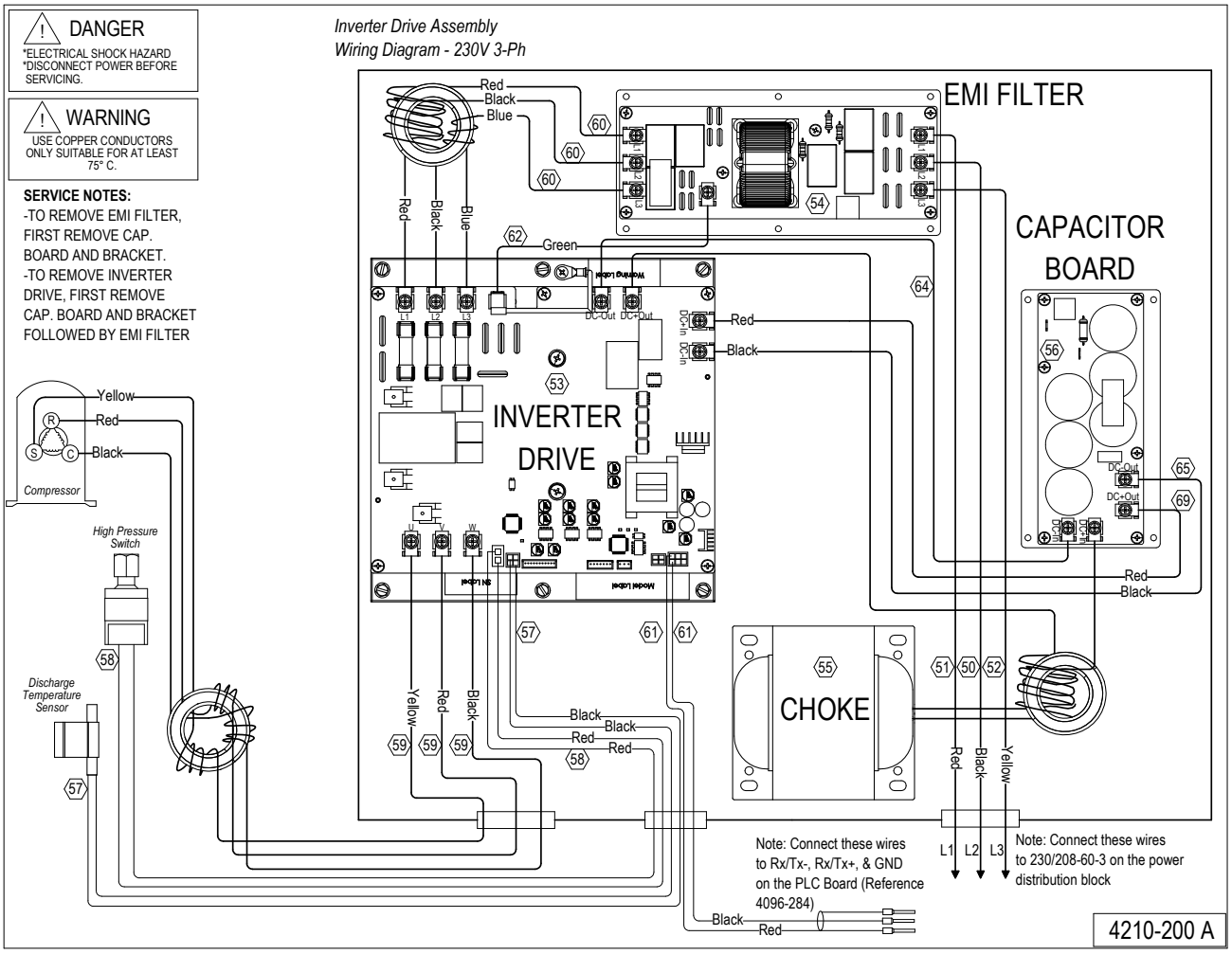
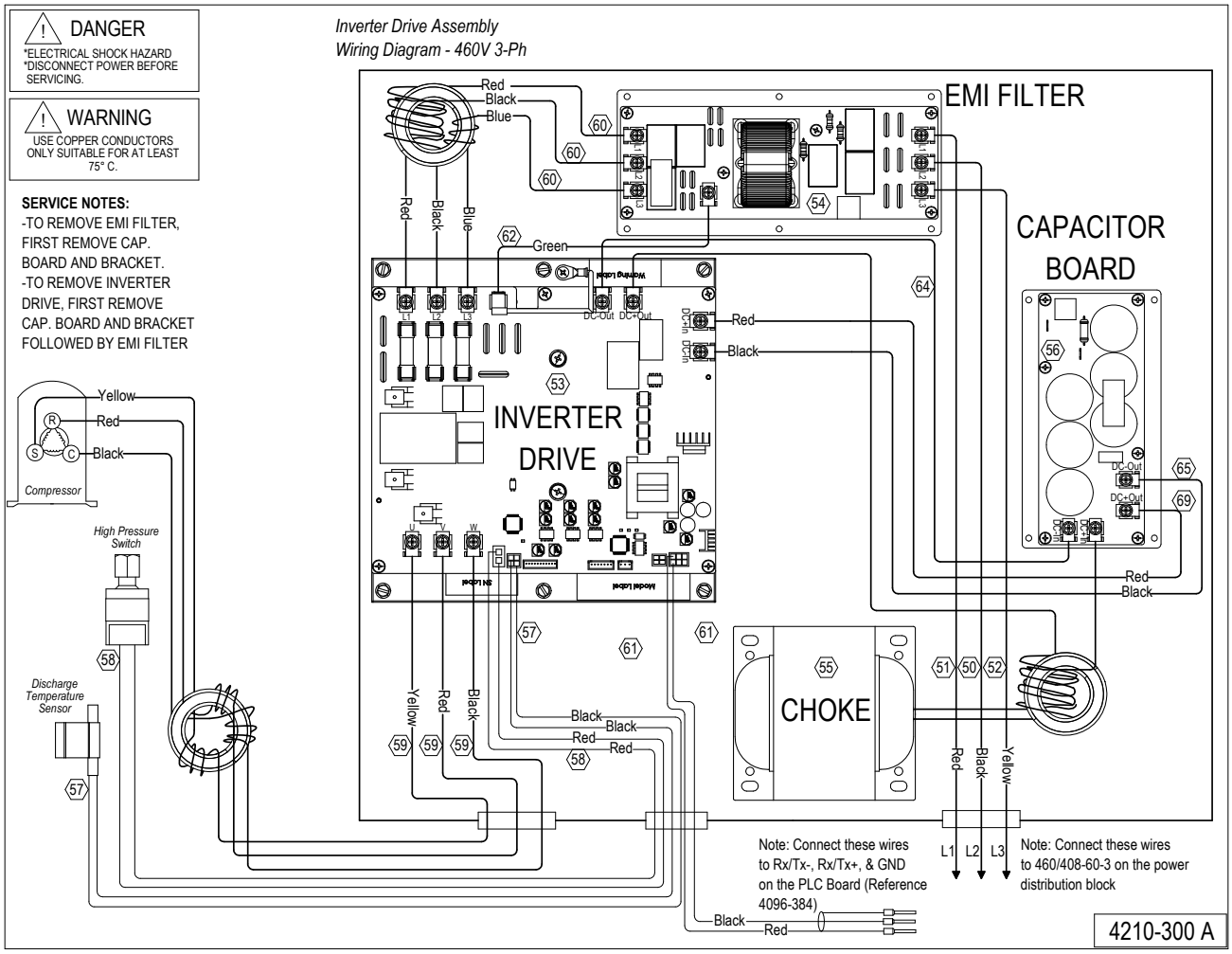


FIGURE 72
Wiring Diagram – 460V 3-Phase



Troubleshooting ECM™ 142R Outdoor Fan Motors

⚠ WARNING

- EXPOSED MOVING PARTS.
- DISCONNECT ALL ELECTRICAL POWER BEFORE SERVICING.
- FAILURE TO DO SO CAN RESULT IN SEVERE INJURY OR AMPUTATION.

⚠ WARNING

- HAZARD OF ELECTRICAL SHOCK.
- ELECTRICAL SHOCK CAN RESULT IN SERIOUS INJURY OR DEATH.
- DISCONNECT THE REMOTE ELECTRIC POWER SUPPLY OR SUPPLIES BEFORE SERVICING.

7961-755-1

⚠ CAUTION

Do not operate motor without fan blade attached. Such operations will cause the motor to oscillate up and down.

⚠ CAUTION

Only use the correct replacement motor from the manufacturer that is a direct replacement for the failed motor.

USING THE WRONG MOTOR VOIDS ALL WARRANTIES AND MAY PRODUCE UNEXPECTED RESULTS.

1. In normal operation, this motor may rock back and forth on start up. Do not replace if this is the only symptom identified.
2. If the system is operating properly, but the motor appears to run slower than it should, the motor is good. High efficiency systems with optimized fan blades are engineered to run slow to decrease noise. The Bard variable speed wall mount adjusts fan speed based upon varied outdoor ambient conditions or discharge pressure to optimize sound and unit efficiency.
3. If the system is noisy, freezing up, running a high head pressure, tripping the high pressure switch or compressor overload, check the following:
   a. Ensure cleanliness of condenser coil(s) and fan blade/shroud.
   b. Confirm the fan blade is not bent or deformed, isn't rubbing on the shroud and that it is tight on the motor shaft. Also ensure the motor is secure in its mounting system, and the mounting system is secure to the unit.
   c. The Bard variable speed wall mount is equipped with a low ambient control. This monitors discharge pressure to disable fan in cooling if discharge pressure falls below 240 psi, or if system is low on charge. (In heat pump {heating} mode, the low ambient fan cycling control is bypassed.)
   d. If motor is not running, go to next section.
4. If the motor does not appear to be running at the proper speed or does not shut off, refer to the next section for voltage checks to determine if the motor is getting the proper input signals.

   If the motor IS NOT receiving any communication, troubleshoot the communication issue using the diagnostic table for the fan logic control.
   a. Power is connected to motor leads:

      High voltage:

      Black connects to L1

      Red connects to L2

      Green/yellow connects to ground
   b. This motor uses a 0-10v signal to modulate fan operation:

      Blue connects to common on low voltage strip terminal #14

      Brown connects to Y3 on PLC

Replacing the Motor

This motor is replaced in one piece. The control cannot be replaced separately from the motor. Even if the control is remotely located, the replacement part will be a new control with harness and new motor.

The correct replacement motor from the manufacturer that is a direct replacement for the failed motor must be used.

Using the wrong motor voids all product warranties and may produce unexpected results.

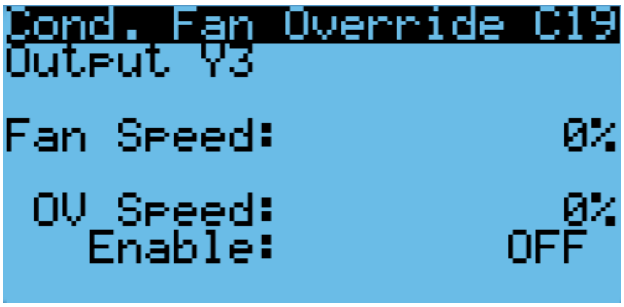
Always mount the replacement motor and control according to the manufacturers specifications using all required hardware to reduce vibration. Make sure all wires are free of the fan blade and not pinched in mountings or cabinet through points.

TABLE 17
Troubleshooting ECM™ 142R Outdoor Fan Motors

Check line power to motor	Check between black and red wires for line power.
	Verify ground by checking green/yellow wire to L1 and L2 line power.
Check for 0-10v Y3 on PLC to motor (against transformer "R" signal)	Check brown wire from Y3 on PLC, blue wire to terminal 14 common.
	Not energized in cooling mode until low ambient fan cycling control is closed by 240 psig refrigerant pressure.
	Fan should run when compressor is energized, unless low ambient control is open or target discharge pressure is not reached.

For troubleshooting, if a stable outdoor fan speed is required there is an override on screen C19 (see Figure 73). If an override speed is input and the enable is turned on, the speed of the outdoor fan will be set to the override speed for 5 minutes. If the enable is turned off or 5 min. has expired, the fan will return to normal operation.

FIGURE 73
Cond. Fan Override C19 Screen



Troubleshooting ECM™ Indoor Blower 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 starting	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 V TB to 24V COM Check low voltage connections 0-10v (Pin 10 to Pin 8) at motor (see Figure 77 on page 67) Check for unseated pins in connectors on motor harness Check motor for tight shaft Perform motor/control replacement check Perform **Moisture Check**
Motor won't start: 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 and 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 or down or intermittent	Check line voltage for variation or "sag" Check low voltage connections 0-10v (Pin 10 to Pin 8) at motor, unseated pins in motor harness connectors Check out system controls, thermostat Perform **Moisture Check**
Motor starts but runs erratically: "Hunts" or "puffs"	Does removing panel or filter reduce "puffing"? - Reduce restriction
Motor starts but runs erratically: Blower won't shut off	Current leakage from controls into Pins 10, 8 - Check for Triac-switched thermostat or solid-state relay
Excessive noise	Determine if it's air noise, cabinet, duct or motor noise; interview customer, if necessary
Excessive noise: Air noise	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
Excessive noise: Noisy blower or cabinet	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
Evidence of Moisture: Motor failure or malfunction has occurred and moisture is present	Replace motor and **Perform Moisture Check**
Evidence of Moisture: Evidence of moisture present inside air mover	Perform **Moisture Check**

Do's and Dont's	
Do	**Don't**
Check out motor, controls, wiring and connections thoroughly before replacing motor	Automatically assume motor is bad
Orient connectors down so water can't get in - Install "drip loops"	Locate connectors above 8 and 4 o'clock positions
Use authorized motor and model #s for replacement	Replace one motor or control model # with another (unless an authorized replacement)
Keep static pressure to a minimum: - Recommend high efficiency, low static filters - Recommend keeping filters clean - Design ductwork for minimum static, maximum comfort - Look for and recommend ductwork improvement, where necessary	Use high pressure drop filters—some have ½" H2O drop! Use restricted returns
Size equipment wisely	Oversize system then compensate with low airflow
Check orientation before inserting motor connectors	Plug in power connector backwards Force plug

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
- Thermostat in bad location?

Replacing ECM Control Module

The following steps must be taken to replace the control module for the GE variable-speed indoor blower motor:

1. 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 (see Figure 74).
5. Using thumb and forefinger to squeeze the latch tab and the opposite side of the connector plug and gently pulling the connector, disconnect the three (3) wires interior of the motor control. **Do not pull on the wires; grip the plug only.** See Figure 74.
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 (see Figure 75). (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 the 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 Steps #5, 4 and 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 selected for replacing the control ensures 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 (see Figure 76).

The installation is now complete. Reapply 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.

