Bard®
SINCE 1914
Climate Control Solutions

Literature Assembly
911-0771-1
BOOK 1 OF 2

Contains the following:

2100-034(G)	User's Guide
2100-695(G)	Fusion Tec Pkg A/C Manual (WR)
2100-479	Leak Test, Evacuation, Charging
7960-788	Commissioning Report
7960-420	Warranty

USER'S APPLICATION GUIDE AND TECHNICAL PRODUCT OVERVIEW

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

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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

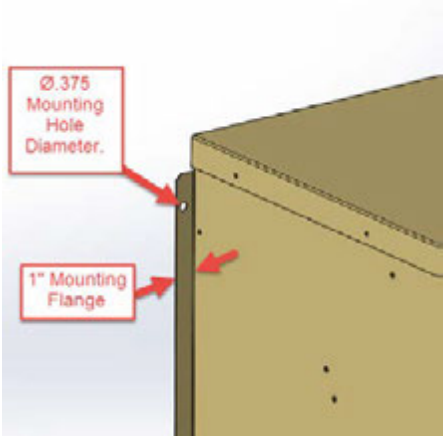
Installation plays a key part in unit functionality, performance and safety. Product securing and placement, duct design and supply/return location, electrical routing and condensate and defrost drainage all play key roles in making sure a unit will perform per the design specifications.

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.

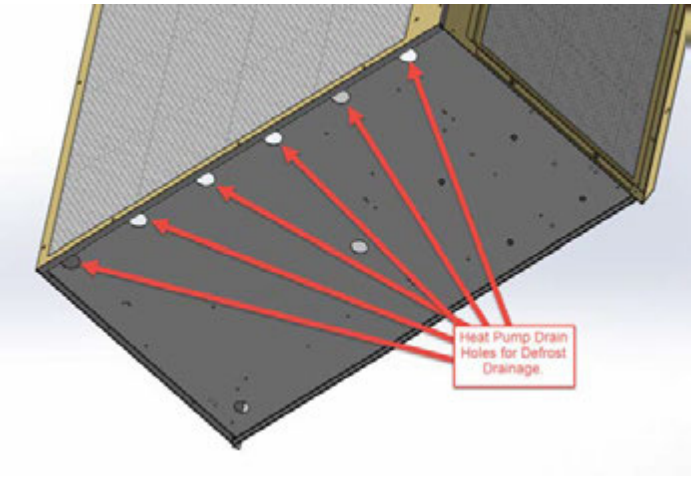
Defrost water drainage from heat pump units needs to be planned before installation. During seasons requiring heating operation, the unit will need to warm the condenser coil to remove frost build-up (defrost). **Outdoor heat pump products include holes in the unit base under the condenser coil for proper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

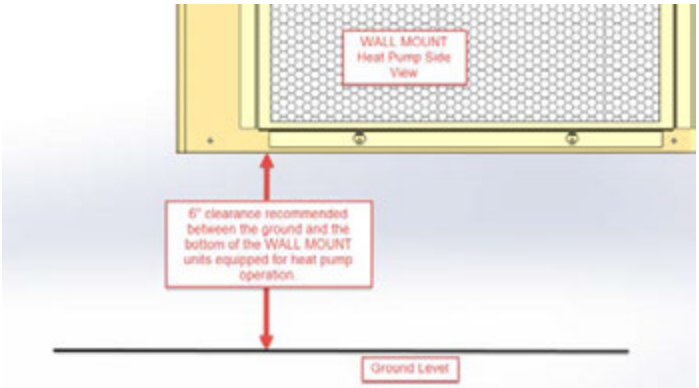
Defrost Water Drainage:

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

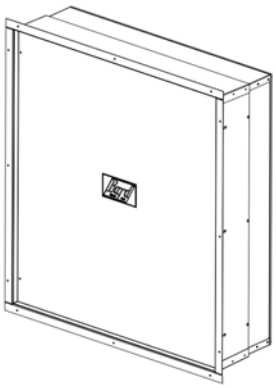
Q-TEC

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.

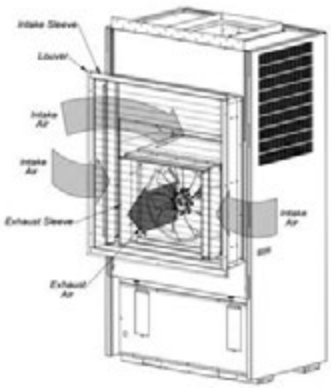
Wall Sleeve:

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

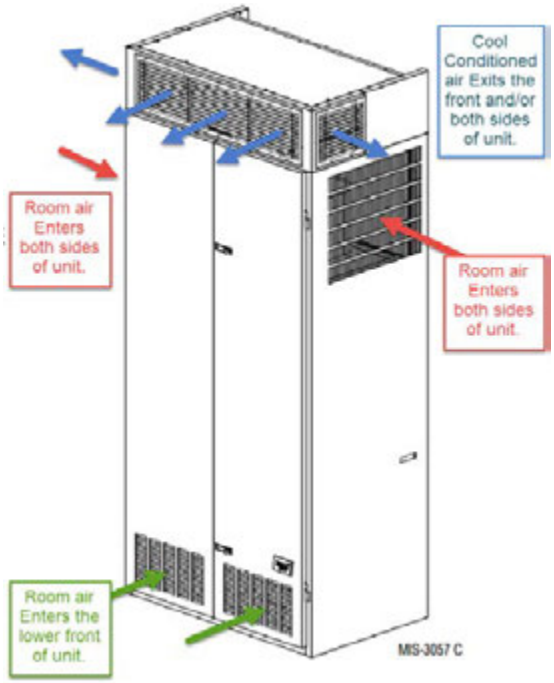
The Bard unit should be placed in an area where the supply (leaving conditioned air) and return (unit air intake) air paths will be unrestricted. Avoid placing objects inside the room within 24" of the return (unit air intake) louvers or grille. Avoid placing objects directly in the path of the supply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

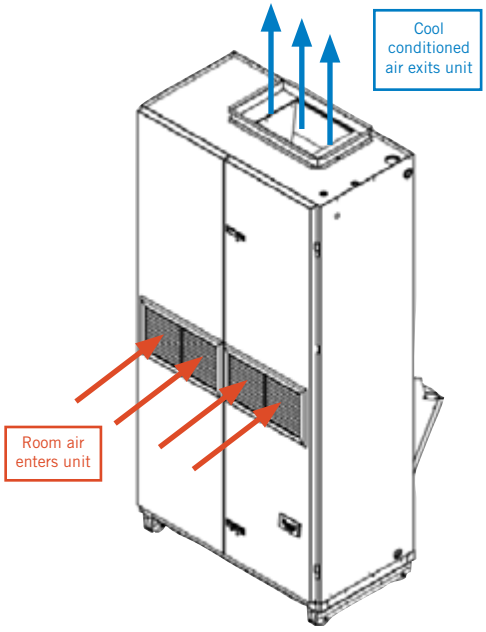
The I-TEC product has been engineered for extremely quiet unit operation and has multiple air paths for air entering and exiting the unit. Room air enters the upper sides to be conditioned (cooled) inside the unit and exits the unit top. The unit will either be ducted to supply registers or have a supply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

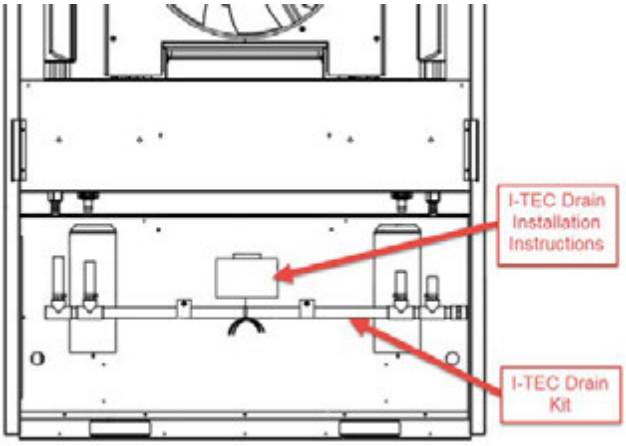
I-TEC and Q-TEC Products – Condensate Drainage

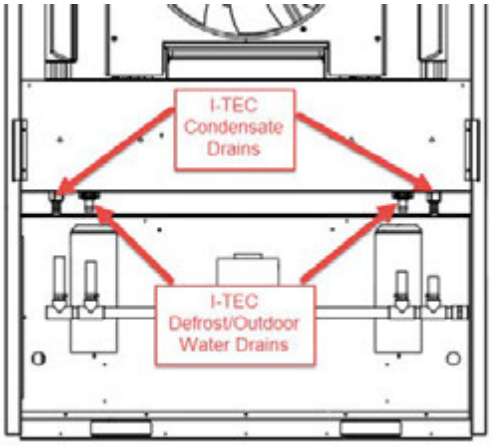
Condensate drainage for Bard indoor cooling units is a very important part of unit installation. During normal air conditioning operation, large amounts of condensate water are generated inside the unit as moisture is extracted from the supply air. This is collected in an evaporator pan and needs to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

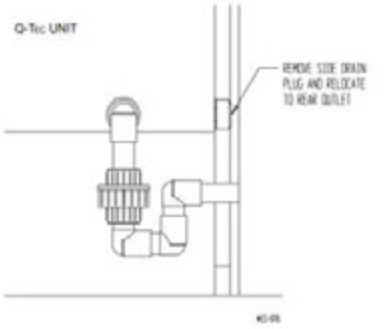
The I-TEC drainage system consists of a manifold drain kit that combines all drains behind the unit to allow connection to the building system.