Figure 74
Control Disassembly

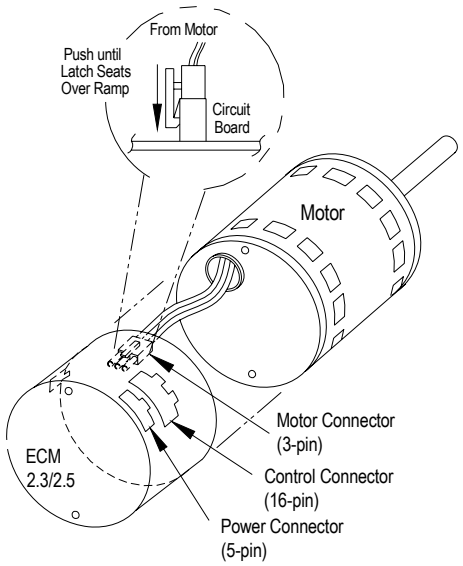


Figure 75
Winding Test

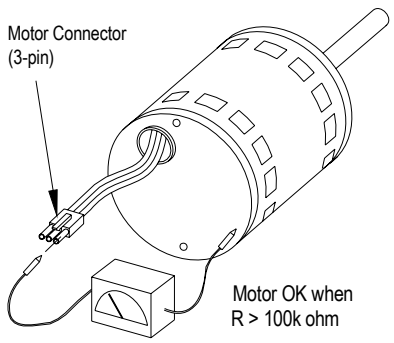


Figure 76
Drip Loop

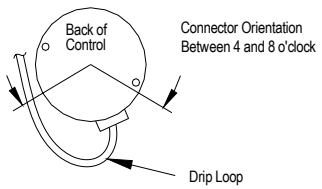
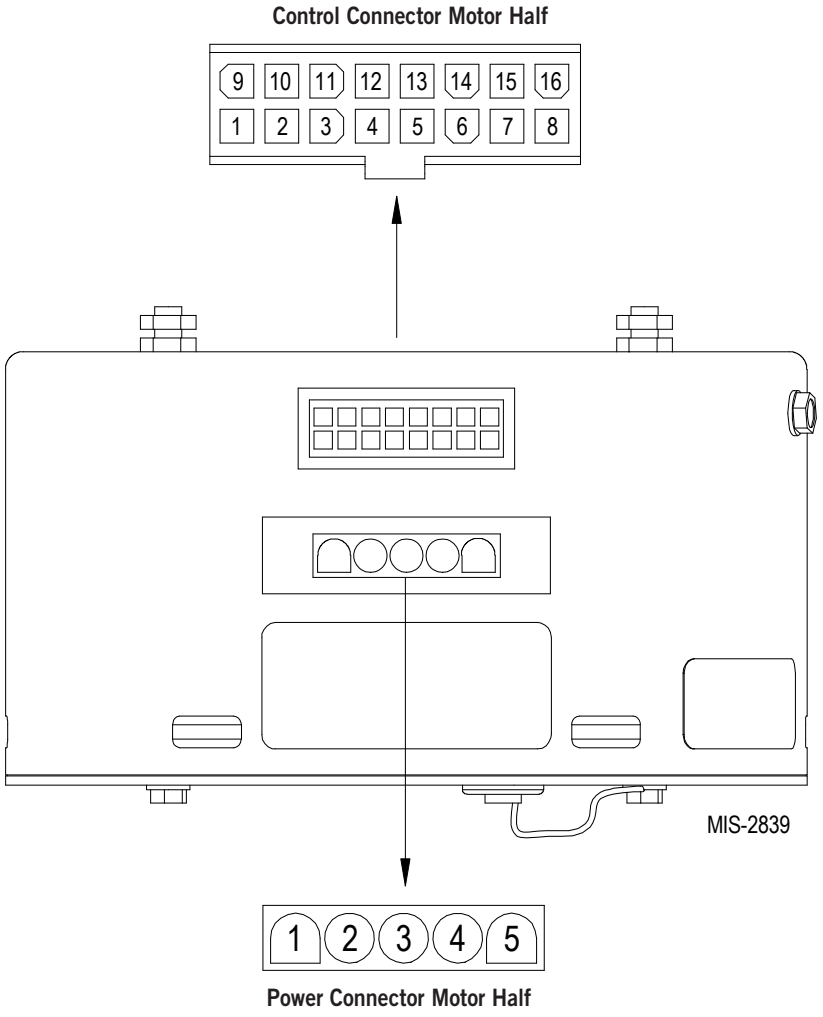


FIGURE 77
Blower Motor Connectors



Blower Motor Power Connector	
PWB Header	**AMP 1-350945-0**
PIN	**Description**
1	Jumper Pin 1 to Pin 2 for 120VAC Line Input Only ①
2	
3	Chassis Ground
4	AC Line
5	AC Line

Blower Motor Control Connector	
Control Connector	**AMP 770613-1**
1	Unused
2	24v common
3	24v
4	Unused
5	0-10v Input
6 – 16	Unused

Suggested mating connector:
Housing — AMP 350809-1
Contact — AMP 350537-1

① ***WARNING*** – *Applying 240VAC line input with PIN 1 to PIN 2 jumper in place will permanently damage unit.*

For troubleshooting, if a stable blower speed is required there is an override on screen C19 (see Figure 73 on page 64). If an override speed is input and the enable is turned on, the speed of the blower will be set to the override speed for 5 minutes. If the enable is turned off or 5 min. has expired, the blower will return to normal operation.

Modbus Communication Line

The communication wires are polarity sensitive; however, reversing the polarity on either end will not damage the devices. Before opening the drive cover, ensure the unit supply voltage has been turned off and locked out. Check the termination points of the communication wires by comparing them to the wiring diagram first if there is any chance that they have been altered. If there is any question about the polarity of the connections, reverse the connections on one of the devices (control panel or inverter drive) and see if communication is restored. To verify the wires are not damaged or broken, continuity of the wires should also be checked. Remove the wires from the devices and connect the two communication wires on one end and check for continuity on the two wires at the opposite end. If there is no continuity the wires will need to be repaired or replaced.

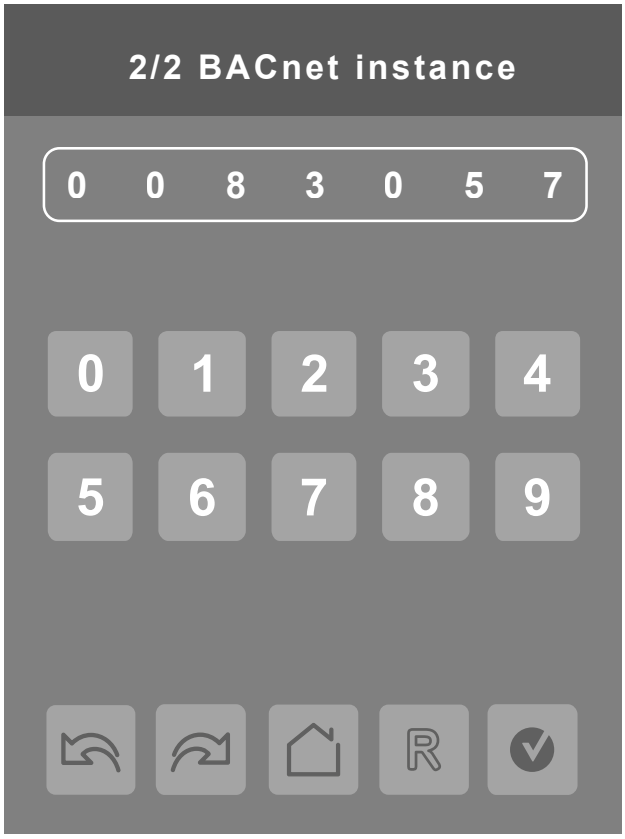
BACnet

In the event that there is a communication alarm/error between the unit and the room controller (BrightStat), the first thing to check is the device instance. (If the unit and controller are on a network with other devices, the first step should be to isolate them from the network.) The instance number is how the room controller (BrightStat) is identified and the same instance number must be present in the unit and controller. In the unit, the controller instance number can be seen or changed on the BACnet configuration screen shown in Figure 78.

FIGURE 78
BACnet Configuration

In the room controller (BrightStat), the instance number can be viewed or changed by navigating to the Network screens. Touch and hold the top middle of the screen for 3 seconds. In the menu, select Network and navigate to the screen shown in Figure 79.

FIGURE 79
BACnet Instance

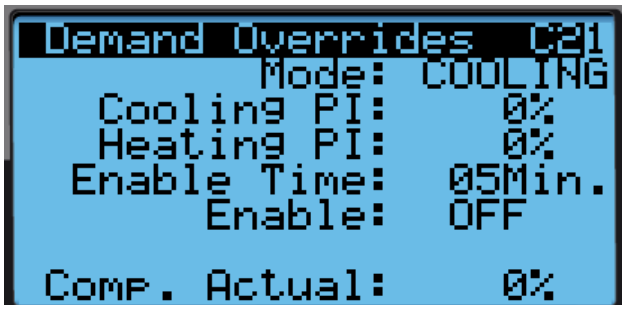


The controller instance number in the unit and the instance number in the controller must be the same for the devices to communicate. If the instance numbers are set correctly, the next step is to verify that the communication wiring is correct. The communication wires are polarity sensitive; however, reversing the polarity on either end will not damage the devices. Terminals 1 in the unit and terminal 13 in the controller should be connected. Terminal 2 in the unit should be connected to terminal 14 in the controller. If there is any question about the polarity of the connections, reverse the connections on one of the devices and see if communication is restored. To verify the wires are not damaged or broken, continuity of the wires should also be checked. Remove the wires from the devices and connect the two communication wires on one end and check for continuity on the two wires at the opposite end. If there is no continuity the wires will need to be repaired or replaced.

Compressor

To check the charge or troubleshoot the compressor, it may be necessary to lock the compressor into a steady state. When this is necessary, overrides for the heating/cooling can be found on screen C21 in the I/O configuration menu of the PLD Pro (see Figure 80). On this screen there are multiple settings that will need to be adjusted. Before adjusting these settings, make sure the room controller (Brightstat) is communicating with the unit and the mode is set to off. This will ensure that the compressor can be observed returning to 0 when Enable is turned off and not to a heating or cooling demand determined speed. These overrides should only be utilized by a qualified service provider.

FIGURE 80
Demand Overrides C21 Screen



The first setting is Mode, which will tell the unit whether heating or cooling is required. The next two settings are the demand percentages for heating and cooling. The heating and cooling demand can be set, but the compressor will only respond to the percentage that matches the mode setting.

The next setting is the Enable Time. This setting will determine how long the unit will remain in override once the enable toggle is set to “ON”. This setting can be set up to 30 minutes to allow for ample troubleshooting time. Remember that when this override is used, the unit will respond as if the room controller (Brightstat) is commanding the unit to heat or cool and all devices will respond as expected in a normal heating or cooling call. **Make sure to be clear of all mechanical and electrical hazards while troubleshooting with this override.**

The final setting is the Enable point and this enacts all the previous settings once toggled to "ON". The toggle can be turned off prior to reaching the time and should be set to "OFF" as soon as troubleshooting is complete. While using the override, it is important to check the Comp. Actual percentage at the bottom of the screen. Features such as boost mode, quiet mode, mitigation calculations, etc. will all be active while using the override. This may mean that the compressor may not move to the demand percentage without adjusting option(s) or if the conditions are adverse (for example, high outdoor ambient temperature). See Table 18 for the optimal demand settings for checking charge.

Refer to ***Demand Overrides C21*** on page 40 for more information.

TABLE 18
Optimal Demand Settings

	W3HY-*	W3HYD*	W5HY-*	W5HYD*
Cooling	38%	38%	40%	40%
Heating	33%	33%	49%	49%

8301-067 Outdoor Temperature/Humidity Sensor

8301-067 Sensor Connections

This unit utilizes a two wire 4-20mA signal from the 8301-067 sensor to communicate outdoor humidity and a 10KΩ Type III (AN) thermocouple from the 8301-067 sensor to communicate outdoor temperature. The humidity sensor is connected to the sensor control board via the J13 connector. The thermocouple wires are loose in the sensor housing and require a butt splice connector or wire nut to connect to the main unit wiring harness. See Figures 80 and 82 for sensor wiring and terminal location.

Table 19 (page 72) and Table 20 (page 74) are correlation charts for troubleshooting the sensor with a test meter:

Table 19: Temperature to Thermistor Resistance
Table 20: Relative Humidity to Humidity Sensor Current Output

FIGURE 81
8301-067 Sensor Electrical Connections

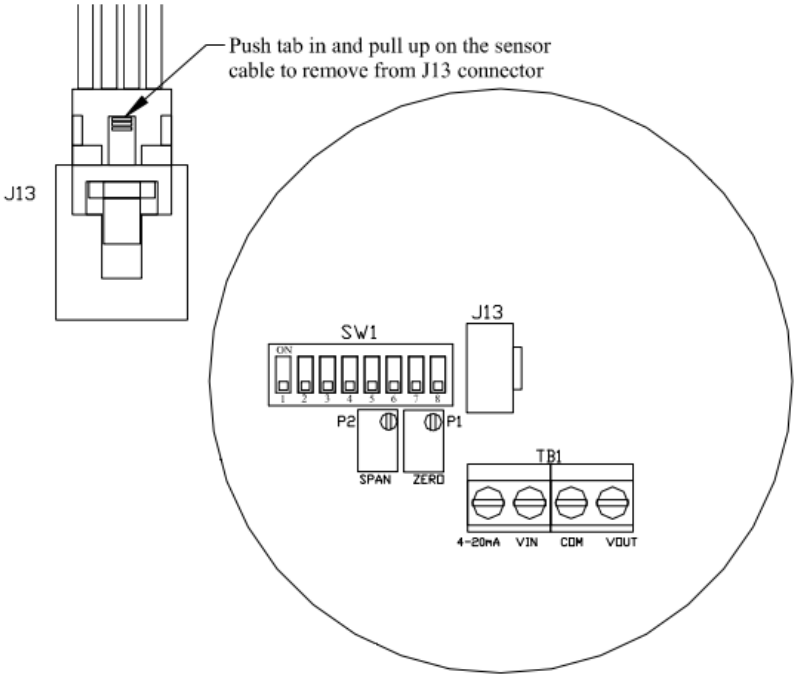
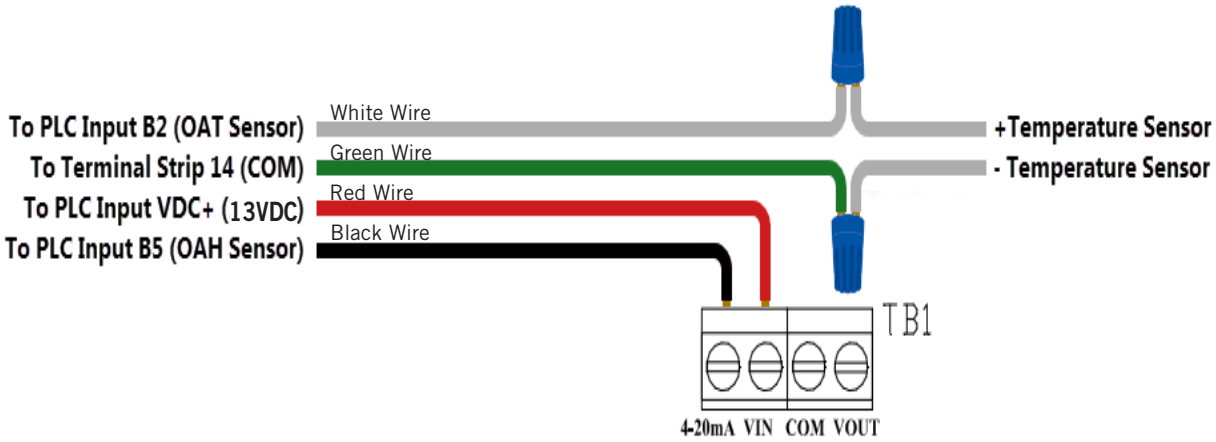


FIGURE 82
8301-067 Sensor Terminal Connections



8301-067 Outdoor Temperature Sensor Troubleshooting

To verify sensor operation:

1. Remove lid from outdoor temperature/humidity sensor.
2. Remove wire nuts from green and white wires (see Figure 82).
3. Use a temperature probe (preferred method) or local weather data to find ambient temperature conditions.
4. Using an ohmmeter or resistance mode on a multimeter, measure resistance across white leads leading to the temperature sensor (see Figure 83).
5. Cross reference readings with Table 19 on page 72.
   A. If readings are consistent with reference temperature, check wiring or offset in PLC if outdoor temp value on PLC does not match.
   B. If readings do not match, replace sensor.