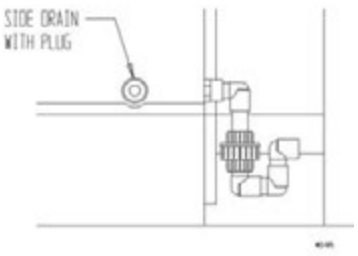


Q-TEC Drain System:

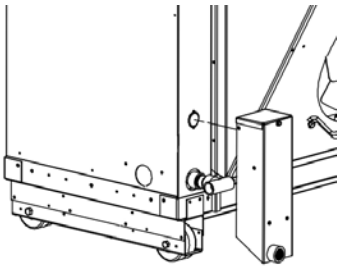
The Q-TEC drainage system consists of a lower right side or lower right rear connection fitting. An optional in-wall drain box may also be purchased as an accessory that allows separate evaporator and defrost water drainage.



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

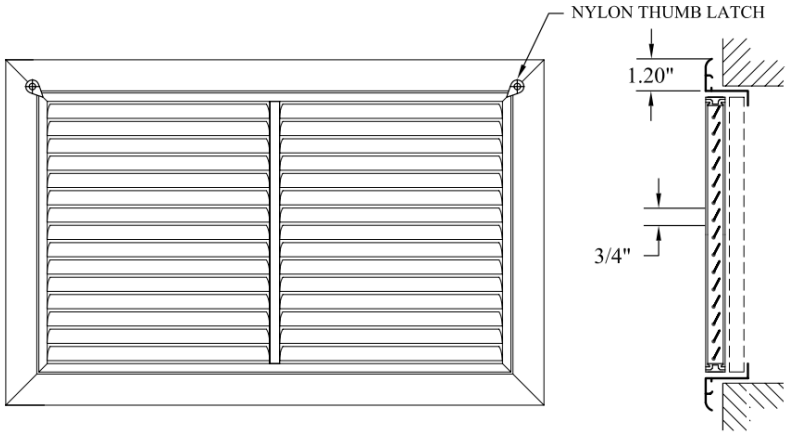
All Products – Filters and Filter Servicing

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.

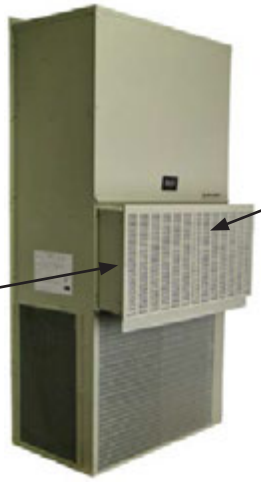
The product installation instructions contain additional information regarding unit maintenance. This information may be accessed at www.bardhvac.com.

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.

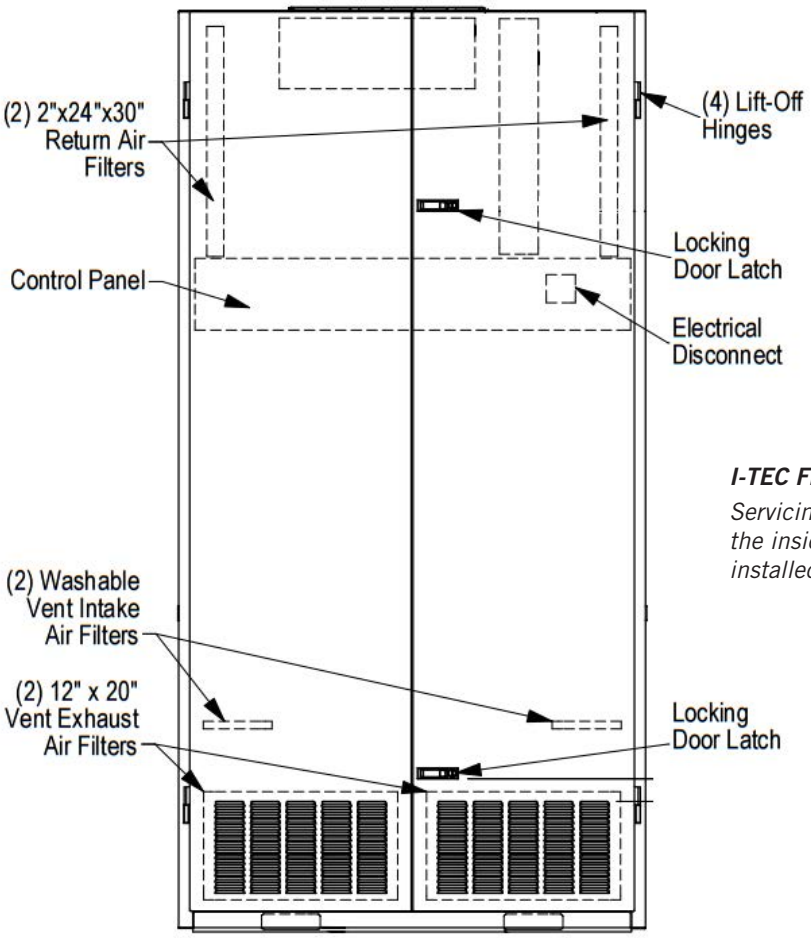
I-TEC Indoor Products – Filters and Filter Servicing

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.

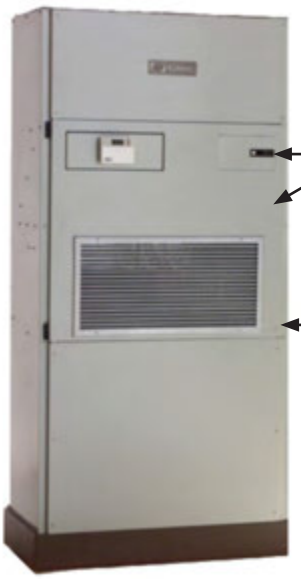
The I-TEC product installation instructions contain additional information regarding unit maintenance. This information may be accessed at www.bardhvac.com.

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



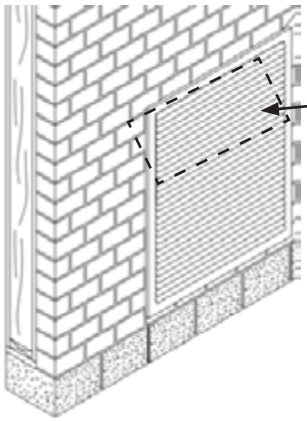
Q-TEC Filter Location:

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.

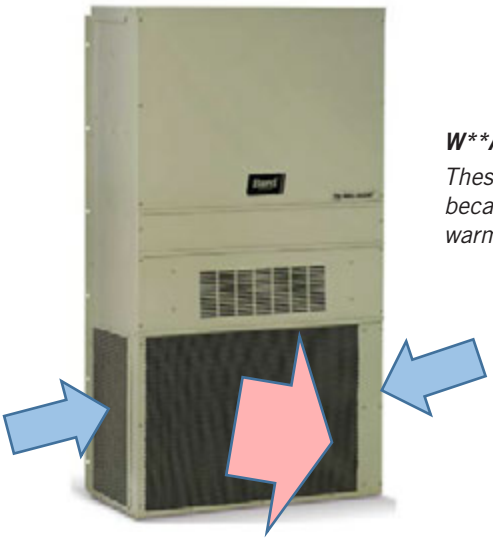
Other conditions that can cause reduction of airflow across the outdoor coil are flowers, shrubbery or other growth too near the outdoor coil air inlet and outlet openings. These living things, especially as they mature and grow, will be just as effective in blocking the airflow and create the same problems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

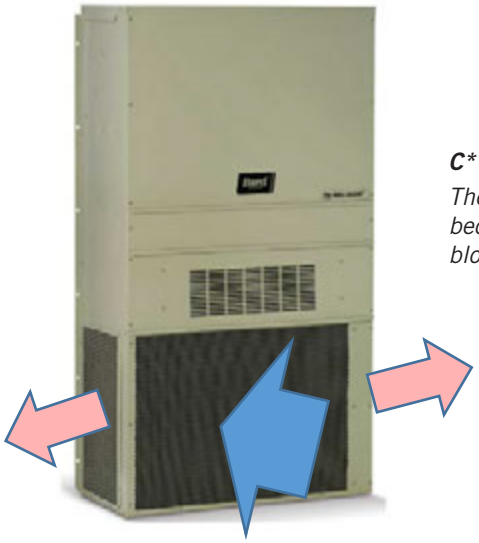
The product installation instructions contain additional information regarding unit coil cleaning. This information may be accessed at www.bardhvac.com.

All Products – Condenser Airflow



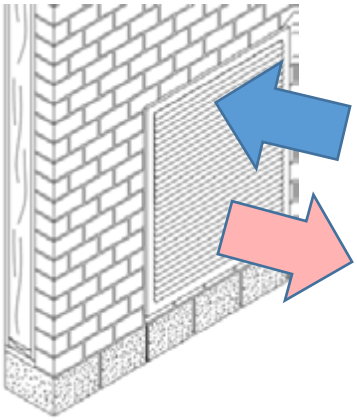
W**A, W**H, T**H, T**S, W*RV Wall Mount Units:

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.

SERVICE INSTRUCTIONS

FUSION-TEC® Wall-Mount Air Conditioner

Models:

WR35BPA WR36BPA WR58BPA
WR35BPB WR36BPB WR58BPB

NOTE: LC6000 controller is required for operation when WR**BP* units are used.

Bard® SINCE 1914
Climate Control Solutions

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

Manual: 2100-695G
Supersedes: 2100-695F
Date: 7-21-23

CONTENTS

Figures and Tables

GENERAL INFORMATION

Air Conditioning System

This Bard air conditioning system is composed of FUSION-TEC WR Series wall-mounted air conditioners matched with an LC6000 lead/lag controller. The wall mounts are specifically engineered for telecom/motor control center rooms.

NOTE: *The LC6000 lead/lag controller and FUSION-TEC WR Series wall-mount units are designed specifically to work together. The controller cannot run other brands of systems, nor can other controllers run the FUSION-TEC WR Series wall-mount units. They are a complete system, and must be used together.*

Wall-Mount Air Conditioner Units

The wall-mount units operate on VAC power. The units will supply 100% of rated cooling airflow in free cooling mode with ability to exhaust the same amount through the unit itself without any additional relief openings in the shelter.

Each of these units are fully charged with refrigerant and have optional auxiliary heat.

General

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

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

The unit is designed for use without duct work. Flanges are provided for transition from unit to wall grilles.

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 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.

Sizing of systems for proposed installation should be based on heat loss and heat gain calculations made according to methods of Air Conditioning Contractors of America (ACCA). The supply flange 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 cartons 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.

These units must remain in upright position at all times.

Additional Publications

These publications can help when installing the air conditioner. 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 Residential Winter and Summer Air Conditioning ..... ACCA Manual J

For more information, contact these publishers:

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

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

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

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

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.

⚠ WARNING

Fire hazard.

Maintain minimum 1/4" clearance between the supply flange and combustible materials.

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

⚠ CAUTION

Cut hazard.

Wear gloves to avoid contact with sharp edges.

Failure to do so could result in personal injury.

FIGURE 1
TEC-EYE (Bard P/N 8301-059) Display and Interface (Status 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

TEC-EYE Hand-Held Diagnostic Tool

The TEC-EYE service tool is used to communicate with the FUSION-TEC unit logic board. By connecting directly to the logic board inside the unit control panel, it is possible to perform diagnostics on the unit, adjust certain settings and verify unit and economizer operation through a self test procedure. **The TEC-EYE service tool is required for unit setup and operation.** The TEC-EYE is supplied with the LC6000 controller but can also be ordered separately (Bard P/N 8301-059).

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 controller is completely programmed at the factory; the default setpoints and their ranges are easily viewed and adjusted from the TEC-EYE display. The program and operating parameters are permanently stored on FLASH-MEMORY in case of power failure.

The TEC-EYE connects to the wall-mount unit control board via an RJ11 modular phone connector as shown in Figure 2.

When not being used, the TEC-EYE hand-held diagnostic tool should be stored inside or near the LC6000 controller. Do not let the TEC-EYE leave the shelter site.

FIGURE 2
TEC-EYE Connection to Unit Control

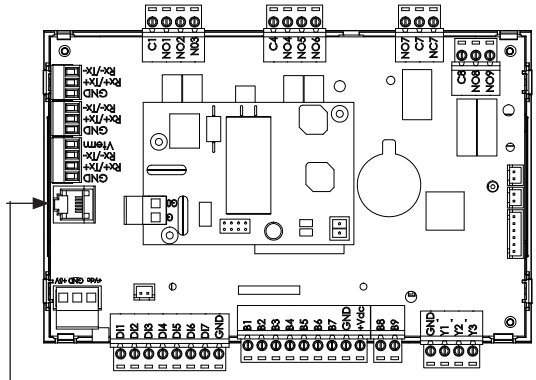


TABLE 1
LC6000/TEC-EYE Passwords (Defaults)

User	2000
Technician	1313
Engineer	9254
Use UP or DOWN keys and ENTER key to enter password	

TEC-EYE Screen Structure and Password Level

Quick Menu
- Setpoints (Orphan Mode Temperature Control)
- Information
- Alarm Log

Main Menu
- System Config: A1-A10 User (2000)
- Adv Sys Config: B1-B8 Technician (1313)
- I-O Config: C1-C15 Technician (1313)
- On/Off: User (2000)
- Alarm Logs: User (2000)
- Settings
  - Date/Time: Technician (1313)
  - Language: User (2000)
  - Import/Export
    - Unit Parameters: Engineer (9254)
    - Alarm Log Export: User (2000)
    - 7 Day Log Export: User (2000)
  - Initialization
    - Alarm Management: User (2000)
    - System Default: Engineer (9254)
  - Change Passwords
- Logout

In addition to the menu structure above, there are also Status and Alarm screens.

TEC-EYE Acronyms

MAT – Mixed air temperature (calculated value)
RAT – Return air temperature
SAT – Supply air temperature
OAT – Outdoor air temperature
OAH – Outdoor air humidity
ODP – Outdoor dew point (calculated value)
Blower – Indoor blower speed
Fan – Outdoor fan speed
Damper – Free cooling damper position
FC – Free cooling status
CL1 – Compressor stage 1 status
CL2 – Compressor stage 2 status
H1 – Heater stage 1 status
H2 – Heater stage 2 status
ST – Number of start requests in last hour

NOTE: *Digital refers to On/Off whereas analog is a variable input.*

Main Status Screen

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

The wall-mount unit address is displayed in the upper right corner on the main Main Status Screen (see Figure 1). The Main Status Screen also shows the current date, time, return air temperature (RAT), mixed air temperature (MAT), supply air temperature (SAT), outdoor air temperature (OAT), outdoor air humidity (OAH) and outdoor dew point (ODP) conditions. Blower speed, condenser fan speed, damper position and unit status are also displayed. See Table 2 for wall-mount unit status messages.

TABLE 2
Unit Status Messages

Message	Description
Waiting...	PLC is on and has not started running the application yet.
Orphan Mode	Unit is on and in orphan mode with no calls for heating or cooling.
LC Online	Unit is on and communicating with the LC6000 with no heating or cooling calls.
Cont. Blower	Unit is operating with continuous blower when no heating or cooling calls are present.
Power Loss	Unit has experienced a loss of main utility power. Alarm only available with inverter units.
Free Cooling	Unit is actively economizing.
Optimized Cool	Unit is mechanical cooling while actively economizing.
Cooling	Unit is actively mechanical cooling.
Heating	Unit is actively heating.
Passive Dehum	Humidity is above the passive setpoint; economizer disabled/ blower speed reduced. See Tables 5A, 5B and 5C on page 21 for dehumidification mode speed.
Active Dehum	Cycling dehumidification is active.
Self Test	Unit is performing a self test.
Off by Alarm	Unit has major fault preventing operation.
Off by DI	Unit is disabled by the local unit disable.
Off by LC	Unit has been turned off by the supervisory controller.
Off by Keyboard	Unit has been turned off by the local user.
Override Active	There is an active override on the system.
Emergency Vent	Unit is in Emergency Ventilation. LC6000 has an active hydrogen alarm.
Emergency Cool	Unit is in Emergency Cooling. Indoor temperatures have exceeded high temp alarms.
Emergency Off	Unit is in Emergency Off. LC6000 Emergency Off input indicates an alarm.

The Quick Menu is accessible from the Main Status Screen. Setpoints, Information and Alarm Log are available through the Quick Menu. Pressing the UP or DOWN keys while on the Main Status Screen will change the Quick Menu icon displayed (see Figure 3). Press the ENTER key when the desired icon is displayed.

FIGURE 3
Quick Menu Icons

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

Quick Menu

Setpoints

From this screen, the local unit heating and cooling setpoints, used for orphan mode operation only, can be changed.

Once the supervisory controller (LC6000) is connected, cooling and heating setpoints will be communicated and local cooling and heating setpoints will be replaced with the communicated cooling and heating setpoints.

If at any time the wall-mount unit(s) loses communication with the LC6000 controller, the wall-mount unit(s) will go into orphan mode and operate using the last communicated setpoints.

To verify or change the wall-mount unit cooling and heating setpoints in orphan mode:

1. Connect the TEC-EYE diagnostic tool to the control board located in the unit.
2. From the Status screen, press UP or DOWN key until Quick Menu displays Setpoints icon. Press ENTER key.
3. Press ENTER key to scroll to the selected choice (see Figure 4).

FIGURE 4
Cool and Heat Setpoints

4. Press UP or DOWN key on desired value until value displays correctly.
5. Press ENTER key to save and scroll to next parameter.
6. Press ESCAPE key until Main Menu screen is displayed.

Information

The information screens are used as a quick reference to show unit operational information such as staging, A/C circuit measurements, last 24 hour run times and software version.

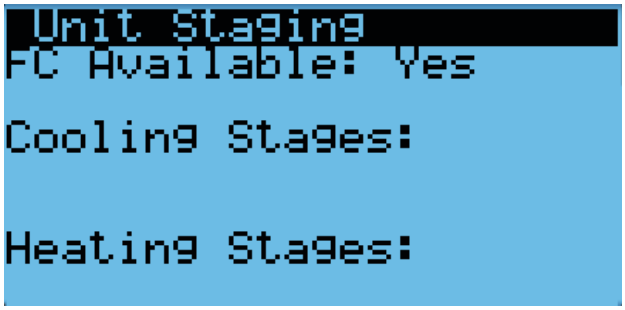
Staging Information

Staging information is used to show if free cooling is available or if any unit operation should be taking place. The look of the staging display depends on if the unit is communicating with a supervisory controller or operating in orphan mode.

Orphan Mode Staging

If the unit is operating in orphan mode, the title will display as **Unit Staging** (see Figure 5). This signifies that the local unit has control of the unit heating and cooling stages.