FIGURE 83
8301-067 Sensor: Temperature Probe Troubleshooting

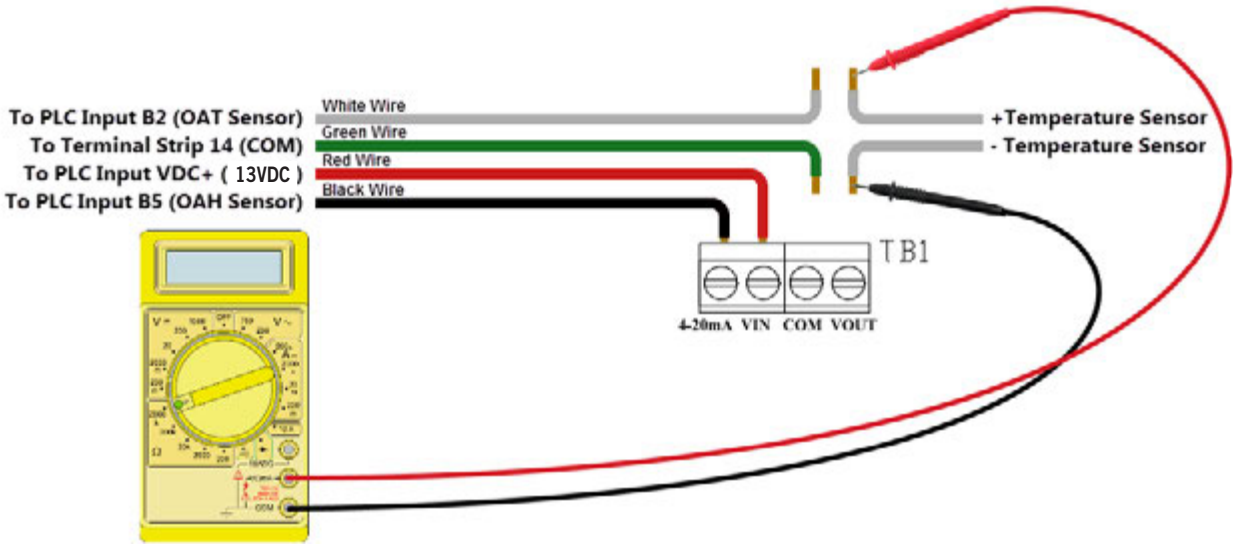


TABLE 19
8301-067 Sensor: Temperature to Thermistor Resistance

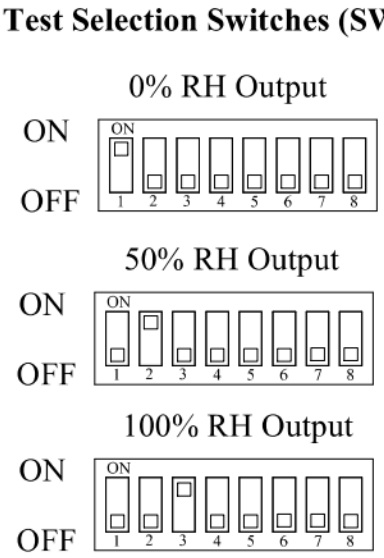
Temperature		Resistance
F	C	Ω
-25	-31.7	148,453
-24	-31.1	143,910
-23	-30.6	139,521
-22	-30.0	135,281
-21	-29.4	131,182
-20	-28.9	127,221
-19	-28.3	123,393
-18	-27.8	119,692
-17	-27.2	116,113
-16	-26.7	112,654
-15	-26.1	109,308
-14	-25.6	106,073
-13	-25.0	102,943
-12	-24.4	99,917
-11	-23.9	96,988
-10	-23.3	94,155
-9	-22.8	91,414
-8	-22.2	88,761
-7	-21.7	86,194
-6	-21.1	83,709
-5	-20.6	81,304
-4	-20.0	78,976
-3	-19.4	76,721
-2	-18.9	74,538
-1	-18.3	72,425
0	-17.8	70,377
1	-17.2	68,395
2	-16.7	66,474
3	-16.1	64,613
4	-15.6	62,811
5	-15.0	61,064
6	-14.4	59,372
7	-13.9	57,731
8	-13.3	56,142
9	-12.8	54,601
10	-12.2	53,107
11	-11.7	51,658
12	-11.1	50,254
13	-10.6	48,892
14	-10.0	47,572
15	-9.4	46,291
16	-8.9	45,049
17	-8.3	43,844
18	-7.8	42,675
19	-7.2	41,541
20	-6.7	40,441
21	-6.1	39,373
22	-5.6	38,336
23	-5.0	37,330
24	-4.4	36,354
25	-3.9	35,406
26	-3.3	34,486
27	-2.8	33,593
28	-2.2	32,725
29	-1.7	31,883
30	-1.1	31,065
31	-0.6	30,270
32	0.0	29,499
33	0.6	28,749
34	1.1	28,020
35	1.7	27,313
36	2.2	26,625
37	2.8	25,957
38	3.3	25,308
39	3.9	24,676
40	4.4	24,063
41	5.0	23,467
42	5.6	22,887
43	6.1	22,323
44	6.7	21,775
45	7.2	21,242
46	7.8	20,724
47	8.3	20,220
48	8.9	19,730
49	9.4	19,253
50	10.0	18,789
51	10.6	18,338
52	11.1	17,898
53	11.7	17,471
54	12.2	17,055
55	12.8	16,651
56	13.3	16,257
57	13.9	15,873
58	14.4	15,500
59	15.0	15,137
60	15.6	14,783
61	16.1	14,439
62	16.7	14,104
63	17.2	13,777
64	17.8	13,459
65	18.3	13,150
66	18.9	12,848
67	19.4	12,554
68	20.0	12,268
69	20.6	11,989
70	21.1	11,718
71	21.7	11,453
72	22.2	11,195
73	22.8	10,943
74	23.3	10,698
75	23.9	10,460
76	24.4	10,227
77	25.0	10,000
78	25.6	9779
79	26.1	9563
80	26.7	9353
81	27.2	9148
82	27.8	8948
83	28.3	8753
84	28.9	8563
85	29.4	8377
86	30.0	8196
87	30.6	8020
88	31.1	7848
89	31.7	7680
90	32.2	7516
91	32.8	7356
92	33.3	7200
93	33.9	7048
94	34.4	6899
95	35.0	6754
96	35.6	6612
97	36.1	6474
98	36.7	6339
99	37.2	6207
100	37.8	6079
101	38.3	5953
102	38.9	5831
103	39.4	5711
104	40.0	5594
105	40.6	5480
106	41.1	5368
107	41.7	5259
108	42.2	5153
109	42.8	5049
110	43.3	4947
111	43.9	4848
112	44.4	4751
113	45.0	4656
114	45.6	4563
115	46.1	4473
116	46.7	4384
117	47.2	4298
118	47.8	4213
119	48.3	4131
120	48.9	4050
121	49.4	3971
122	50.0	3894
123	50.6	3818
124	51.1	3744
125	51.7	3672

8301-067 Humidity Sensor Test Value Outputs

This sensor has the ability to output fixed test signals when testing/troubleshooting sensor operation. These settings are to be used for sensor testing/ troubleshooting only and need to be removed before unit can resume normal operation. These settings allow the sensor board to output 0% RH, 50% RH and 100% RH. When these settings are active, the actual humidity sensor is ignored. DIP switches 1, 2 and 3 are used to override the output to a test signal. See Figure 84 for DIP switch/output configuration.

NOTE: *If any DIP switches are disrupted, they will need to be returned to the off state in order for the humidity sensor to return to normal operation.*

FIGURE 84
8301-067 DIP Switch/Output Configuration



8301-067 Outdoor Humidity Sensor Troubleshooting

To verify sensor operation:

1. Remove lid from outdoor temperature/humidity sensor.
2. Loosen and remove black wire from the 4-20 mA input of TB1 (see Figure 82 on page 70).
3. Use an RH meter (preferred method) or local weather data to find accurate RH reading.
4. Using an ohmmeter or amperage mode on a multimeter, measure the amperage through the black 4-20 mA wire leading to the PLC (see Figure 85).
5. Cross reference readings with Table 20 on page 74.
   A. If readings are consistent with reference humidity, verify the DIP switches are all in the off position, check wiring or offset in PLC if outdoor humidity value on PLC does not match.
   B. If readings do not match, replace sensor.

FIGURE 85
8301-067 Sensor: Humidity Probe Troubleshooting

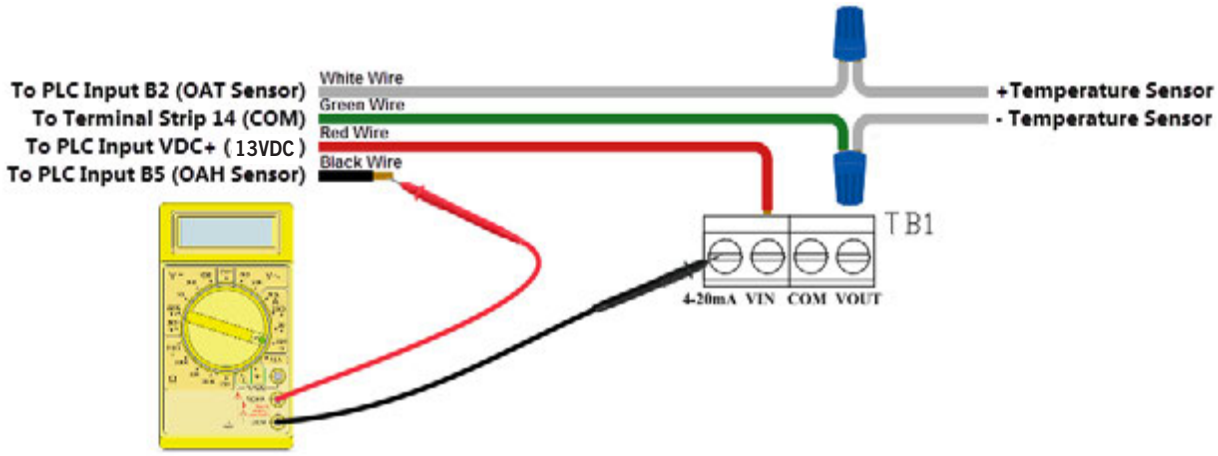


TABLE 20
8301-067 Sensor: Relative Humidity to Humidity Sensor Current Output

Humidity	Signal
% RH	mA
0	4.000
1	4.160
2	4.320
3	4.480
4	4.640
5	4.800
6	4.960
7	5.120
8	5.280
9	5.440
10	5.600
11	5.760
12	5.920
13	6.080
14	6.240
15	6.400
16	6.560
17	6.720
18	6.880
19	7.040
20	7.200
21	7.360
22	7.520
23	7.680
24	7.840
25	8.000
26	8.160
27	8.320
28	8.480
29	8.640
30	8.800
31	8.960
32	9.120
33	9.280

Humidity	Signal
% RH	mA
34	9.440
35	9.600
36	9.760
37	9.920
38	10.080
39	10.240
40	10.400
41	10.560
42	10.720
43	10.880
44	11.040
45	11.200
46	11.360
47	11.520
48	11.680
49	11.840
50	12.000
51	12.160
52	12.320
53	12.480
54	12.640
55	12.800
56	12.960
57	13.120
58	13.280
59	13.440
60	13.600
61	13.760
62	13.920
63	14.080
64	14.240
65	14.400
66	14.560
67	14.720

Humidity	Signal
% RH	mA
68	14.880
69	15.040
70	15.200
71	15.360
72	15.520
73	15.680
74	15.840
75	16.000
76	16.160
77	16.320
78	16.480
79	16.640
80	16.800
81	16.960
82	17.120
83	17.280
84	17.440
85	17.600
86	17.760
87	17.920
88	18.080
89	18.240
90	18.400
91	18.560
92	18.720
93	18.880
94	19.040
95	19.200
96	19.360
97	19.520
98	19.680
99	19.840
100	20.000

8406-157 Discharge Line Pressure Transducer

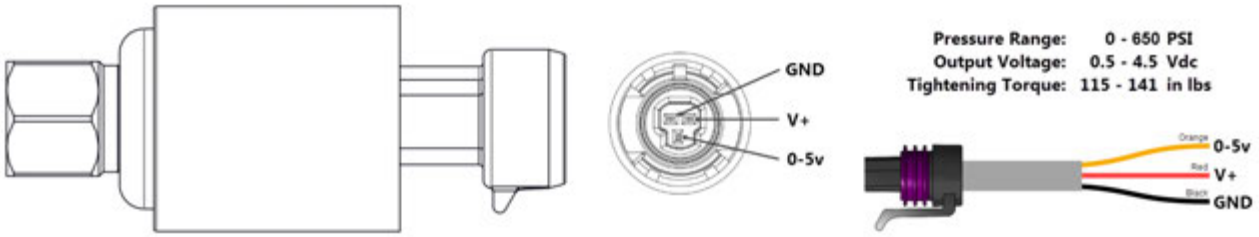


TABLE 21
8406-157 0-650 psi Pressure Transducer: Pressure/DC Voltage

Pressure		Signal
PSI	Bar	Vdc
0	0.0	0.500
5	0.3	0.531
10	0.7	0.562
15	1.0	0.592
20	1.4	0.623
25	1.7	0.654
30	2.0	0.685
35	2.4	0.715
40	2.7	0.746
45	3.1	0.777
50	3.4	0.808
55	3.7	0.838
60	4.1	0.869
65	4.4	0.900
70	4.8	0.931
75	5.1	0.962
80	5.4	0.992
85	5.8	1.023
90	6.1	1.054
95	6.5	1.085
100	6.8	1.115
105	7.1	1.146
110	7.5	1.177
115	7.8	1.208
120	8.2	1.238
125	8.5	1.269
130	8.8	1.300
135	9.2	1.331
140	9.5	1.362
145	9.9	1.392
150	10.2	1.423
155	10.5	1.454
160	10.9	1.485

Pressure		Signal
PSI	Bar	Vdc
165	11.2	1.515
170	11.6	1.546
175	11.9	1.577
180	12.2	1.608
185	12.6	1.638
190	12.9	1.669
195	13.3	1.700
200	13.6	1.731
205	13.9	1.762
210	14.3	1.792
215	14.6	1.823
220	15.0	1.854
225	15.3	1.885
230	15.7	1.915
235	16.0	1.946
240	16.3	1.977
245	16.7	2.008
250	17.0	2.039
255	17.4	2.069
260	17.7	2.100
265	18.0	2.131
270	18.4	2.162
275	18.7	2.192
280	19.1	2.223
285	19.4	2.254
290	19.7	2.285
295	20.1	2.315
300	20.4	2.346
305	20.8	2.377
310	21.1	2.408
315	21.4	2.439
320	21.8	2.469
325	22.1	2.500

Pressure		Signal
PSI	Bar	Vdc
330	22.5	2.531
335	22.8	2.562
340	23.1	2.592
345	23.5	2.623
350	23.8	2.654
355	24.2	2.685
360	24.5	2.715
365	24.8	2.746
370	25.2	2.777
375	25.5	2.808
380	25.9	2.839
385	26.2	2.869
390	26.5	2.900
395	26.9	2.931
400	27.2	2.962
405	27.6	2.992
410	27.9	3.023
415	28.2	3.054
420	28.6	3.085
425	28.9	3.115
430	29.3	3.146
435	29.6	3.177
440	29.9	3.208
445	30.3	3.239
450	30.6	3.269
455	31.0	3.300
460	31.3	3.331
465	31.6	3.362
470	32.0	3.392
475	32.3	3.423
480	32.7	3.454
485	33.0	3.485
490	33.3	3.515

Pressure		Signal
PSI	Bar	Vdc
495	33.7	3.546
500	34.0	3.577
505	34.4	3.608
510	34.7	3.639
515	35.0	3.669
520	35.4	3.700
525	35.7	3.731
530	36.1	3.762
535	36.4	3.792
540	36.7	3.823
545	37.1	3.854
550	37.4	3.885
555	37.8	3.915
560	38.1	3.946
565	38.4	3.977
570	38.8	4.008
575	39.1	4.039
580	39.5	4.069
585	39.8	4.100
590	40.1	4.131
595	40.5	4.162
600	40.8	4.192
605	41.2	4.223
610	41.5	4.254
615	41.8	4.285
620	42.2	4.315
625	42.5	4.346
630	42.9	4.377
635	43.2	4.408
640	43.5	4.439
645	43.9	4.469
650	44.2	4.500

8406-158 Suction Pressure Transducer

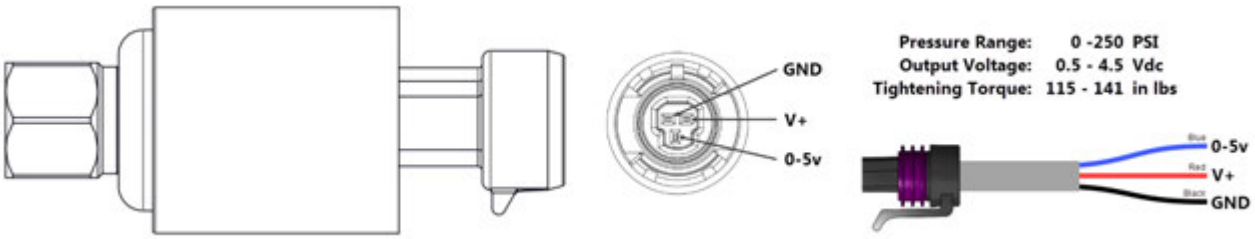


TABLE 22
8406-158 0-250 psi Pressure Transducer: Pressure/DC Voltage

Pressure		Signal
PSI	Bar	Vdc
0	0.0	0.500
2	0.1	0.532
4	0.3	0.564
6	0.4	0.596
8	0.5	0.628
10	0.7	0.660
12	0.8	0.692
14	1.0	0.724
16	1.1	0.756
18	1.2	0.788
20	1.4	0.820
22	1.5	0.852
24	1.6	0.884
26	1.8	0.916
28	1.9	0.948
30	2.0	0.980
32	2.2	1.012
34	2.3	1.044
36	2.4	1.076
38	2.6	1.108
40	2.7	1.140
42	2.9	1.172
44	3.0	1.204
46	3.1	1.236
48	3.3	1.268
50	3.4	1.300
52	3.5	1.332
54	3.7	1.364
56	3.8	1.396
58	3.9	1.428
60	4.1	1.460
62	4.2	1.492