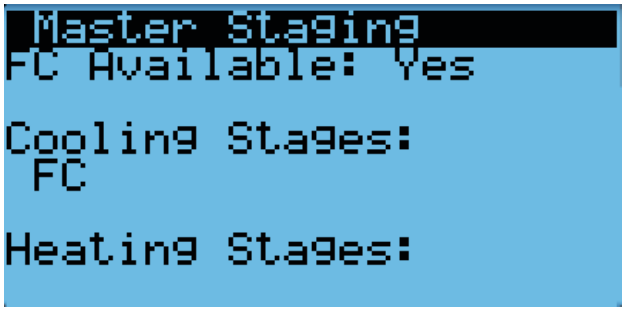
FIGURE 5
Orphan Mode Staging



Master Staging

If the unit is communicating with a supervisory controller, the title will display as **Master Staging** (see Figure 6). This signifies that the supervisory controller has control of the unit heating and cooling stages.

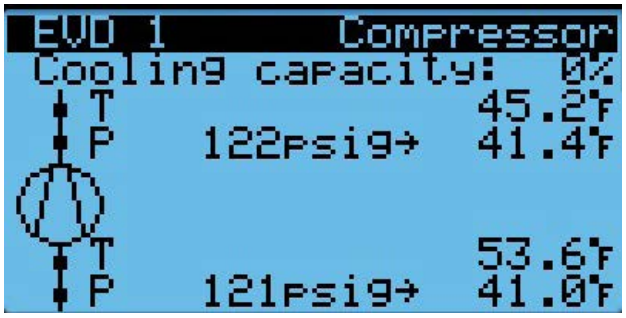
FIGURE 6
Master Staging

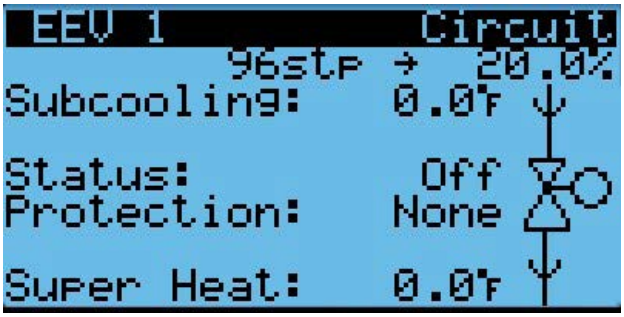


A/C Circuit Measurements

A/C Circuit Information can be found in two screens within the information menu (see Figure 7). The information and measurements provided are liquid line temperature, liquid line pressure, condensing saturated temperature, suction line temperature, suction line pressures, suction saturated temperature, super heat, sub-cooling and electronic expansion valve position.

FIGURE 7
A/C Circuit Measurements

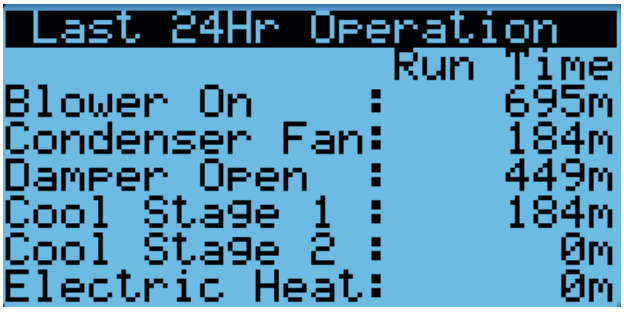




Last 24 Hour Operation

Last 24 Hour Operation information tracks the runtimes (**Time**) of different components or operations in the last 24 hour period (see Figure 8).

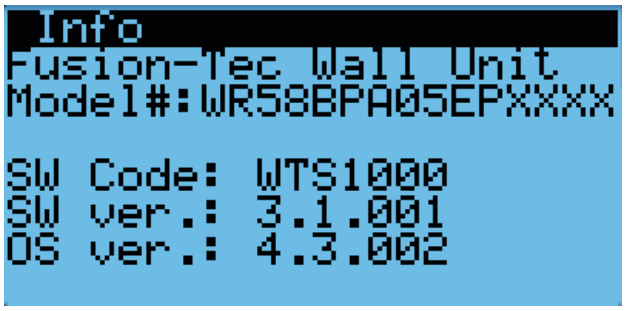
FIGURE 8
Last 24 Hour Operation



Software Version

The Software Version screen displays the model number of the unit as well as all software version information for the PLC (see Figure 9). This information can be used to determine whether a software update may be required based on information found in the software change log. This change log can be found at http://www.bardhvac.com/software-download/.

FIGURE 9
Software Version



Software Versioning Guide

WTS1000.x.y.z

Software Name: The name of the software is the base part number used to identify which product the software is used in.

TABLE 3
Software Versioning Guide

Product	Software Name
MULTI-TEC	MTS1000
FUSION-TEC (WR)	WTS1000
MEGA-TEC	MGS1000
LC6000	LCS6000

X: The letter X represents a major change to the software effecting product compatibility or function of the equipment.

Y: The letter Y represents a minor change to the software that either adds, removes, or alters a feature of the equipment without effecting compatibility with other products.

Z: The letter Z represents a change to the software that fixes existing features or user interface.

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/

Alarm Log

The alarm log screens show a log of each alarm. There will be a log for when alarm occurred and if the alarm auto clears, it will show when the alarm cleared.

Addressing Wall-Mount Units

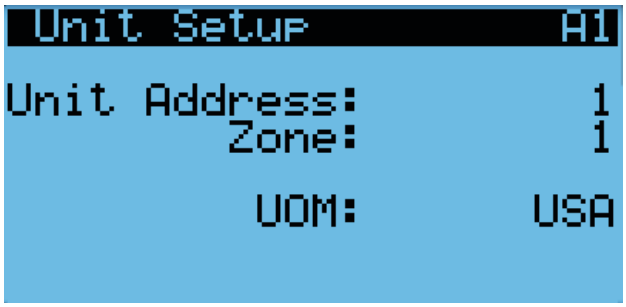
Each unit must have a unique address for the system to operate correctly with th LC controller (*Ex: 1, 2, 3, ...14 depending on the number of units*). The wall-mount unit address is displayed in the upper right corner on the Status screen on the TEC-EYE display (see Figure 1 on page 6).

To change the unit address:

1. Press MENU key to access 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 **Sys Config**; press ENTER key.
4. Press ENTER key to scroll to **Unit Address** (see Figure 10).
5. Press UP or DOWN keys to change the address to a value between 1 and 14.
7. Press ENTER key to save.

See page 13 for information on changing unit zone.

FIGURE 10
Changing Unit Address



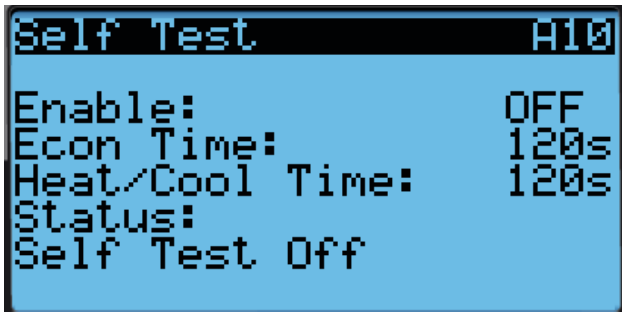
Executing a Self Test

This unit has the ability to perform a self test that will operate all available unit functions in order to quickly determine unit operation. 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 A10** screen.
5. Press ENTER key to scroll to **Enable** parameter (see Figure 11).
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 11
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 12).
7. Press UP or DOWN key to change value to **YES**; press ENTER key.
8. System will restart with default values.

FIGURE 12
Restoring Factory Default Settings

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 TEC-EYE. 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:

- System Off (set from LC6000)
- Emergency Off (set from LC6000)
- Unit Disable Input
- Invalid Model Number Size
- Return Air Sensor Failure Alarm in Orphan Mode
- Damper Failed to Close Alarm
- No Airflow Alarm
- Power Loss Input Active on Non-Inverter Model Number

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 13) and press and hold the ALARM key for 3 seconds.

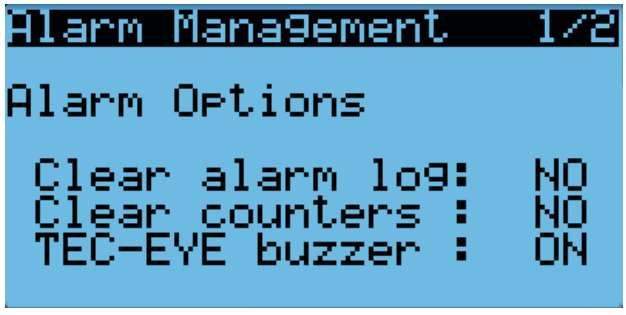
FIGURE 13
Clearing All Alarms

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 14).
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 14
Clearing Alarm Logs and Counters



Exporting Alarm Logs

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

Exporting 7 Day Logs

See latest version of Supplemental Instructions manual 7960-826 for information on exporting 7 day I/O logs.

Orphan Mode

FUSION-TEC WR Series wall-mount units have the capability to run without the LC6000 controller attached—this feature is called orphan mode. This keeps the shelter between 60°F and 77°F (factory default settings) by the use of the factory-installed return air sensor in each wall-mount unit. In orphan mode, no auxiliary temperature measurement devices are required for operation. The wall-mount unit automatically uses a continuous blower setting to circulate room air into the return air inlet and uses the return air temperature sensor to control room temperature.

To change default setpoints, refer to ***Setpoints*** on page 8.

During installation, the ability to run in orphan mode allows deactivation of one of the existing, older wall-mount units, while keeping the shelter cool with the other unit still operating. Once the first of the Bard wall-mount units is installed and powered on, it will operate in orphan mode—keeping the climate inside the shelter stable and the installers comfortable while the remainder of the older equipment is removed and the remaining Bard wall-mount units and LC6000 controller are installed.