Pressure		Signal
PSI	Bar	Vdc
64	4.4	1.524
66	4.5	1.556
68	4.6	1.588
70	4.8	1.620
72	4.9	1.652
74	5.0	1.684
76	5.2	1.716
78	5.3	1.748
80	5.4	1.780
82	5.6	1.812
84	5.7	1.844
86	5.9	1.876
88	6.0	1.908
90	6.1	1.940
92	6.3	1.972
94	6.4	2.004
96	6.5	2.036
98	6.7	2.068
100	6.8	2.100
102	6.9	2.132
104	7.1	2.164
106	7.2	2.196
108	7.3	2.228
110	7.5	2.260
112	7.6	2.292
114	7.8	2.324
116	7.9	2.356
118	8.0	2.388
120	8.2	2.420
122	8.3	2.452
124	8.4	2.484
126	8.6	2.516

Pressure		Signal
PSI	Bar	Vdc
128	8.7	2.548
130	8.8	2.580
132	9.0	2.612
134	9.1	2.644
136	9.3	2.676
138	9.4	2.708
140	9.5	2.740
142	9.7	2.772
144	9.8	2.804
146	9.9	2.836
148	10.1	2.868
150	10.2	2.900
152	10.3	2.932
154	10.5	2.964
156	10.6	2.996
158	10.8	3.028
160	10.9	3.060
162	11.0	3.092
164	11.2	3.124
166	11.3	3.156
168	11.4	3.188
170	11.6	3.220
172	11.7	3.252
174	11.8	3.284
176	12.0	3.316
178	12.1	3.348
180	12.2	3.380
182	12.4	3.412
184	12.5	3.444
186	12.7	3.476
188	12.8	3.508
190	12.9	3.540

Pressure		Signal
PSI	Bar	Vdc
192	13.1	3.572
194	13.2	3.604
196	13.3	3.636
198	13.5	3.668
200	13.6	3.700
202	13.7	3.732
204	13.9	3.764
206	14.0	3.796
208	14.2	3.828
210	14.3	3.860
212	14.4	3.892
214	14.6	3.924
216	14.7	3.956
218	14.8	3.988
220	15.0	4.020
222	15.1	4.052
224	15.2	4.084
226	15.4	4.116
228	15.5	4.148
230	15.7	4.180
232	15.8	4.212
234	15.9	4.244
236	16.1	4.276
238	16.2	4.308
240	16.3	4.340
242	16.5	4.372
244	16.6	4.404
246	16.7	4.436
248	16.9	4.468
250	17.0	4.500

8408-044 Return Air Sensor/Suction Sensor

TABLE 23
8408-044 Sensor: Temperature/Resistance Curve J

Temperature		Resistance	Temperature		Resistance	Temperature		Resistance	Temperature		Resistance
°F	°C	Ω	°F	°C	Ω	°F	°C	Ω	°F	°C	Ω
-25	-31.7	196,871	13	-10.6	56,985	53	10.6	19,374	89	31.7	7507
-24	-31.1	190,099	14	-10.0	55,284	52	11.1	18,867	90	32.2	7334
-23	-30.6	183,585	15	-9.4	53,640	53	11.7	18,375	91	32.8	7165
-22	-30.0	177,318	16	-8.9	52,051	54	12.2	17,989	92	33.3	7000
-21	-29.4	171,289	17	-8.3	50,514	55	12.8	17,434	93	33.9	6840
-20	-28.9	165,487	18	-7.8	49,028	56	13.3	16,984	94	34.4	6683
-19	-28.3	159,904	19	-7.2	47,590	57	13.9	16,547	95	35.0	6531
-18	-27.8	154,529	20	-6.7	46,200	58	14.4	16,122	96	35.6	6383
-17	-27.2	149,355	21	-6.1	44,855	59	15.0	15,710	97	36.1	6239
-16	-26.7	144,374	22	-5.6	43,554	60	15.6	15,310	98	36.7	6098
-15	-26.1	139,576	23	-5.0	42,295	61	16.1	14,921	99	37.2	5961
-14	-25.6	134,956	24	-4.4	41,077	62	16.7	14,544	100	37.8	5827
-13	-25.0	130,506	25	-3.9	39,898	63	17.2	14,177	101	38.3	5697
-12	-24.4	126,219	26	-3.3	38,757	64	17.8	13,820	102	38.9	5570
-11	-23.9	122,089	27	-2.8	37,652	65	18.3	13,474	103	39.4	5446
-10	-23.3	118,108	28	-2.2	36,583	66	18.9	13,137	104	40.0	5326
-9	-22.8	114,272	29	-1.7	35,548	67	19.4	12,810	105	40.6	5208
-8	-22.2	110,575	30	-1.1	34,545	68	20.0	12,492	106	41.1	5094
-7	-21.7	107,010	31	-0.6	33,574	69	20.6	12,183	107	41.7	4982
-6	-21.1	103,574	32	0.0	32,634	70	21.1	11,883	108	42.2	4873
-5	-20.6	100,260	33	0.6	31,723	71	21.7	11,591	109	42.8	4767
-4	-20.0	97,064	34	1.1	30,840	72	22.2	11,307	110	43.3	4663
-3	-19.4	93,981	35	1.7	29,986	73	22.8	11,031	111	43.9	4562
-2	-18.9	91,008	36	2.2	29,157	74	23.3	10,762	112	44.4	4464
-1	-18.3	88,139	37	2.8	28,355	75	23.9	10,501	113	45.0	4367
0	-17.8	85,371	38	3.3	27,577	76	24.4	10,247	114	45.6	4274
1	-17.2	82,699	39	3.9	26,823	77	25.0	10,000	115	46.1	4182
2	-16.7	80,121	40	4.4	26,092	78	25.6	9760	116	46.7	4093
3	-16.1	77,632	41	5.0	25,383	79	26.1	9526	117	47.2	4006
4	-15.6	75,230	42	5.6	24,696	80	26.7	9299	118	47.8	3921
5	-15.0	72,910	43	6.1	24,030	81	27.2	9077	119	48.3	3838
6	-14.4	70,670	44	6.7	23,384	82	27.8	8862	120	48.9	3757
7	-13.9	68,507	45	7.2	22,758	83	28.3	8653	121	49.4	3678
8	-13.3	66,418	46	7.8	22,150	84	28.9	8449	122	50.0	3601
9	-12.8	64,399	47	8.3	21,561	85	29.4	8250	123	50.6	3526
10	-12.2	62,449	48	8.9	20,989	86	30.0	8057	124	51.1	3452
11	-11.7	60,565	49	9.4	20,435	87	30.6	7869			
12	-11.1	58,745	50	10.0	19,896	88	31.1	7686			

8301-066 Supply Air Sensor

TABLE 24
8301-066 Sensor: Temperature/Resistance

Temperature		Resistance
°F	°C	Ω
32	0	29,490
33.8	1	28,157
35.6	2	26,891
37.4	3	25,689
39.2	4	24,547
41	5	23,462
42.8	6	22,431
44.6	7	21,450
46.4	8	20,518
48.2	9	19,631
50	10	18,787
51.8	11	17,983
53.6	12	17,219
55.4	13	16,490
57.2	14	15,797
59	15	15,136
60.8	16	14,506
62.6	17	13,906
64.4	18	13,334
66.2	19	12,788
68	20	12,268
69.8	21	11,771
71.6	22	11,297
73.4	23	10,845
75.2	24	10,413
77	25	10,000
78.8	26	9606
80.6	27	9229
82.4	28	8869
84.2	29	8525
86	30	8196
87.8	31	7882
89.6	32	7581
91.4	33	7293
93.2	34	7018
95	35	6754

Temperature		Resistance
°F	°C	Ω
96.8	36	6501
98.6	37	6260
100.4	38	6028
102.2	39	5806
104	40	5594
105.8	41	5390
107.6	42	5195
109.4	43	5007
111.2	44	4828
113	45	4656
114.8	46	4490
116.6	47	4332
118.4	48	4180
120.2	49	4034
122	50	3893
123.8	51	3759
125.6	52	3629
127.4	53	3505
192.2	54	3386
131	55	3271
132.8	56	3160
134.6	57	3054
136.4	58	2952
138.2	59	2854
140	60	2760
141.8	61	2669
143.6	62	2582
145.4	63	2498
147.2	64	2417
149	65	2339
150.8	66	2264
152.6	67	2191
154.4	68	2122
156.2	69	2055
158	70	1990
159.8	71	1928

Temperature		Resistance
°F	°C	Ω
161.6	72	1868
163.4	73	1810
165.2	74	1754
167	75	1700
168.8	76	1648
170.6	77	1598
172.4	78	1550
174.2	79	1503
176	80	1458
177.8	81	1414
179.6	82	1372
181.4	83	1332
183.2	84	1293
185	85	1255
186.8	86	1218
188.6	87	1183
190.4	88	1149
192.2	89	1116
194	90	1084
195.8	91	1053
197.6	92	1023
199.4	93	994
201.2	94	967
203	95	940
204.8	96	913
206.6	97	888
208.4	98	864
210.2	99	840
212	100	817
213.8	101	795
215.6	102	774
217.4	103	753
219.2	104	733
221	105	713
222.8	106	694
224.6	107	676

Checking Temperature Sensor Outside Unit Circuit

1. Disconnect temperature sensor from board and from outdoor coil.
2. Use an ohmmeter to measure the resistance of the sensor. Also use ohmmeter to check for short or open.
3. Check resistance reading to chart of resistance. Use sensor ambient temperature. (Tolerance of part is ± 10%.)
4. If sensor resistance reads very low, sensor is shorted and will not allow proper operation of the heat pump control.
5. If sensor is out of tolerance, shorted, open or reads very low ohms, it should be replaced.

TABLE 25
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		

SUPPLEMENTAL INSTRUCTIONS

Exporting Alarm Logs on UPC3 Controller

These instructions detail the process for exporting alarm logs on all UPC3 controllers, including the LC6000-200, WVHY, MEGA-TEC®, MULTI-TEC® and FUSION-TEC® WR series. This will need to be completed when contacting Technical Service.

Tools and Supplies Needed

- Laptop computer
- USB cable
- Personal anti-static grounding strap

Instructions

IMPORTANT: *Bard recommends the use of personal grounding straps to prevent static electricity shorts to electronic controls.*

To export an alarm log:

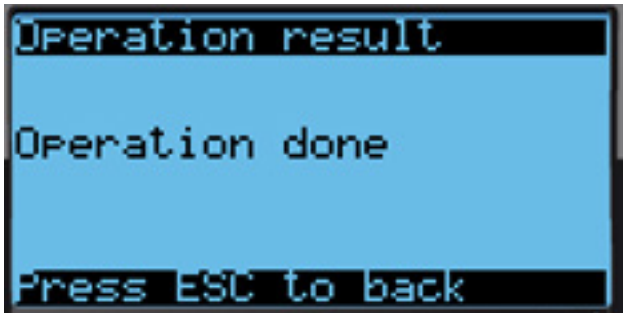
1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 1313.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Initialization**; press ENTER key.
5. Press UP or DOWN keys to scroll to **Alarm Export** (see Figure 1).
6. Press ENTER key to scroll to **File Name**.

NOTE: *Make sure **Memory type** is set as **INTERNAL FLASH MEMORY** to ensure proper download.*

FIGURE 1

7. Press UP or DOWN key to change the AL_EXPORT number, if desired.
8. Press ENTER key to scroll to **Confirm?**
9. Press UP or DOWN key to change value to **YES**; press ENTER key.
10. After download is complete, the **Operation done** screen will appear (see Figure 2).

FIGURE 2



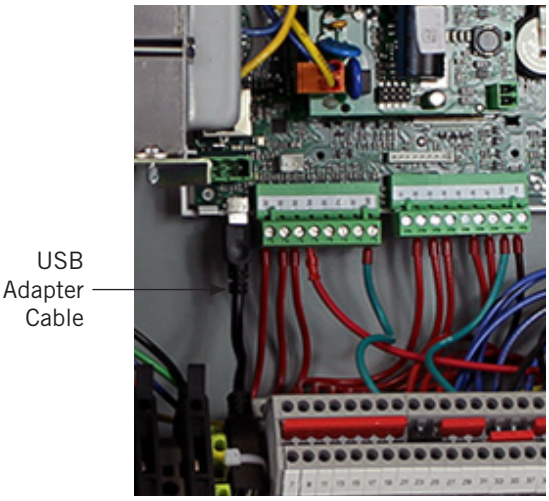
Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Manual: 7960-825A
Supersedes: 7960-825
Date: 7-27-22

NOTE: *Do not connect the control board to the laptop using the USB cable before exporting as this will cause a* ***Cannot access file*** *message to appear and the log will not be saved. If this happens, remove USB connection, press ESCAPE key and redo Steps 8 and 9.*

11. Connect one end of USB cable to the short USB adapter cable on the bottom left corner of the control board (see Figure 3). Connect other end of USB cable to laptop.

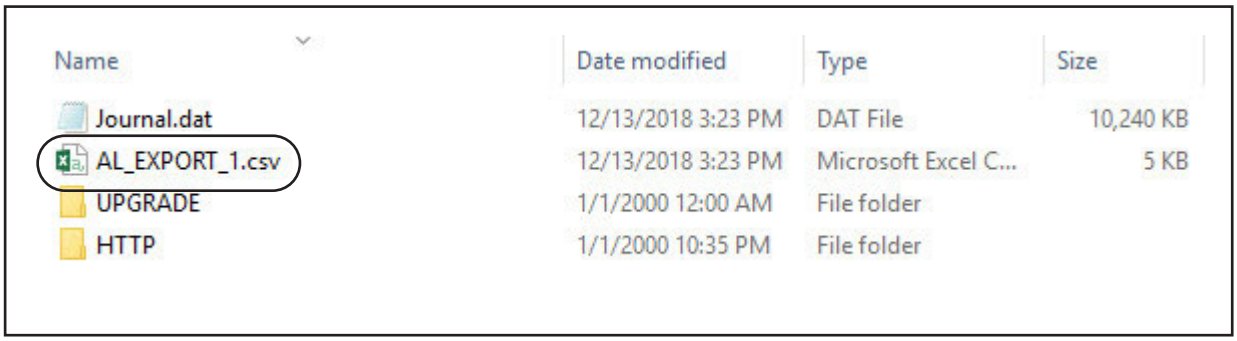
FIGURE 3



12. Once the connection has been made between control board and laptop, the laptop screen should display as shown in Figure 4. The unit will export the alarm log as an Excel file.

This completes the software update process.

FIGURE 4



SUPPLEMENTAL INSTRUCTIONS

Exporting I/O Logs on UPC3 Controller

These instructions detail the process for exporting 7 day I/O logs on all UPC3 controllers, including the LC6000-200, WVHY, MEGA-TEC®, MULTI-TEC® and FUSION-TEC® WR series. This will need to be completed when contacting Technical Service.

Tools and Supplies Needed

- Laptop computer
- USB cable
- Personal anti-static grounding strap

Instructions

IMPORTANT: *Bard recommends the use of personal grounding straps to prevent static electricity shorts to electronic controls.*

o export an alarm log:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 1313.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Initialization**; press ENTER key.
5. Press UP or DOWN keys to scroll to **I/O Log Export**; (see Figure 1).

NOTE: *The screen descriptions may look slightly different depending on which controller is being accessed.*

6. Press ENTER key to scroll to **File Name**.

NOTE: *Make sure **Memory type** is set as **INTERNAL FLASH MEMORY** to ensure proper download.*

FIGURE 1

7. Press UP or DOWN key to change the file name number, if desired.

NOTE: *The first two letters of the file name will vary depending on which controller is being accessed.*

8. Press ENTER key to scroll to **Confirm?**
9. Press UP or DOWN key to change value to **YES**; press ENTER key.
10. After download is complete, the **Operation done** screen will appear (see Figure 2).

FIGURE 2

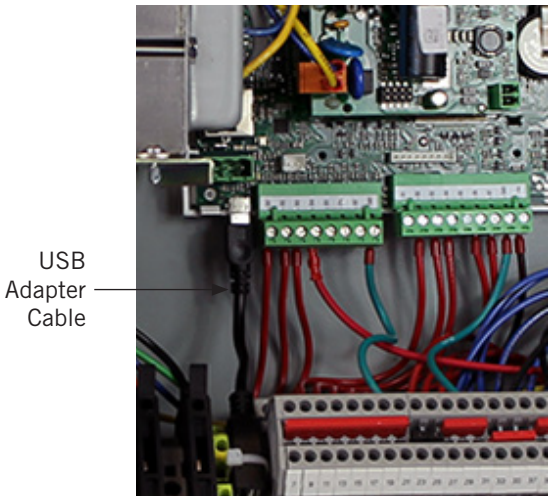
Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Manual: 7960-826A
Supersedes: 7960-826
Date: 7-27-22

NOTE: *Do not connect the control board to the laptop using the USB cable before exporting as this will cause a* ***Cannot access file*** *message to appear and the log will not be saved. If this happens, remove USB connection, press ESCAPE key and redo Steps 8 and 9.*

11. Connect one end of USB cable to the short USB adapter cable on the bottom left corner of the control board (see Figure 3). Connect other end of USB cable to laptop.

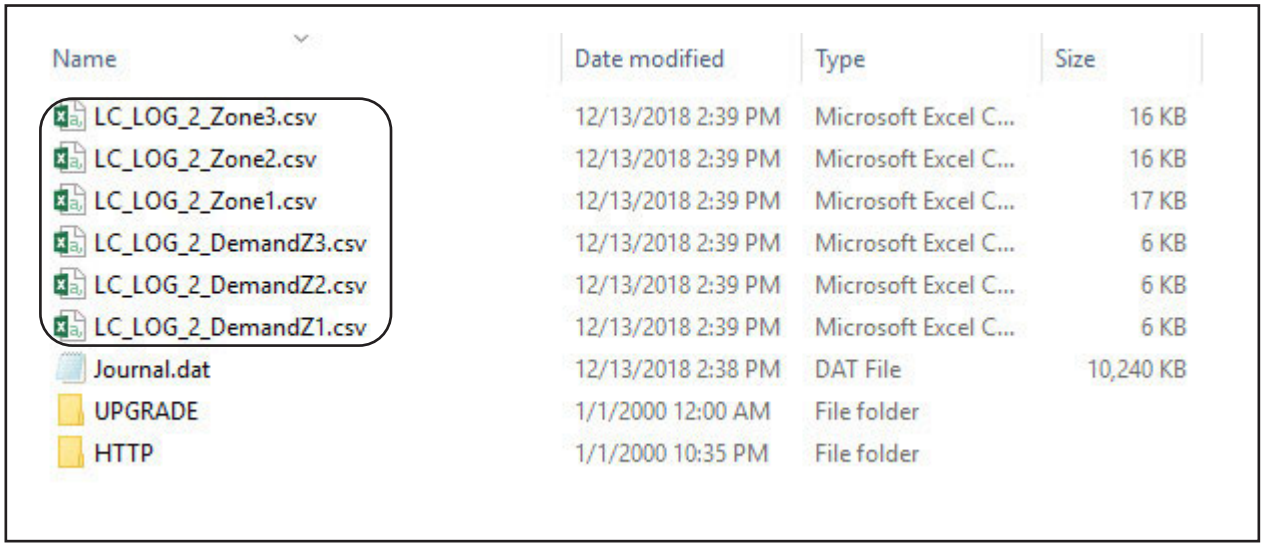
FIGURE 3



12. Once the connection has been made between control board and laptop, the laptop screen should display as shown in Figure 4. The unit will export the I/O logs as Excel files.

This completes the software update process.

FIGURE 4



REPLACEMENT PARTS MANUAL

Wall Mount Variable Speed Heat Pump

Models:

W3VHY-R	W3VHYDR	W5VHY-R	W5VHYDR
W3VHY-S	W3VHYDS	W5VHY-S	W5VHYDS
W3VHY-T	W3VHYDT	W5VHY-T	W5VHYDT

Contents

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.

Important

- Contact the installing and/or local Bard distributor for all parts requirements. Make sure to have the complete model and serial number available from the unit rating plates.

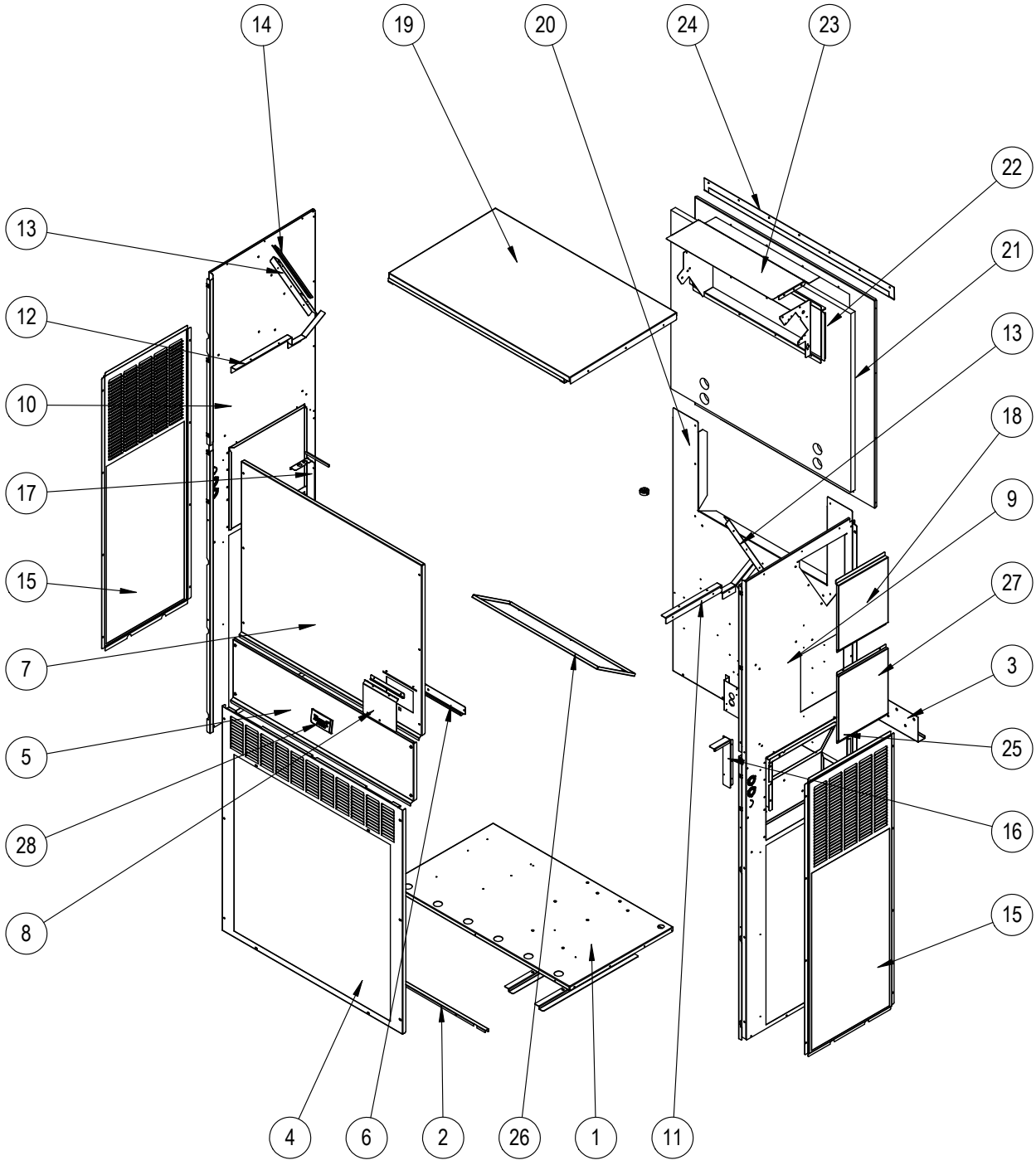
Bard® SINCE 1914
Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

www.bardhvac.com

Manual: 2110-1577
Supersedes: ***NEW***
Date: 11-28-23

EXTERNAL PARTS – STANDARD



SEXP-1099

This drawing to be used for reference for pages 3 and 4

Dwg No.	Part Number	Description	W3VHY-R, S, T	W3VHYDR, S, T	W5VHY-R, S, T	W5VHYDR, S, T
1	127-623BX	Base (only)	X	X	X	X
1	527-623BX	Base Assembly w/Compressor Plate	X	X	X	X
1	127-624BX ③	Base (only) - Stainless	O	O	O	O
1	527-624BX ③	Base Assembly w/Compressor Plate - Stainless	O	O	O	O
2	113-762BX	Front Base Bracket	X	X	X	X
2	113-797BX ③	Front Base Bracket - Stainless	O	O	O	O
3	113-140BX	Bottom Support Bracket	X	X	X	X
4	119-125-*BX ①	Front Grille	X	X		
4	119-148BX ②	Front Grille - Aluminum	O	O		
4	119-135BX ③	Front Grille - Stainless	O	O		
4	119-127-*BX ①	Front Grille			X	X
4	119-149BX ②	Front Grille - Aluminum			O	O
4	119-137BX ③	Front Grille - Stainless			O	O
5	533-301-*BX ①	Control Panel Cover (Outer)	X	X	X	X
5	533-309BX ②	Control Panel Cover (Outer)	O	O	O	O
5	533-310BX ③	Control Panel Cover (Outer)	O	O	O	O
6	165-608-*BX ①	Rain Channel	X	X	X	X
6	165-609BX ②	Rain Channel	O	O	O	O
6	165-610BX ③	Rain Channel	O	O	O	O
7	515-323-*BX ①	Upper Front	X	X		
7	515-328BX ②	Upper Front - Aluminum	O	O		
7	515-330BX ③	Upper Front - Stainless	O	O		
7	515-324-*BX ①	Upper Front			X	X
7	515-329BX ②	Upper Front - Aluminum			O	O
7	515-331BX ③	Upper Front - Stainless			O	O
8	153-717-*BX ①	Disconnect Access Door	X	X	X	X
8	153-723BX ②	Disconnect Access Door - Aluminum	O	O	O	O
8	153-724BX ③	Disconnect Access Door - Stainless	O	O	O	O
9	501-1133-*BX ①	Right Side Assembly	X	X		
9	501-1128BX ②	Right Side Assembly - Aluminum	O	O		
9	501-1129BX ③	Right Side Assembly - Stainless	O	O		
9	501-1135-*BX ①	Right Side Assembly			X	X
9	501-1131BX ②	Right Side Assembly - Aluminum			O	O
9	501-1132BX ③	Right Side Assembly - Stainless			O	O
10	501-1083-*BX ①	Left Side Assembly	X	X		
10	501-1073BX ②	Left Side Assembly - Aluminum	O	O		
10	501-1077BX ③	Left Side Assembly - Stainless	O	O		
10	501-1081-*BX ①	Left Side Assembly			X	X
10	501-1075BX ②	Left Side Assembly - Aluminum			O	O
10	501-1079BX ③	Left Side Assembly - Stainless			O	O
11	105X1454BX	Right Support Angle	X	X	X	X
12	105Y1454BX	Left Support Angle	X	X	X	X
13	105-1457BX	Coil Support	2	2		
13	105-1455BX	Coil Support			2	2
14	147-055BX	Coil Support Offset	X	X		
14	147-054BX	Coil Support Offset			X	X

Continued on page 4

① Exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, include the complete model and serial number of the unit for which cabinet parts are being ordered.

② Exterior cabinet parts are manufactured from aluminum Code "A"

③ Exterior cabinet parts are manufactured from stainless steel Code "S"

X – Standard Component
O – Optional Component

* ***IMPORTANT:*** *Parts shown on this page and page 4 reflect model nomenclature character 11 X or D (W*HY******X/D**) for units with standard cabinets. See page 7 for external parts for nomenclature character 11 J or N (units with recessed cabinets).*

EXTERNAL PARTS – STANDARD*

Dwg No.	Part Number	Description	W3VHY-R, S, T	W3VHYDR, S, T	W5VHY-R, S, T	W5VHYDR, S, T
		Continued from page 3				
15	119-126-*BX ①	Side Grille	2	2		
15	119-142BX ②	Side Grille - Aluminum	2	2		
15	119-136BX ③	Side Grille - Stainless	2	2		
15	119-128-*BX ①	Side Grille			2	2
15	119-143BX ②	Side Grille - Aluminum			2	2
15	119-138BX ③	Side Grille - Stainless			2	2
16	105-1450BX	Right Control Panel Angle	X	X	X	X
17	105-1451BX	Left Control Panel Angle	X	X	X	X
18	543-221-*BX ①	Heater Access Cover	X	X	X	X
18	543-228BX ②	Heater Access Cover - Aluminum	O	O	O	O
18	543-229BX ③	Heater Access Cover - Stainless	O	O	O	O
19	507-382-*BX ①	Top	X	X	X	X
19	507-391BX ②	Top - Aluminum	O	O	O	O
19	507-392BX ③	Top - Stainless	O	O	O	O
20	109-412BX	Lower Back	X	X		
20	109-418BX	Lower Back	O	O		
20	109-422BX ③	Lower Back - Stainless	O	O		
20	109-414BX	Lower Back			X	X
20	109-420BX	Lower Back			O	O
20	109-424BX ③	Lower Back - Stainless			O	O
21	509-411BX	Upper Back	X	X		
21	509-417BX	Upper Back	O	O		
21	509-421BX ③	Upper Back - Stainless	O	O		
21	509-413BX	Upper Back			X	X
21	509-419BX	Upper Back			O	O
21	509-423BX ③	Upper Back - Stainless			O	O
22	111-299BX	Outlet Air Frame Assembly	X	X	X	X
23	535-129BX	Heat Shield	X	X	X	X
24	113-150-*BX ①	Top Rain Flashing	X	X	X	X
24	113-150-4BX ②	Top Rain Flashing	O	O	O	O
24	113-359BX ③	Top Rain Flashing - Stainless	O	O	O	O
25	539-406BX	Fresh Air Damper Assembly	X	X	X	X
25	543-222BX	Intake Blank-Off Plate	O	O	O	O
26	543-220BX	Exhaust Blank-Off Plate	X	X	X	X
27	543-248-*BX ①	Access Cover	X	X	X	X
27	543-250BX ②	Access Cover - Aluminum	O	O	O	O
27	543-251BX ③	Access Cover - Stainless	O	O	O	O
28	5252-033BX	Bard Nameplate	X	X	X	X

NS = Not Shown

X – Standard Component
O – Optional Component

① Exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, include the complete model and serial number of the unit for which cabinet parts are being ordered.

② Exterior cabinet parts are manufactured from aluminum Code "A"
NOTE: #24 - Top rain flashing not available in aluminum; order 113-150-4 (Buckeye Gray).