Additionally, should any or all of the FUSION-TEC WR Series wall-mount units lose communication with the LC6000 controller (such as during maintenance), they will continue to serve the shelter's needs until a repair can be made.

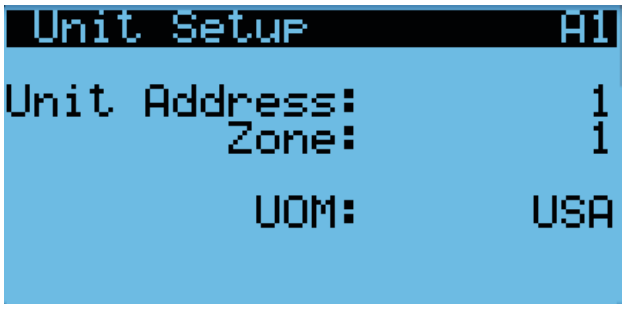
Zone

When paired with a supervisory controller that uses zones to control groups of wall units, this unit uses the zone setting to relay to the supervisory controller what zone it is set to operate in.

To change the zone:

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 **Unit Setup A1** screen.
5. Press ENTER key to scroll to **Zone (**see Figure 15).
6. Press UP or DOWN keys to change to the desired value.
7. Press ENTER key to save value.

FIGURE 15
Changing Zone



Temperature/Humidity Control

Temperature/Humidity Control Components

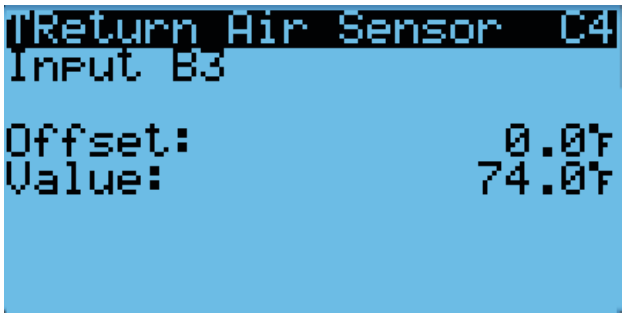
Return Air Temperature Sensor

The unit is equipped with a return air temperature sensor to monitor the space temperature when the unit is in orphan mode. The return air sensor is located in the upper part of the return opening in such a way that it is exposed to the entering airstream. An alarm signal will be sent to the LC controller if the return air temperature sensor is disconnected. The temperature is measured with a 10k ohm NTC thermistor.

This sensor 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 **Return Air Sensor C4**.
5. Verify the measurement displayed on screen is accurate (see Figure 16).

FIGURE 16
Adjusting Return Air Sensor



6. If the measurement needs to be adjusted, apply an offset value by pressing ENTER to scroll to **Offset**.
7. Press UP or DOWN keys to adjust the offset.

8. The update will not take effect until the cursor is moved out of the **Offset** parameter.
9. Once adjusted, press the ESCAPE key several times to return to Main Menu screen.

Return Air Temperature Alarm

When the return air 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 is fixed and cannot be adjusted.

Temperature/Humidity Control Operation

When the unit is connected to the LC controller, it will receive all of its heating, cooling and ventilation commands from the controller. When the unit is in orphan mode, it will heat, cool and ventilate based on the return air temperature measurement. The return air temperature will be compared to the cooling setpoint. Based on differentials above and below the setpoint, the available cooling and heating stages will be utilized.

To change or view the unit setpoint:

1. From the Status screen, press UP or DOWN key until Quick Menu displays Setpoints icon ( ). Press ENTER key.
2. Press ENTER key to scroll to **Cool Setpoint** or **Heat Setpoint** (see Figure 4 on page 8).
3. Press UP or DOWN keys to change the value to desired heating and/or cooling setpoint.

Cooling Sequence – Economizer Available

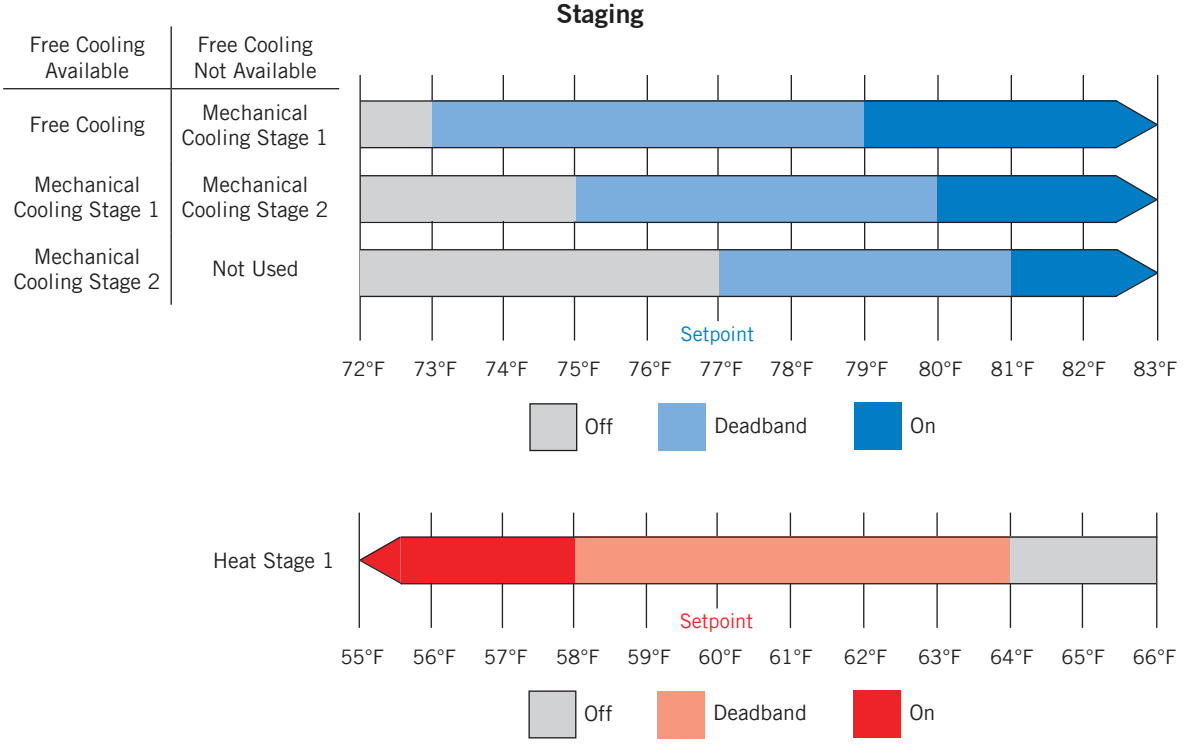
NOTE: *This description is based on the example shown in Figure 17 and Figure 20 (page 16).*

If the return air temperature is higher than 79°F (Setpoint of 77°F + Stage 1 On Differential of 2°F) and outdoor conditions are acceptable for economizing, the unit will enable economizer operation (free cooling). If the return air temperature is higher than 80°F (Setpoint of 77°F + Stage 2 On Differential of 3°F), the unit will enable mechanical cooling stage 1. If the return air temperature is higher than 81°F (Setpoint of 77°F + Stage 3 On Differential of 4°F), the unit will enable mechanical cooling stage 2. Each stage will then be disabled when the return air temperature reaches the setpoint plus the stage off differential.

Economizer Operation in Orphan Mode

In orphan mode,there is a chance that the economizer will not be given ample time to operate before the heat load requires more cooling. In this case, there is a delay that can be enabled in order to allow for the most amount of free cooling to be utilized before the compressor is staged on.

FIGURE 17
Staging



NOTE: *Deadband refers to a region where one end limit will turn the heating or cooling function **on** and the opposite end limit will turn the heating or cooling function **off**.*

To enable this delay:

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 **Adv Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **FC Comp. Delay B7**.
5. Press ENTER key to scroll to **Enable** (see Figure 18).
6. Press UP or DOWN key to change the value.
7. Press ENTER key to save value and move cursor to **Delay**.
8. Press UP or DOWN keys to change the time value.
9. Press ENTER key to save value and move cursor to top of the screen.
10. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 18
Enabling Free Cooling Delay

Cooling Sequence – Economizer Not Available

NOTE: *This description is based on the example shown in Figure 17 and Figure 20 (page 16).*

If the return air temperature is higher than 79°F (Setpoint of 77°F + Stage 1 On Differential of 2°F), the unit will enable mechanical cooling stage 1. If the return air temperature is higher than 80°F (Setpoint of 77°F + Stage 2 On Differential of 3°F), the unit will enable mechanical cooling stage 2. Each stage will then be disabled when the return air temperature reaches the setpoint plus the stage off differential.

Heating Sequence

NOTE: *This description is based on the example shown in Figure 17 and Figure 20 (page 16).*

If the return air temperature is below 58°F (Setpoint of 60°F + Stage 1 On Differential of -2°F), the unit will enable electric heat stage 1. If the return air temperature is below 57°F (Setpoint of 60°F + Stage 2 On Differential), the unit will enable electric heat stage 2 (if available). Each stage will then be disabled when the return air temperature reaches the setpoint plus the stage off differential.