③ Exterior cabinet parts are manufactured from stainless steel Code "S"

Refer to drawing on page 2

* ***IMPORTANT:*** *Parts shown on this page and page 3 reflect model nomenclature character 11 (W*HY******X/D**) for units with standard cabinets. See page 7 for external parts for nomenclature character 11 J or N (recessed cabinets).*

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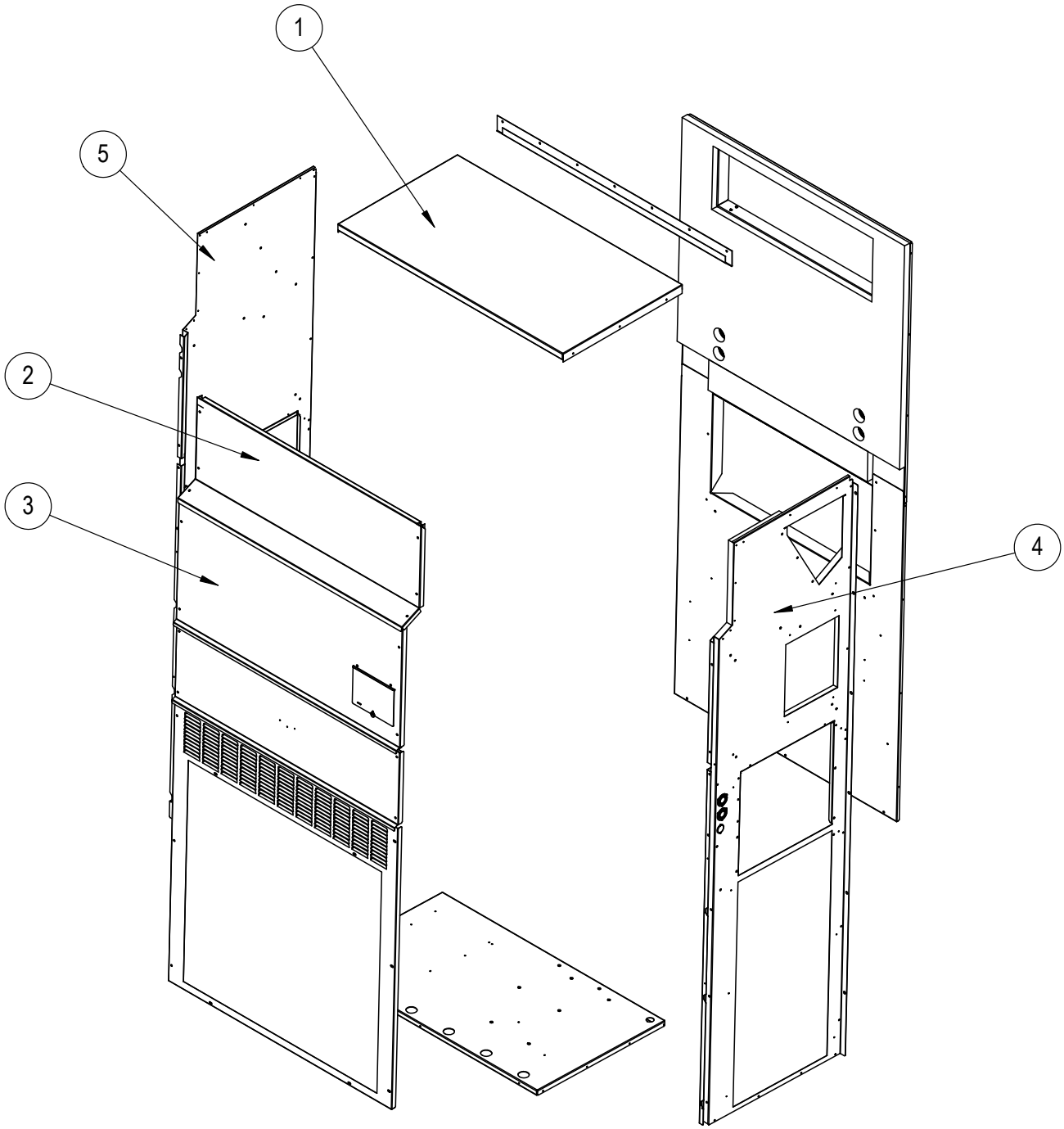
EXTERNAL PARTS – RECESSED CABINET



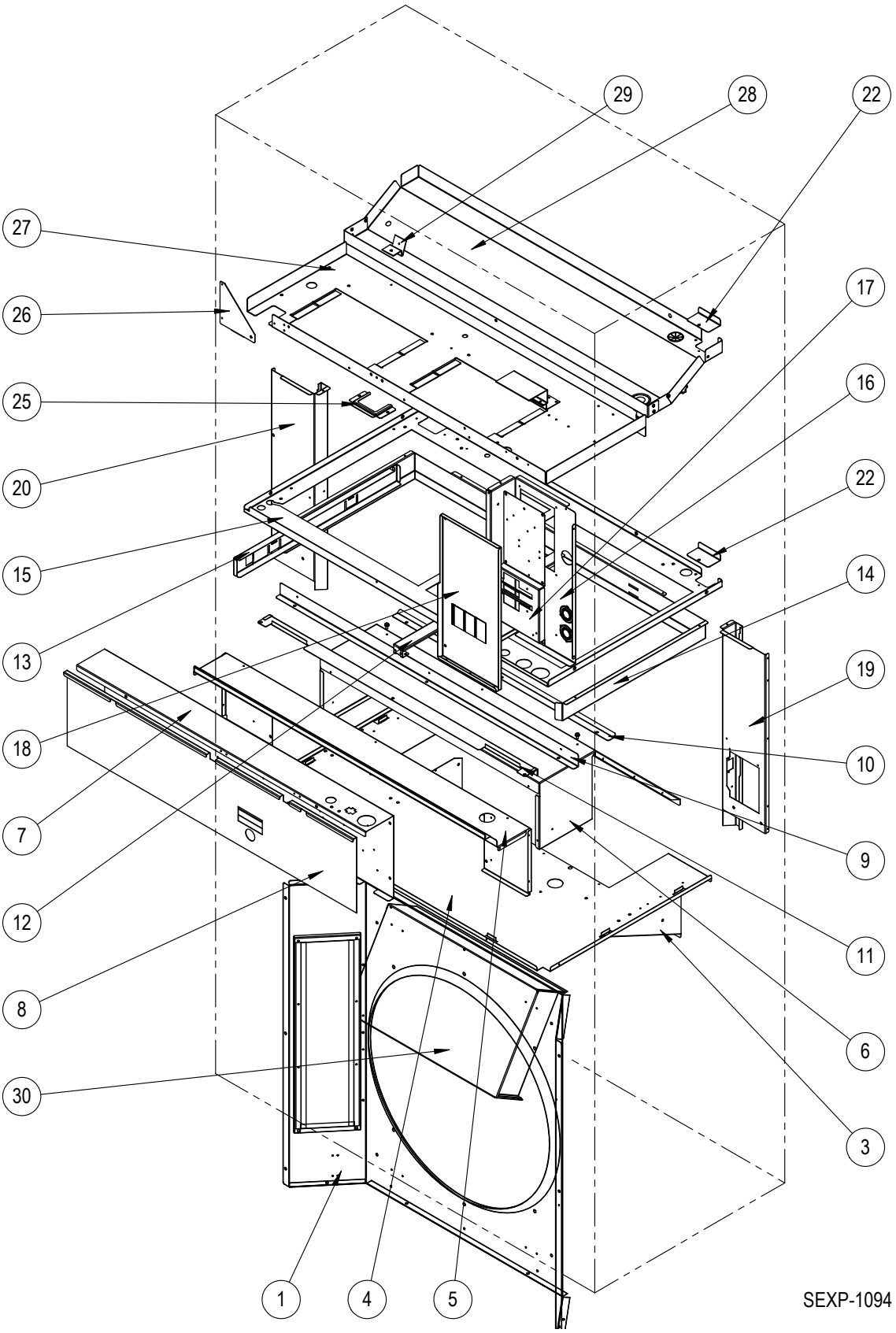
SEXP-1088

Drawing No.	Part Number	Description	W3VHY-R, S, T	W3VHYDR, S, T	W5VHY-R, S, T	W5VHYDR, S, T
1	507-413-*BX ①	Top	X	X	X	X
2	515-354-*BX ①	Upper Front	X	X		
2	515-356-*BX ①	Upper Front			X	X
3	515-355-*BX ①	Center Front	X	X		
3	515-357-*BX ①	Center Front			X	X
4	501-1142-*BX ①	Right Side Assembly	X	X		
4	501-1144-*BX ①	Right Side Assembly			X	X
5	501-1143-*BX ①	Left Side Assembly	X	X		
5	501-1145-*BX ①	Left Side Assembly			X	X

① Exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, include the complete model and serial number of the unit for which cabinet parts are being ordered.

** The replacement cabinet parts listed above are specific to the recessed unit W3/5VHY heat pump models (model nomenclature character 11 J or N). All other replacement cabinet external parts for these models are referenced on pages 2, 3 and 4. See **IMPORTANT** on page 3.*

INTERNAL PARTS – STANDARD & RECESSED



Dwg. No.	Part Number	Description	W3VHY-R	W3VHY-S	W3VHY-T	W3VHYDR	W3VHYDS	W3VHYDT	W5VHY-R	W5VHY-S	W5VHY-T	W5VHYDR	W5VHYDS	W5VHYDT
1	921-0122BX	Fan Shroud - Blow Thru	X	X	X	X	X	X						
1	921-0123BX	Fan Shroud - Blow Thru							X	X	X	X	X	X
1	921-0120BX ①	Fan Shroud - Draw Thru	O	O	O	O	O	O						
1	921-0121BX ①	Fan Shroud - Draw Thru							O	O	O	O	O	O
1	921-0126BX ①②	Fan Shroud - Blow Thru - Stainless	O	O	O	O	O	O						
1	921-0127BX ①②	Fan Shroud - Blow Thru - Stainless							O	O	O	O	O	O
1	921-0124BX ①②	Fan Shroud - Draw Thru - Stainless	O	O	O	O	O	O						
1	921-0125BX ①②	Fan Shroud - Draw Thru - Stainless							O	O	O	O	O	O
3	121-586BX	Condenser Partition Insert	X	X	X	X	X	X	X	X	X	X	X	X
3	121-600BX ②	Condenser Partition Insert - Stainless	O	O	O	O	O	O	O	O	O	O	O	O
4	121-585BX	Condenser Partition	X	X	X	X	X	X	X	X	X	X	X	X
4	121-599BX ②	Condenser Partition - Stainless	O	O	O	O	O	O	O	O	O	O	O	O
5	521-630BX	Front Exhaust Partition	X	X	X	X	X	X	X	X	X	X	X	X
6	521-587BX	Exhaust Partition	X	X	X	X	X	X	X	X	X	X	X	X
7	Control Panel Assy.	See **Control Panel** on pages 14 – 16	X	X	X	X	X	X	X	X	X	X	X	X
8	133-356BX	Control Panel Cover (Inner)	X	X	X	X	X	X	X	X	X	X	X	X
9	105-1453BX	Front Vent Guide Rail	X	X	X	X	X	X	X	X	X	X	X	X
10	105-1452BX	Vent Guide Rail	X	X	X	X	X	X	X	X	X	X	X	X
11	135-424BX	Field Wire Shield	X	X	X	X	X	X	X	X	X	X	X	X
12	131-168BX	Filter Support Bracket	X	X	X	X	X	X	X	X	X	X	X	X
13	131-170BX	Filter Slide	X	X	X	X	X	X	X	X	X	X	X	X
14	131-169BX	Filter Rack Frame	X	X	X	X	X	X	X	X	X	X	X	X
15	121-583BX	Filter Partition	X	X	X	X	X	X	X	X	X	X	X	X
16	117-412BX	Upper Control Panel	X	X	X	X	X	X	X	X	X	X	X	X
17	127-575BX	Circuit Breaker Base	X	X		X	X		X	X		X	X	
17	127-585BX	Circuit Breaker Base - 460V			X			X			X			X
18	133-303BX	Upper Control Panel Cover	X	X		X	X		X	X		X	X	
18	133-304BX	Upper Control Panel Cover			X			X			X			X
19	135X422BX	Right Copper Chase	X	X	X	X	X	X	X	X	X	X	X	X
19	135X423BX ②	Right Copper Chase - Stainless	O	O	O	O	O	O	O	O	O	O	O	O
20	135Y393BX	Left Copper Chase	X	X	X	X	X	X	X	X	X	X	X	X
20	135-398BX ②	Left Copper Chase - Stainless	O	O	O	O	O	O	O	O	O	O	O	O
22	137-920BX	Copper Fill Plate	2	2	2	2	2	2	2	2	2	2	2	2
25	113-765BX	Grommet Retainer Bracket	X	X	X	X	X	X	X	X	X	X	X	X
26	141-492BX	Blower Partition Support	X	X	X	X	X	X	X	X	X	X	X	X
27	121-582BX	Blower Partition	X	X	X	X	X	X	X	X	X	X	X	X
28	523-161BX	Drain Pan Assembly	X	X	X	X	X	X	X	X	X	X	X	X
28	523-162BX ②③	Drain Pan Assembly - Stainless	O	O	O	O	O	O	O	O	O	O	O	O
29	113-768BX	TXV Bracket	X	X	X	X	X	X	X	X	X	X	X	X
30	Inverter Assy.	See Inverter Drive Assembly Drawing and Parts List	X	X	X	X	X	X	X	X	X	X	X	X

NS = Not Shown

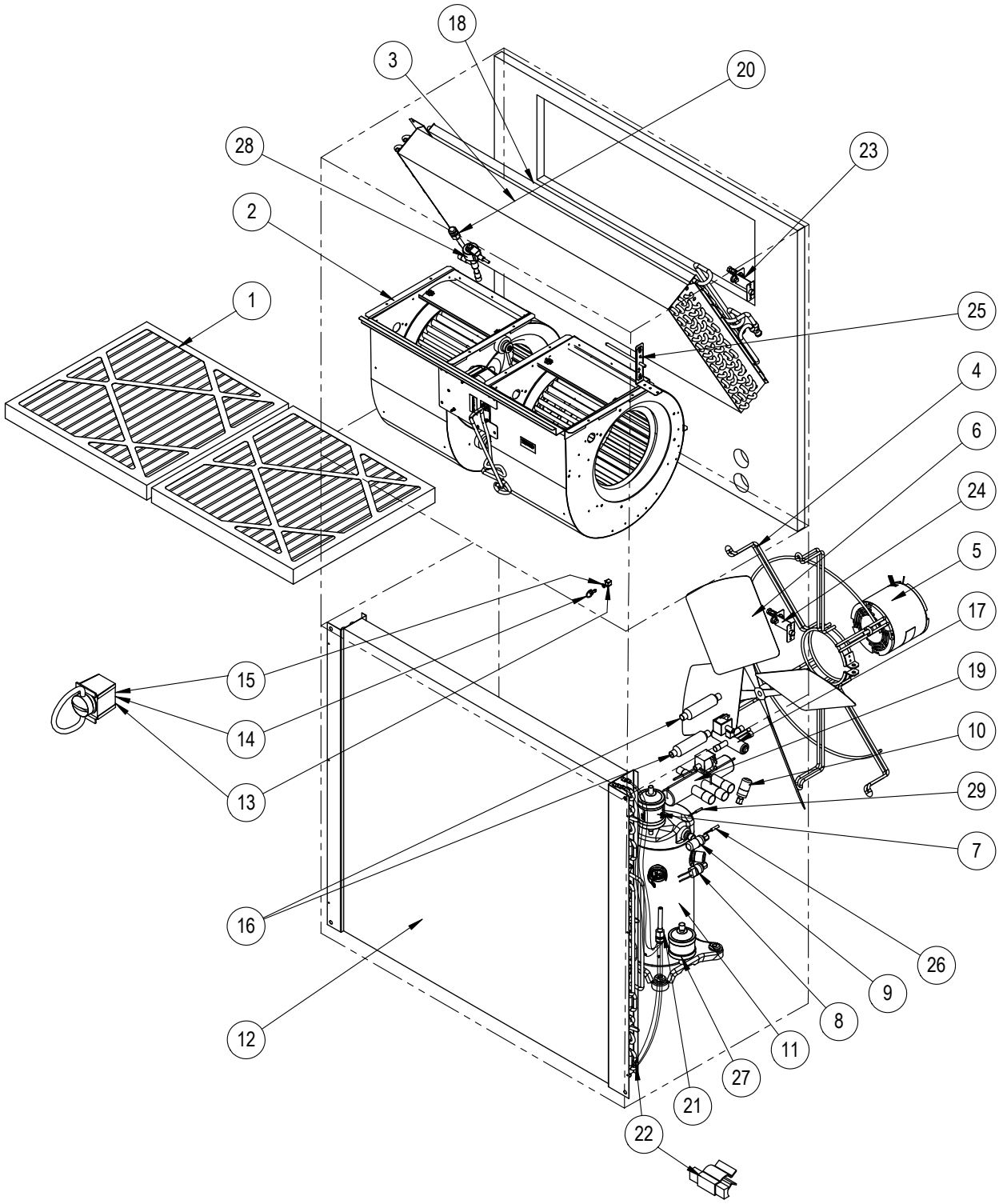
X – Standard Component
O – Optional Component

① Fan assemblies offered in blow thru or draw thru. Refer to nomenclature character 11 X, D, J or N.