Staging

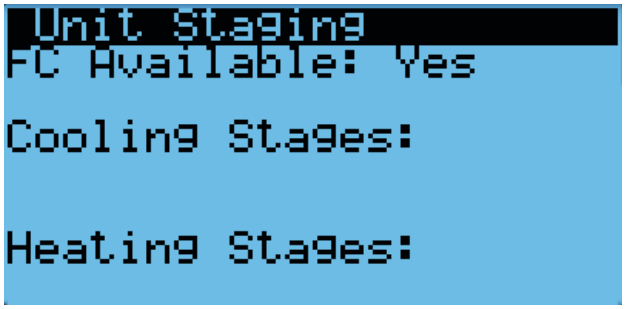
The unit will stage the cooling components based on the cooling demand referenced in the temperature control. The unit will stage the economizer on first if the indoor and outdoor conditions are favorable. The compressor stage 1 will be enabled next as the demand increases. Finally, the compressor stage 2 will be enabled as the demand continues to increase.

The unit is only equipped with one stage of heat and will turn on based on the heating demand.

To view unit stages:

1. From the Status screen, press UP or DOWN key until Quick Menu displays Unit Information icon ( ). Press ENTER key.
2. The cooling and heating demand are visible on this screen. The unit stages will display here when active as FC, CL1, CL2 or H1 (see Figure 19).

FIGURE 19
Viewing Unit Stages



Adjusting Cooling Staging

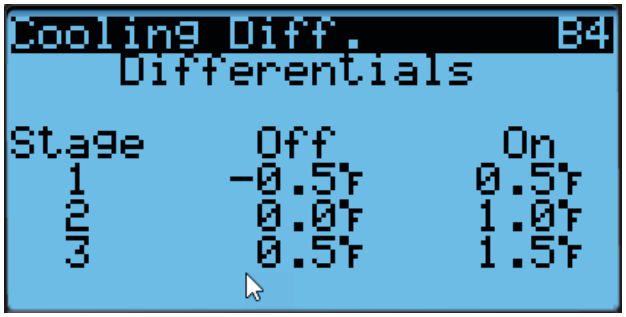
This unit uses staging differentials to control cooling operation. The on differential for a stage references the number of degrees above the setpoint at which the stage turns on. The off differential for a stage references the number of degrees below the setpoint at which the stage turns off.

To adjust cooling stage differentials:

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 **Adv Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Cooling Diff. B4**.
5. Press ENTER key to scroll to **Stage 1 On** (see Figure 20 on page 16).
6. Press UP or DOWN keys to adjust number of degrees above setpoint to turn cooling operation on.

7. Press ENTER key to save value and move cursor to **Stage 1 Off**.
8. Press UP or DOWN keys to adjust number of degrees below setpoint to turn cooling operation off.
9. Press ENTER key to save value and move cursor to next stage differential.
10. Repeat steps 6 through 9 for **Stage 2** and **Stage 3** differentials.
11. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 20
Adjusting Cooling Stage Differentials



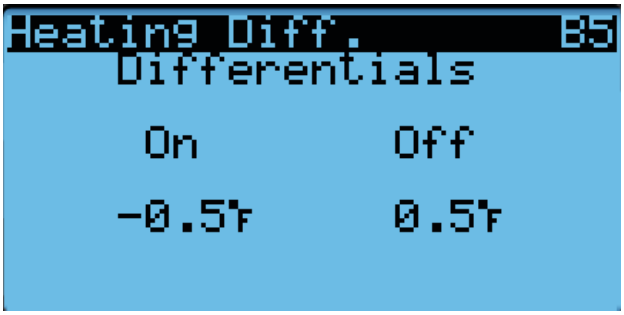
Adjusting Heating Staging

This unit uses staging differentials to control heating operation. The on differential for a stage references the number of degrees below the setpoint at which the stage turns on. The off differential for a stage references the number of degrees above the setpoint at which the stage turns off.

To adjust heating stage differentials:

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 **Adv Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Heating Diff. B5**.
5. Press ENTER key to scroll to **On** (see Figure 21).
6. Press UP or DOWN keys to adjust number of degrees below setpoint to turn heating operation on.
7. Press ENTER key to save value and move cursor to **Off**.
8. Press UP or DOWN keys to adjust number of degrees above setpoint to turn heating operation off.
9. Press ENTER key to save value and move cursor to next stage differential.
10. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 21
Adjusting Heating Stage Differentials



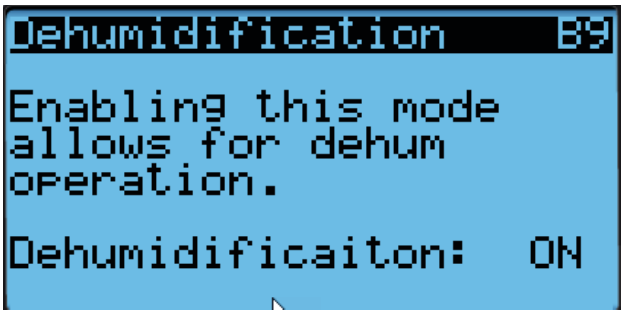
Dehumidification

The unit uses a dehumidification sequence (cycling dehumidification) that does not require the electric heat to run at the same time as the compressor. Instead, the unit will turn on the compressor to cool down to the heating setpoint. Once the lower setpoint has been reached, the unit will heat the space back up to the upper setpoint. This cycle continues until the humidity level in the shelter reaches an acceptable level. At this point, the unit will revert back to normal operation. The economizer will also be disabled while the unit is in the dehumidification mode.

To turn dehumidification 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 TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **Adv Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Dehumidification B9**.
5. Press UP or DOWN keys to turn dehumidification on or off (see FIgure 22).
6. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 22
Turning Dehumidification On or Off



Dehumidification Modes

Dehumidification Off

When the humidity level inside a zone falls to the Dehumidification Off setpoint, the system will stop attempting to dehumidify the space. The default setpoint value for this mode is 60% RH.

Passive Dehumidification

When the humidity level rises to the Passive Dehumidification setpoint, the controller will activate staged dehumidification at the available wall units. As the humidity level rises to the passive dehumidification setpoint, the free cooling function (economizer) is disabled. When there is a call for cooling, the compressor will energize and the blower speed will be reduced to the unit dehumidification mode or Balanced Climate speed whichever is applicable to the unit. All units allowed to run within the zone will be given the dehumidification command and will operate as such on a call for cooling. The default setpoint value for passive dehumidification is 70% RH.

Active Dehumidification

When the humidity level rises to the Active Dehumidification setpoint, the supervisory controller will active staged dehumidification at the available wall units. The supervisory controller will then calculate the dehumidification demand based on how far above the setpoint and how long the RH level has been above the setpoint. The controller will then utilize all of the units with active dehumidification capabilities to reduce the indoor humidity level. The units will be staged on based on the existing cooling rotation for the units in the zone up to the maximum number of units allowed to run. When in demand minimum compressor run time is applicable, examples of demand are as follows:

With two units with dehumidification capabilities, Unit 1 in rotation will come on at 50% demand and Unit 2 in rotation will come on at 100% demand. They will rotate off in a reverse; Unit 2 will be off at 50% demand and Unit 1 will be off at the dehumidification off setpoint.

With three units with dehumidification capabilities, Unit 1 in rotation will come on at 33% demand, Unit 2 in rotation will come on at 67% demand and Unit 3 in rotation will come on at 100% demand. They will rotate off in reverse; Unit 3 will be off at 67% demand, Unit 2 will be off at 33% demand and Unit 1 will be off at dehumidification off setpoint.

An active dehumidification sequence will run until the space temperature falls to the heating setpoint or increases to the cooling setpoint, or the dehumidification off setpoint is reached. Refer to the specific unit manual for active dehumidification sequence and space temperature control.

The passive dehumidification setpoint must be lower than the active dehumidification setpoint to ensure the economizer is disabled during active dehumidification.

Availability for active dehumidification will be determined by model number. Units with electric reheat, mechanical dehumidification or cycling reheat will be considered. The active dehumidification default setpoint is 80% RH.

Cycling Dehumidification Operation

On a call for active dehumidification from the supervisory control, the wall unit will enter cycling dehumidification mode and economizer free cooling operation will be discontinued during cycling reheat. If at any time the unit receives a heat or cooling call while in cycling dehumidification mode, the unit will exit cycling dehumidification until the heating or cooling call is satisfied.

During cycling dehumidification, the return air sensor is used to determine operation of the cycling dehumidification. When the unit enters cycling dehumidification mode and the return temperature is above 55°F, the unit compressor will come on with a reduced blower speed. The blower speeds are referenced in tables 5A, 5B, and 5C on page 21 as Dehumidification Mode; these speeds are unit specific. The unit will continue to operate in this fashion until the return air temperature falls to 55°F at which time the compressor will be deactivated. After a 5-10 second delay, the electric heat will energize and the blower will go to rated speed for electric heat. The unit will continue to utilize electric heat until the return air temp rises to 2°F below the cooling setpoint and then return to compressor operation with the blower at dehumidification mode speed. If the unit enters cycling dehumidification mode and the return air is below 55°F, the unit will begin the sequence with the heating mode as described.

A call for cycling dehumidification is ignored if there is a call for emergency vent, emergency cool or emergency off.

NOTE: *This feature is dependent upon the LC6000 indoor humidity sensors and a command from the LC to enter dehumidification mode. See the latest revision of LC6000 Service Instructions 2100-669 for adjustment of the dehumidification setpoint and differentials.*

Electronic Expansion Valve (EEV)

EEV Components

Electronic Expansion Valve

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

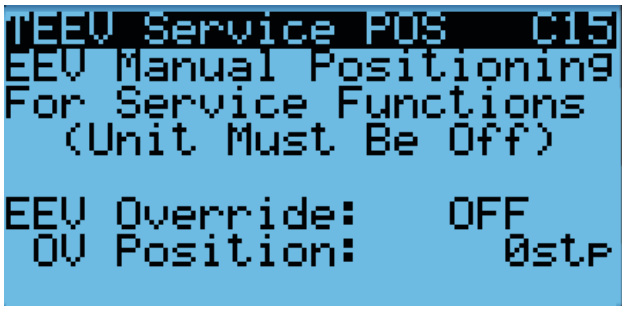
may need to be manually positioned for service or troubleshooting. The valve can be positioned by using a menu override.