② Used with stainless steel cabinet option.

③ For aluminum units, order 523-162 stainless steel drain pan.

FUNCTIONAL COMPONENTS – STANDARD & RECESSED



SEXP-1095

This drawing to be used for reference for pages 11 and 12

Dwg. No.	Part Number	Description	W3VHY-R	W3VHY-S	W3VHY-T	W3VHYDR	W3VHYDS	W3VHYDT	W5VHY-R	W5VHY-S	W5VHY-T	W5VHYDR	W5VHYDS	W5VHYDT
1	7004-012	Air Filter 1" Throw-Away (20 x 20 x 1)	2	2	2	2	2	2	2	2	2	2	2	2
1	7003-085 ①	Air Filter 1" Washable (20 x 20 x 1)	2	2	2	2	2	2	2	2	2	2	2	2
1	7004-052 ①	Air Filter 2" Merv 8 (20 x 20 x 2)	2	2	2	2	2	2	2	2	2	2	2	2
1	7004-060 ①	Air Filter 2" Merv 11 (20 x 20 x 2)	2	2	2	2	2	2	2	2	2	2	2	2
1	7004-063 ①	Air Filter 2" Merv 13 (20 x 20 x 2)	2	2	2	2	2	2	2	2	2	2	2	2
2	900-398-0244BX	Blower Assembly	X	X	X	X	X	X						
2	900-397-0245BX	Blower Assembly							X	X	X	X	X	X
3	917-0405BX	Indoor Coil w/Distributor Assy.	X	X	X	X	X	X						
3	917-0406BX	Indoor Coil - Coated w/Distributor Assy.	O	O	O	O	O	O						
3	917-0376BX	Indoor Coil w/Distributor Assy.							X	X	X	X	X	X
3	917-0377BX	Indoor Coil - Coated w/Distributor Assy.							O	O	O	O	O	O
4	8200-049BX	Fan Motor Mount	X	X	X	X	X	X	X	X	X	X	X	X
4	8200-052BX ②	Fan Motor Mount - Stainless Steel	O	O	O	O	O	O	O	O	O	O	O	O
5	8106-079-0246BX	Condenser Motor	X	X	X	X	X	X	X	X	X	X	X	X
6	5151-060BX ③	Fan Blade	X	X	X	X	X	X	X	X	X	X	X	X
6	5151C060BX ③	Fan Blade - Coated	O	O	O	O	O	O	O	O	O	O	O	O
6	5151-054BX ③	Fan Blade	O	O	O	O	O	O	O	O	O	O	O	O
6	5151C054BX ③	Fan Blade - Coated	O	O	O	O	O	O	O	O	O	O	O	O
7	5201-020BX	H/P Liquid Filter Drier	X	X	X	X	X	X	X	X	X	X	X	X
8	8406-164BX	High Pressure Switch	X	X	X	X	X	X	X	X	X	X	X	X
9	8406-157BX	High Pressure Transducer	X	X	X	X	X	X	X	X	X	X	X	X
10	8408-158BX	Low Pressure Transducer	X	X	X	X	X	X	X	X	X	X	X	X
11	8000-498BX	Compressor ZPV0382E-2E9							X	X	X	X	X	X
11	8000-499BX	Compressor ZPV0282E-2E9	X	X	X	X	X	X						
12	917-0413BX	Outdoor Coil (Includes Distributor)	X	X	X	X	X	X						
12	917-0414BX	Outdoor Coil - Coated (Includes Distributor)	O	O	O	O	O	O						
12	917-0417BX	Outdoor Coil (Includes Distributor)							X	X	X	X	X	X
12	917-0418BX	Outdoor Coil - Coated (Includes Distributor)							O	O	O	O	O	O
13	1171-023	1/4 Turn Receptacle	X	X	X	X	X	X	X	X	X	X	X	X
14	1171-022	1/4 Turn Fastener	X	X	X	X	X	X	X	X	X	X	X	X
15	1171-024	1/4 Turn Retainer	X	X	X	X	X	X	X	X	X	X	X	X
16	5651-219	Check Valve				2	2	2				2	2	2
17	5650-051	Dehumidification 3-Way Valve				X	X	X				X	X	X
18	5051-221BX	Reheat Coil				X	X	X				X	X	X
19	5650-040BX	Reversing Valve	X	X	X	X	X	X	X	X	X	X	X	X
20	800-0461BX	Distributor Assembly - Indoor Coil	X	X	X	X	X	X						
20	800-0455BX	Distributor Assembly - Indoor Coil							X	X	X	X	X	X
21	800-0424BX	Distributor Assembly - Outdoor Coil	X	X	X	X	X	X						
21	800-0455BX	Distributor Assembly - Outdoor Coil							X	X	X	X	X	X
22	8408-058	Defrost Thermistor Sensor	X	X	X	X	X	X	X	X	X	X	X	X
23	910-2257BX	Supply Temp Sensor	X	X	X	X	X	X	X	X	X	X	X	X
24	910-2258BX	Return Temp Sensor	X	X	X	X	X	X	X	X	X	X	X	X
25	910-2106BX	Mixed Air Sensor	X	X	X	X	X	X	X	X	X	X	X	X
26	8408-063BX	Discharge Line Thermostat (DLT Sensor)	X	X	X	X	X	X	X	X	X	X	X	X
27	5220-013BX	Pulsation Dampener/Muffler	X	X	X	X	X	X	X	X	X	X	X	X

Continued on page 12

① Optional on these models

② Used with stainless steel cabinet option

③ Fan assemblies offered in blow thru or draw thru. Refer to nomenclature character 11 X, D, J or N.

X – Standard Component
O – Optional Component

FUNCTIONAL COMPONENTS – STANDARD & RECESSED

Dwg. No.	Part Number	Description	W3VHY-R	W3VHY-S	W3VHY-T	W3VHYDR	W3VHYDS	W3VHYDT	W5VHY-R	W5VHY-S	W5VHY-T	W5VHYDR	W5VHYDS	W5VHYDT
		Continued from page 11												
28 28	905-0737BX 905-0800BX	Electronic Expansion Valve Assembly E2V24 Electronic Expansion Valve Assembly E2V30	X	X	X	X	X	X	X	X	X	X	X	X
29	8408-054BX	Suction Temp Sensor	X	X	X	X	X	X	X	X	X	X	X	X
NS NS	910-2132BX 910-2209BX	460V 2KVa Transformer Assembly (Non-ERV) 460V 3KVa Transformer Assembly (ERV Installed)			X O			X O			X O			X O
NS	5650-042BX	Rev. Valve Solenoid, Red Casing (Ranco)	X	X	X	X	X	X	X	X	X	X	X	X
NS	5650-046BX	Rev. Valve Solenoid, Black Casing (San Hua)	X	X	X	X	X	X	X	X	X	X	X	X
NS	5451-024	Tubing Isolation Grommet	2	2	2	2	2	2	2	2	2	2	2	2
NS	6031-009	Coremax Valve Core	2	2	2	2	2	2	2	2	2	2	2	2
NS	1171-028	Control Panel Door Clip	4	4	4	4	4	4	4	4	4	4	4	4
NS	1171-057	Control Panel Door Screw	4	4	4	4	4	4	4	4	4	4	4	4
NS	1171-027	Control Panel Door Screw Retainer	4	4	4	4	4	4	4	4	4	4	4	4
NS	3000-1779BX	Molded Plug for Reversing Valve (Blue Lead)	X	X	X	X	X	X	X	X	X	X	X	X
NS	3000-1780BX	Molded Plug for Dehum Valve (Purple/White Lead)				X	X	X				X	X	X

NS = Not Shown

X – Standard Component
O – Optional Component

Refer to drawing on page 10

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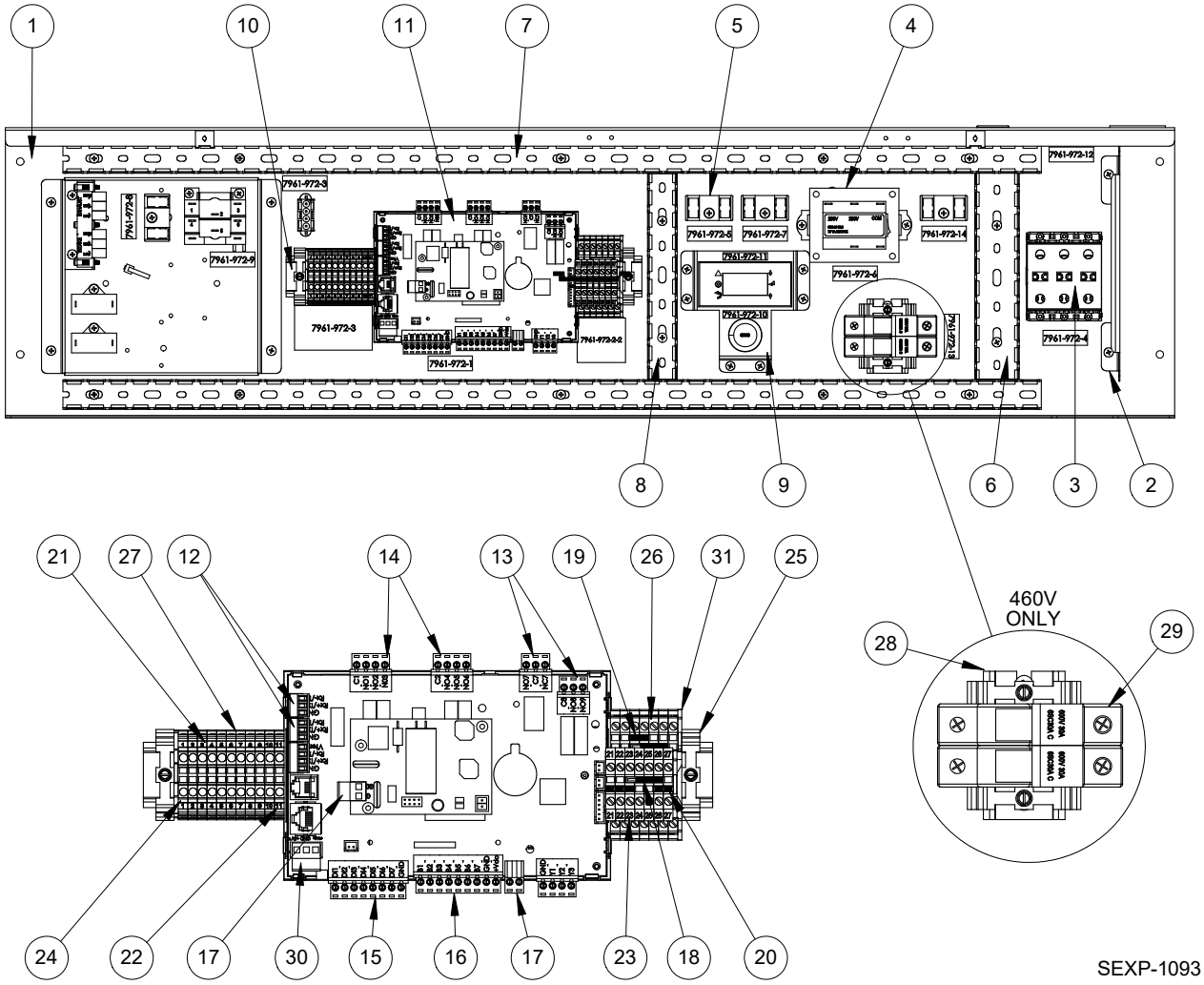
CONTROL PANEL – STANDARD & RECESSED



This drawing to be used for reference for pages 15 and 16

Dwg. No.	Part Number	Description	W3VHY-R	W3VHY-S	W3VHY-T	W3VHYDR	W3VHYDS	W3VHYDT	W5VHY-R	W5VHY-S	W5VHY-T	W5VHYDR	W5VHYDS	W5VHYDT
1	517-446BX	Control Panel	X	X	X	X	X	X	X	X	X	X	X	X
2	135-394BX	Wire Shield	X	X	X	X	X	X	X	X	X	X	X	X
3	8607-074BX	Power Terminal Block 2 Pole	X			X			X			X		
3	8607-070BX	Power Terminal Block 3 Pole		X	X		X	X		X	X		X	X
4	8407-065BX	Transformer 230/24VAC 75VA	X	X		X	X		X	X		X	X	
4	8407-072BX	Transformer 460/24VAC 75VA			X			X			X			X
5	8607-017BX	Terminal Block 240V 2 Terminal	2	2	3	2	2	3	2	2	3	2	2	3
6	8611-244-0700	2-1/4" x 1-1/2" Cable Duct 7"	X	X	X	X	X	X	X	X	X	X	X	X
7	8611-140-3300	2-1/4" x 1" Cable Duct 33"	2	2	2	2	2	2	2	2	2	2	2	2
8	8611-140-0700	2-1/4" x 1" Cable Duct 7"	X	X	X	X	X	X	X	X	X	X	X	X
9	910-2266BX	PLD Display Assembly	X	X	X	X	X	X	X	X	X	X	X	X
10	113-820BX	12" DIN Rail	X	X	X	X	X	X	X	X	X	X	X	X
11	8301-109-001BX	UPC3 C2 - Variable Speed	X	X	X	X	X	X	X	X	X	X	X	X
12	8611-192	3-PIN Circuit Board Connector	2	2	2	2	2	2	2	2	2	2	2	2
13	8611-147	3-PIN Circuit Board Connector	2	2	2	2	2	2	2	2	2	2	2	2
14	8611-148	4-PIN Circuit Board Connector	3	3	3	3	3	3	3	3	3	3	3	3
15	8611-185	8-PIN Circuit Board Connector	X	X	X	X	X	X	X	X	X	X	X	X
16	8611-149	9-PIN Circuit Board Connector	X	X	X	X	X	X	X	X	X	X	X	X
17	8611-183	2-PIN Circuit Board Connector	2	2	2	2	2	2	2	2	2	2	2	2
18	8611-195	Jumper 4 Position	X	X	X	X	X	X	X	X	X	X	X	X
20	8611-282	Jumper 1 Position	4	4	4	4	4	4	4	4	4	4	4	4
21	8607-056	Terminal Designation (1-10)	2	2	2	2	2	2	2	2	2	2	2	2
22	8607-055	Terminal Designation (11-20)	2	2	2	2	2	2	2	2	2	2	2	2
23	8607-054	Terminal Designation (21-30)	2	2	2	2	2	2	2	2	2	2	2	2
24	8611-151	Terminal Block End Cap for DIN Rail	X	X	X	X	X	X	X	X	X	X	X	X
25	8611-144	End Clamp for DIN Rail	2	2	2	2	2	4	2	2	2	2	2	4
26	8611-058	Double Level Terminal Block	7	7	7	7	7	7	7	7	7	7	7	7
27	8611-150BX	Terminal Block for DIN Rail RS485	11	11	11	11	11	11	11	11	11	11	11	11
28	113-943BX	35MM DIN Rail 2-1/2"			X			X			X			X
29	8614-058BX	2-POLE Enclosed Fuse Holder			X			X			X			X
30	8611-237	3-PIN Circuit Board Connector	X	X	X	X	X	X	X	X	X	X	X	X
31	8611-221	End Cover	X	X	X	X	X	X	X	X	X	X	X	X
NS	8614-042BX	7A Class CC Fuse (Non-ERV units)			2			2			2			2
NS	8614-043BX	10A Class CC Fuse (Unit with ERV Only)			2			2			2			2
NS	8615-038BX	Circuit Breaker 35A 2 Pole ①	X			X								
NS	8615-039BX	Circuit Breaker 45A 2 Pole ①							X					
NS	8615-040BX	Circuit Breaker 50A 2 Pole ①										X		
NS	8615-051BX	Circuit Breaker 25A 3 Pole ①		X										
NS	8615-052BX	Circuit Breaker 30A 3 Pole ①					X							
NS	8615-042BX	Circuit Breaker 35A 3 Pole ①								X			X	
NS	8615-095BX	Toggle Disconnect			X			X			X			X
NS	8615-096BX	Disconnect Cover			X			X			X			X

Continued on page 16

NS = Not Shown

① Circuit breakers listed are for units without electric heat, "OZ" models. See heater replacement parts manual for units with electric heat.

X – Standard Component
O – Optional Component

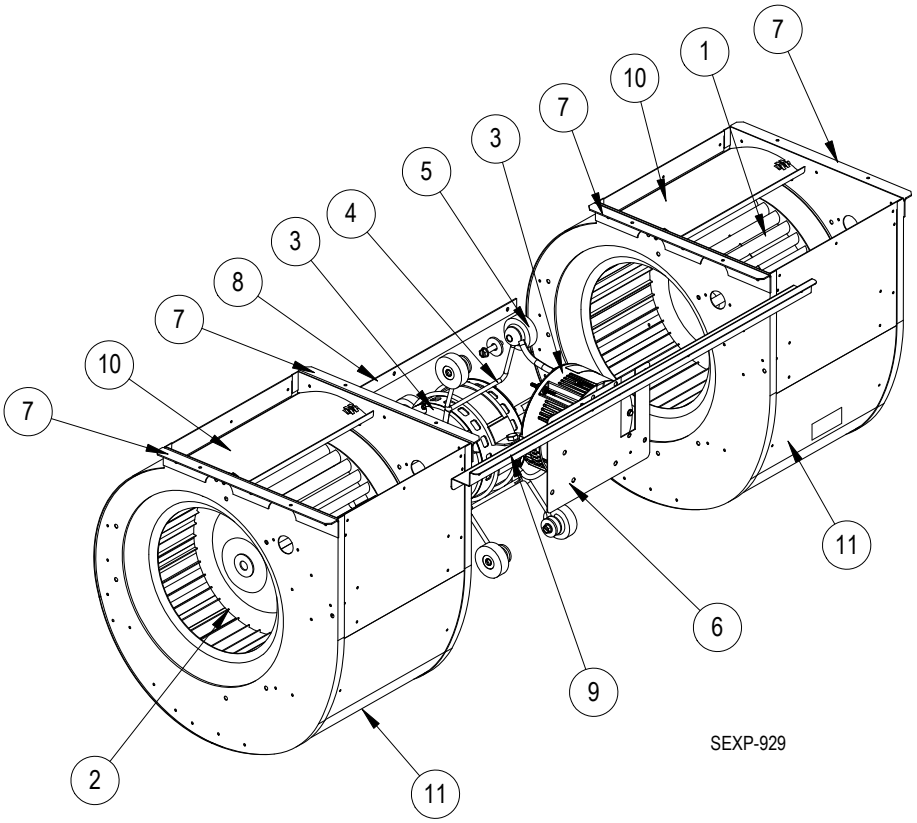
CONTROL PANEL – STANDARD & RECESSED

Dwg. No.	Part Number	Description	W3VHY-R	W3VHY-S	W3VHY-T	W3VHYDR	W3VHYDS	W3VHYDT	W5VHY-R	W5VHY-S	W5VHY-T	W5VHYDR	W5VHYDS	W5VHYDT
		Continued from page 15												
NS	4096-184	Wiring Diagram	X			X			X			X		
NS	4096-284	Wiring Diagram		X			X			X			X	
NS	4096-384	Wiring Diagram			X			X			X			X
NS	910-2265BX	Blower Speed Plug Harness	X	X	X	X	X	X	X	X	X	X	X	X
NS	3000-1799BX	Blower Power Plug Harness	X	X	X	X	X	X	X	X	X	X	X	X
NS	3000-1758BX	Compressor Harness	X			X			X			X		
NS	3000-1759BX	Compressor Harness		X	X		X	X		X	X		X	X

NS = Not Shown

X – Standard Component
O – Optional Component

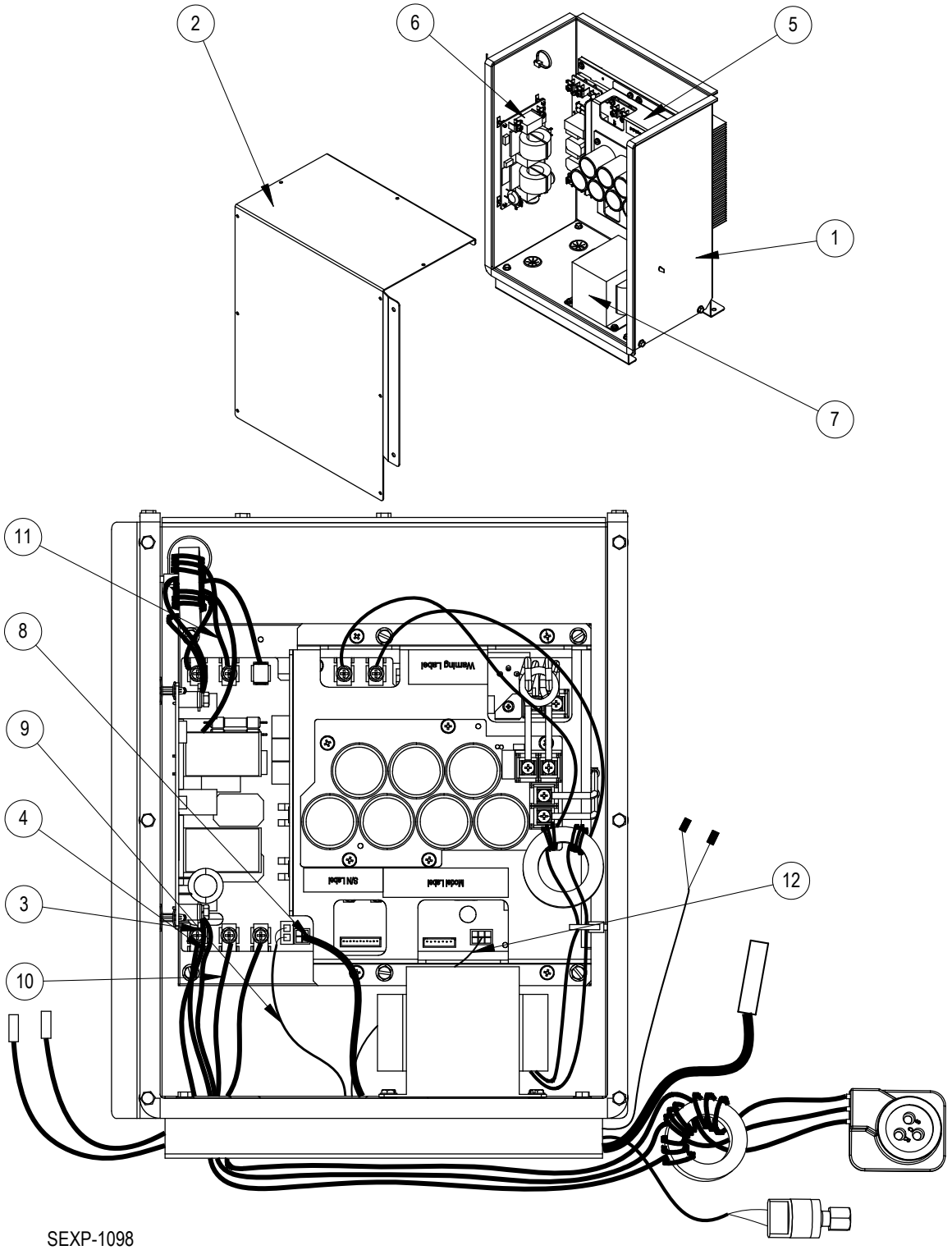
Refer to drawing on page 14



Dwg No.	Part Number	Description	900-397-0245BX	900-398-0244BX
1	5152-011BX	Blower Wheel (CW) 1/2" 10-8DD	X	X
2	5152-012BX	Blower Wheel (CCW) 1/2" 10-8DD	X	X
3	8106-073-0244BX	Programmed Blower Motor & Control (230/208V)		X
3	8107-032-0245BX	Programmed Blower Motor & Control (230/208V)	X	
3	C8106-073-0244	Programmed Control Only (230/208V)		O
3	C8107-032-0245	Programmed Control Only (230/208V)	O	
4	8200-040BX	Motor Mount	X	X
5	5451-011	Grommets	6	6
6	112-775BX	Motor Control Bracket	X	X
7	105-880BX	Side Angle	4	4
8	105-881BX	Back Brace	X	X
9	103-541BX	Front Mounting Offset	X	X
10	144-166BX	Diffuser	2	2
11	151-101BX	Blower Housing	2	2

X – Standard Component
O – Optional Component

INVERTER DRIVE ASSEMBLY – 230V 1 PHASE



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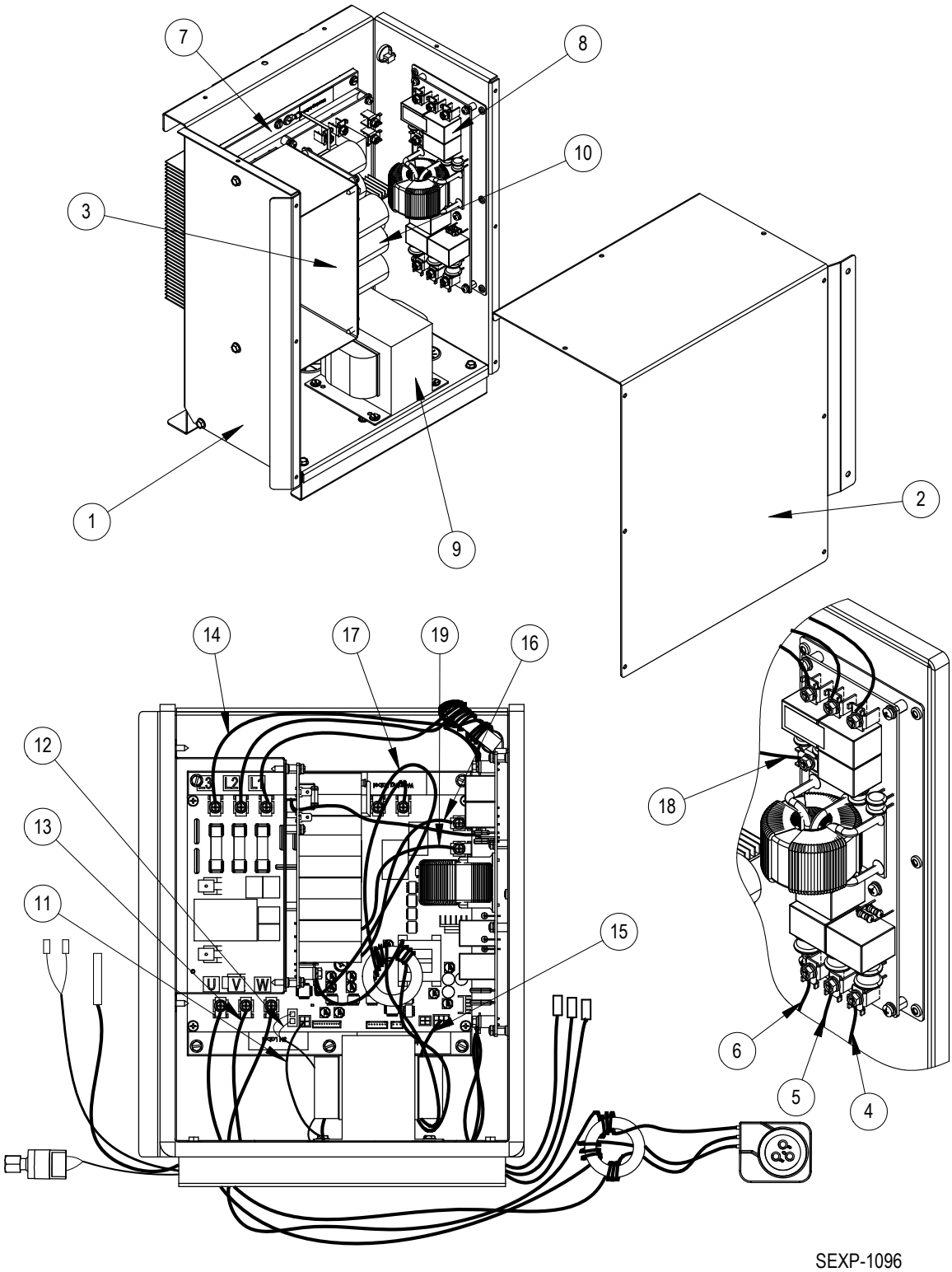
Dwg. No.	Part Number	Description	W3VHY-R	W3VHYDR	W5VHY-R	W5VHYDR
1	527-634BX	Inverter Base Assembly	X	X	X	X
2	115-362BX	Inverter Cover	X	X	X	X
3	3010-070A	EA2-112-GR6-50	X	X	X	X
4	3010-069A	EC2-112-GR6-51	X	X	X	X
5	8003-001BX	Inverter Drive EV2055M-C9-291	X	X		
5	8003-004BX	Inverter Drive EV2080M-C9-291			X	X
6	8004-001BX	EMI Filter Board 230-1PH	X	X	X	X
7	8005-001BX	Choke 230-1PH	X	X	X	X
8	8408-063BX	Temp Sensor Assembly	X	X	X	X
9	8406-164BX	High Pressure Switch Assembly	X	X	X	X
10	3000-1758BX	Wire Assembly Drive to Compressor	X	X	X	X
11	3000-1755BX	Wire Assembly Filter to Drive	X	X	X	X
12	3000-1748BX	Communication Cable	X	X	X	X
NS	4210-100	Wire Diagram	X	X	X	X

INVERTER DRIVE ASSEMBLY – 230V 3 PHASE & 460V 3 PHASE



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INVERTER DRIVE ASSEMBLY – 230V 3 PHASE & 460V 3 PHASE

Dwg. No.	Part Number	Description	W3VHY-S	W3VHY-T	W3VHYDS	W3VHYDT	W5VHY-S	W5VHY-T	W5VHYDS	W5VHYDT
1	527-633BX	Inverter Base Assembly	X	X	X	X	X	X	X	X
2	515-362BX	Inverter Cover	X	X	X	X	X	X	X	X
3	103-559BX	Capacitor Board Bracket	X	X	X	X	X	X	X	X
4	3010-070A	EA2-112-GR6-50	X	X	X	X	X	X	X	X
5	3010-069A	EC2-112-GR6-51	X	X	X	X	X	X	X	X
6	3010-071A	EE2-112-GR6-52	X	X	X	X	X	X	X	X
7	8003-002BX	Inverter Drive EV2055M-J9-291	X		X					
7	8003-003BX	Inverter Drive EV2055M-K9-291		X		X				
7	8003-005BX	Inverter Drive EV2080M-J9-291					X		X	
7	8003-006BX	Inverter Drive EV2080M-K9-291						X		X
8	8004-002BX	EMI Filter Board 230-3PH	X		X		X		X	
8	8004-003BX	EMI Filter Board 460-3PH		X		X		X		X
9	8005-002BX	Choke 230-3PH	X		X		X		X	
9	8005-003BX	Choke 460-3PH		X		X		X		X
10	8006-001BX	Capacitor Board w/Base - 5.5KW 230-3Ph	X		X					
10	8006-002BX	Capacitor Board w/Base - 5.5KW 460-3Ph		X		X				
10	8006-003BX	Capacitor Board w/Base - 8KW 230-3Ph					X		X	
10	8006-004BX	Capacitor Board w/Base - 8KW 460-3Ph						X		X
11	8408-063BX	Temp Sensor Assembly	X	X	X	X	X	X	X	X
12	8406-164BX	High Pressure Switch Assembly	X	X	X	X	X	X	X	X
13	3000-1759BX	Wire Assembly Drive to Compressor	X	X	X	X	X	X	X	X
14	3000-1756BX	Wire Assembly Filter to Drive	X		X		X		X	
14	3000-1757BX	Wire Assembly Filter to Drive		X		X		X		X
15	3000-1748BX	Communication Cable	X	X	X	X	X	X	X	X
16	3010-074	EA2-12-GG	X	X	X	X	X	X	X	X
17	3010-075	EC2-12-CG	X	X	X	X	X	X	X	X
18	3010-076	EF2-06-CG	X	X	X	X	X	X	X	X
19	3000-1783BX	Drive to Capacitor Board	X		X		X		X	
19	3000-1784BX	Drive to Capacitor Board		X		X		X		X
NS	4210-200	Wiring Diagram	X		X		X		X	
NS	4210-300	Wiring Diagram		X		X		X		X