To manually override the valve:

NOTE: *The unit must be off to perform this override.*

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 **EEV Service C15**.
5. Press ENTER key to scroll to **Enable** (see Figure 23)**.**
6. Press UP or DOWN key to change **Disable** to **Enable**.
7. Press ENTER key to scroll to **Position**.
8. Press UP or DOWN keys to adjust to the desired value.
9. Press ENTER key to save.

FIGURE 23
Overriding EEV Output

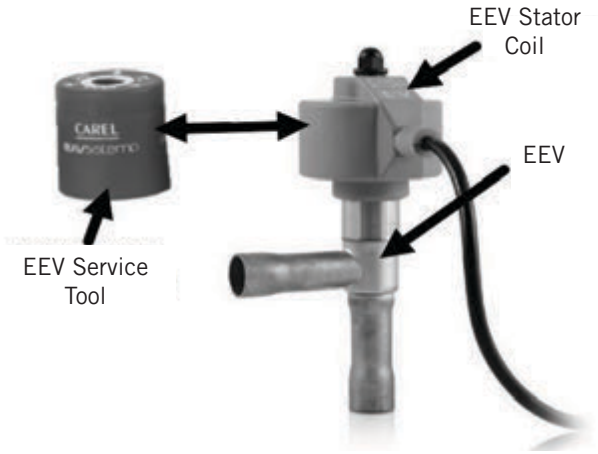


The valve can also be opened or closed using the EEV service tool (Bard Part # 2151-021). This magnetic EEV service tool (shown in Figure 24) is used to manually open the EEV. To do this, remove the EEV stator coil (red color with retaining nut on top), slide the magnetic tool over the shaft where the 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.

With the stator removed, the resistance should be 40 ohms +/- 10%. There are two sets of three wires that will have this resistance.

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.

FIGURE 24
Electronic Expansion Valve (EEV) and Service Tool



System Pressures

To view system pressure and temperatures during this process:

1. From the Status screen, press UP or DOWN key until Quick Menu displays Information icon ( ). Press ENTER key.
2. Press UP or DOWN keys to scroll to **EEV 1 Circuit** and **EVD 1 Compressor** screens (see Figure 7 on page 9).
3. Reference the **Pressures** and **Temperatures** on **EVD 1 Compressor** and the **Superheat** and **Subcooling** on **EEV 1 Circuit**.

Suction Pressure Transducer

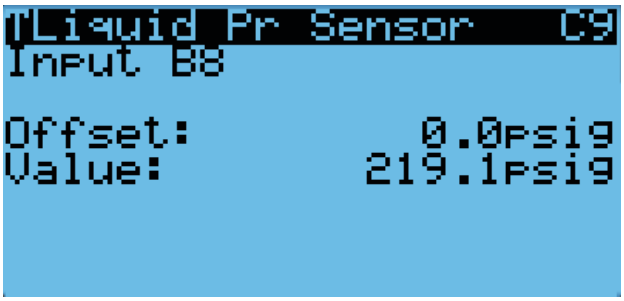
The unit has a pressure transducer installed on the suction line between the evaporator coil and compressor. The transducer is used for system monitoring of suction system pressures. The sensor is used with the suction temperature sensor to provide a real time superheat calculation that determines the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

This sensor 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 **Liquid Pr Sensor C9**.
5. Verify the measurement displayed on screen is accurate (see Figure 25).
6. If the measurement needs to be adjusted, apply an offset value by pressing ENTER to scroll to **Offset**.
7. Press UP or DOWN keys to adjust the offset.
8. The update will not take effect until the cursor is moved out of the **Offset** parameter.

9. Once adjusted, press the ESCAPE key several times to return to Main Menu screen.

FIGURE 25
Adjusting Suction Pressure Transducer Values



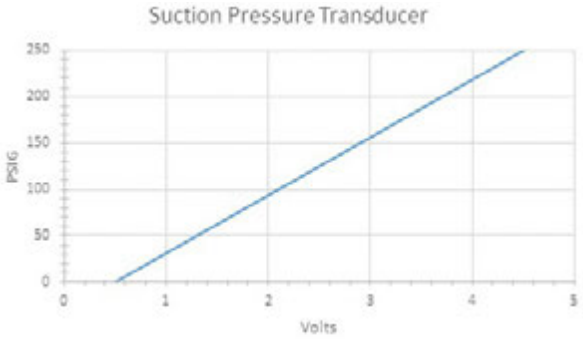
Troubleshooting the Suction Pressure Transducer

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

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

Formula for Tech:
Measured Pressure x .016 + Sensor Offset = Expected Transducer Signal Voltage (see Figure 26).

FIGURE 26
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.

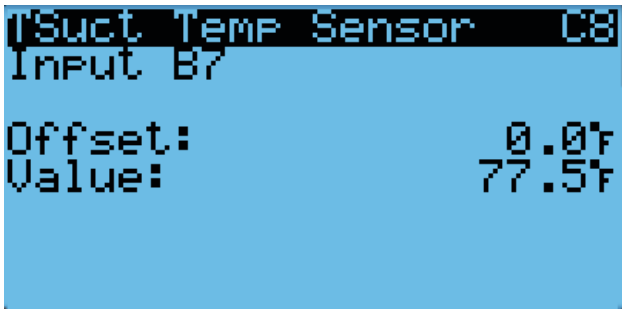
Suction Temperature Sensor

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.

The suction temperature sensor measurement 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 **Suct Temp Sensor C8**.
5. Verify the measurement displayed on screen is accurate (see Figure 27).
6. If the measurement needs to be adjusted, apply an offset value by pressing ENTER to scroll to **Offset**.
7. Press UP or DOWN keys to adjust the offset.
8. The update will not take effect until the cursor is moved out of the **Offset** parameter.

FIGURE 27
Adjusting Suction Temperature Sensor Values



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.

Evaporator Freeze Condition Alarm

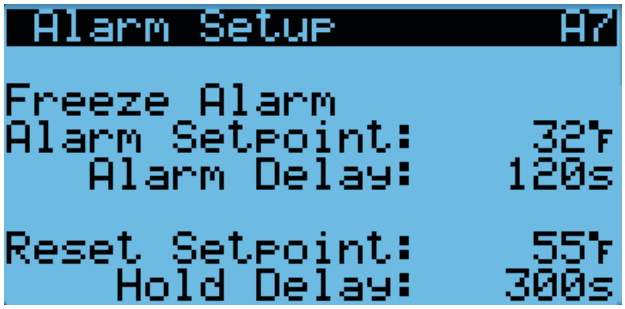
The freeze alarm (evaporator coil freeze protection) uses the suction temperature sensor to alarm and manage operation when conditions are favorable for an evaporator coil freeze condition. Whenever the compressor is running, the system will constantly monitor the suction line temperature. If the suction line temperature falls below the freeze setpoint (32°F factory default) for a period of time exceeding freeze alarm delay time (120 seconds factory default), the system will alarm a freeze condition. Once a freeze condition is triggered, the system will stop the compressor operation and increase the blower speed to 80% in order to rapidly warm and thaw the evaporator coil. After the coil has reached a temperature above the freeze alarm reset temperature setpoint (55°F factory default) for a period of time exceeding the freeze alarm reset hold time (5 minutes factory default), normal operation will continue.

To adjust the freeze setpoint and/or alarm delay time:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A7**.
5. Press ENTER key to scroll to **Alarm Setpoint** (see Figure 28).
6. Press UP or DOWN keys to change to the desired value.
7. Press ENTER key to save the value and move cursor to **Alarm Delay**.
8. Press UP or DOWN keys to change to the desired **Alarm Delay** value.
9. Press ENTER key to save the value.

FIGURE 28
Adjusting Freeze Setpoint and Alarm Delay



EEV Operation

EEV Superheat Control

The electronic expansion valve (EEV) will modulate to maintain a specific superheat (see Table 4) while the compressor is running. When the compressor is not running, the valve will open to 40% to allow system equalization.

TABLE 4
Unit Specific Superheat Settings

Unit Size	Target Superheat
WR35	11°F
WR36	11°F
WR58	12°F

There are two forms of low superheat protection on the FUSION-TEC WR Series units. One form will be active once the superheat value is at or below 5°F. At this point, the control will aggressively close the valve to prevent flood back. The second form occurs at low ambient temperatures. This control will slightly raise the superheat setpoint based on outdoor temperature to prevent system instability.

Additional EEV Alarm

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.

Indoor Airflow

Indoor Airflow Components

Blower

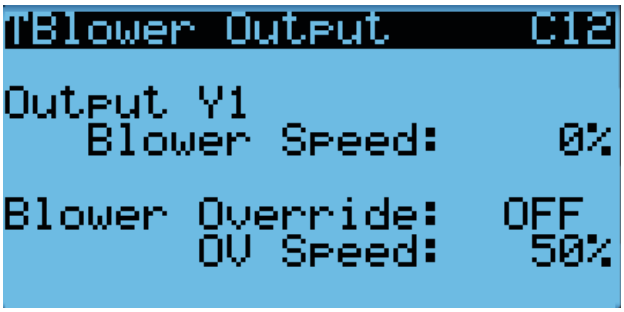
The unit is equipped with a blower that is driven by an electronically commutated motor (ECM). This blower is controlled by a 0-10v signal provided from the controller. This 0-10v signal is converted to a PWM signal with an adapter. The blowers on both the WR36BP* and WR58BP* models use a 10" diameter wheel. The WR36BP* operates between 250-850 rpm while the WR58BP* operates between 250-1400 rpm.

The blower output can be put into an override mode for verification or troubleshooting. The override will last for 5 minutes or until the **Blower Override** parameter is set to **OFF** again.

To put the blower into override:

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 **Blower Output C12**.
5. Press ENTER key to scroll to **Blower Override** (see Figure 29).

FIGURE 29
Putting Blower Output into Override Mode



6. Press UP or DOWN key to change **OFF** to **ON**.
7. Press ENTER key to scroll to **OV Speed**.
8. Press UP or DOWN keys to adjust the speed to the desired output. See Table 5A, 5B or 5C.
9. Press ENTER key to save.

NOTE: *If unit is operating at the time the blower override is being enabled, adjustments must be made to* **OV Speed** *first before switching* **Blower Override** *on.*

TABLE 5A
WR35BP* Blower Speeds

Mode	Speed Percentage	Controller Output Volts	CFM[1]
High Sensible Full Load Cooling	80.0	8.0 v	1400
High Sensible Part Load Cooling	48.0	4.8 v	1040
Standard Full Load Cooling	55.0	5.5 v	1120
Standard Part Load Cooling	36.0	3.6 v	900
Economizer Standard Economizer High S/T	80.0 100.0	8.0 v 10.0 v	1200 1620
Heating	41.0	4.1 v	900
Dehumidification Mode	20.0	2.0 v	500

[1] CFM at 0.0 static pressure

TABLE 5B
WR36BP* Blower Speeds

Mode	Speed Percentage	Controller Output Volts	CFM[1]
High Sensible Full Load Cooling	94.0	9.4 v	1500
High Sensible Part Load Cooling	65.0	6.5 v	1100
Standard Full Load Cooling	77.0	7.7 v	1200
Standard Part Load Cooling	54.0	5.4 v	950
Economizer Standard Economizer High S/T	90.0 63.0	9.0 v 6.3 v	1450 1200
Heating	63.0	6.3 v	1200
Dehumidification Mode	19.0	1.9 v	470

[1] CFM at 0.0 static pressure

TABLE 5C
WR58BP* Blower Speeds

Mode	Speed Percentage	Controller Output Volts	CFM[1]
High Sensible Full Load Cooling	75.0	7.5 v	2180
High Sensible Part Load Cooling	50.0	5.0 v	1705
Standard Full Load Cooling	55.0	5.5 v	1830
Standard Part Load Cooling	35.0	3.5 v	1335
Economizer Standard Economizer High S/T	45.0 75.0	4.5 v 7.5 v	1600 1950
Heating	35.0	3.5 v	1335
Dehumidification Mode	35.0	3.5 v	1335

[1] CFM at 0.0 static pressure

TABLE 6
Rated Airflow

	Nominal Rated CFM[1]		Nominal Rated ESP
	High	Low	
WR35BP*	1100	900	0.00
WR36BP*	1200	950	0.00
WR58BP*	1800	1400	0.10

[1] CFM at 0.0 static pressure

TABLE 7
Indoor Blower Performance

	Speed	High		Low	
	ESP (Inch H_2O)	Dry Coil	Wet Coil	Dry Coil	Wet Coil
WR35BP*	0.00	1150	1100	940	900
WR36BP*	0.00	1260	1200	995	950
WR58BP*	0.10	1885	1800	1470	1400

TABLE 8
Maximum ESP of Operation
Electric Heat Only

Model	Static Pressure*
-A0Z -A05	.00" .00"
-B0Z -B06	.00" .00"

* Unit is rated for free blow non-ducted operation with SGR-5W Supply Grille and RGR-5W Return Grille.

Blower Status Switch

The unit is equipped with a differential pressure airflow switch to monitor the blower (see Figure 32). If the blower is turned on and the switch doesn't close to indicate there is differential pressure between the inlet and outlet of the blower, an alarm will be generated. For switch settings, see Figure 30.

Differential airflow status can be viewed 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 **Digital In Config C1**.
5. Reference **7 NoAir** row and **Val** column (see Figure 31).

FIGURE 30
Dirty Filter Switch and Blower Status Switch

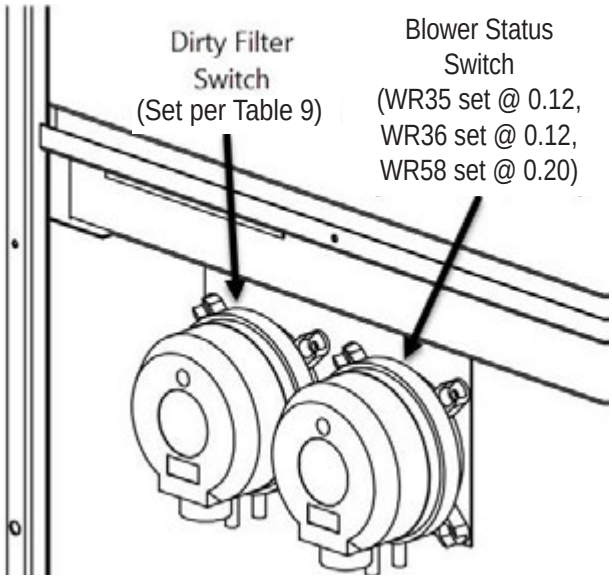
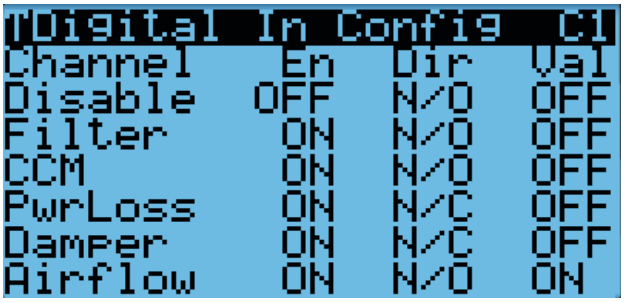


FIGURE 31
Verifying Differential Airflow Status



Blower Status Alarm

If the blower is commanded on and the fan status switch (differential pressure) has not indicated the fan is running within 45 seconds, the system will generate an alarm.

Disabling the blower status switch in **I/O Config** disables this alarm.

This alarm is just a notification and will clear itself when the conditions are no longer present.

To adjust the air flow alarm delay:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A8**.
5. Press ENTER key to scroll to **Air Flow Alarm Del** (see Figure 32).
6. Press UP or DOWN keys to change to the desired value.
7. Press ENTER key to save the value.

FIGURE 32
Adjusting Air Flow Alarm Delay

Filters

The unit is equipped with two (2) 20" x 30" x 2" MERV 8 filters. The filters slide into position making them easy to service. The filters can be serviced from the outside by removing either the right or left filter access panel.

Dirty Filter Switch

These units are equipped with a differential pressure switch to indicate when the filter(s) needs to be replaced (see Figure 30). The dirty filter switch measures the pressure difference across the filter through silicone tubing routed to the blower and vent areas of the unit.

The switch circuit consists of a *normally open* filter pressure switch. The switch will open when the pressure differential goes above the setting indicated on the dial. When the pressure difference returns below the setting on the dial, the switch will close.

Adjustment of dirty filter switch may be necessary to ensure proper operation. See Table 9 and Figure 34 on page 24 to aid in setting the filter switch to operate at different percentages of filter blockage.

Dirty Filter Alarm

The wall-mount unit is equipped with a differential pressure switch input to the controller (see Figure 32). When the switch indicates a dirty filter, the controller will generate an alarm. Once the condition is no longer present, the alarm will automatically clear. Additionally, an indicator light will be turned on with the alarm and turned off when the alarm clears (see Figure 34 on page 24).

Disabling the dirty filter switch in **I/O Config** disables this alarm.

The threshold of this alarm is adjusted by changing the settings on the switch (see Table 9).

Filter Indicator Light

These units are equipped with a 24v indicator light mounted on side of unit that displays the current status of the filter (see Figure 36 on page 24). When the light is on, the filter needs to be replaced. Once the filter(s) has been changed, the indicator light will turn off.

Indoor Airflow Operation

High Sensible Mode

High sensible mode allows for higher airflow through the indoor air section. In this mode, air circulation is increased through the cooled space, but less moisture is removed from the air circulating through the unit.

NOTE: *High sensible enable on the wall-mount unit will only toggle high sensible mode during orphan mode operation. When connected to the LC6000 controller, the high sensible mode will be overridden by the controller operation.*

To change these settings:

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 **Adv System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Blower CFM Mode B6**.
5. Press ENTER key to scroll to **High Sensible** (see Figure 33).

FIGURE 33
Enabling High Sensible Mode

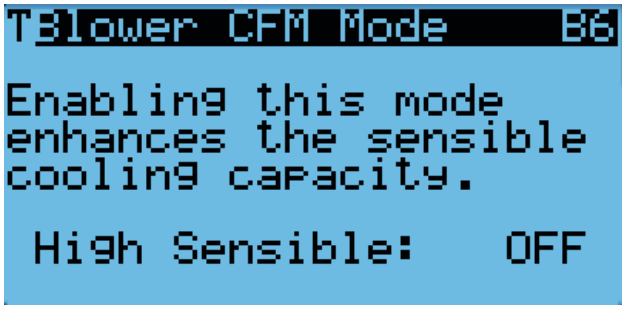


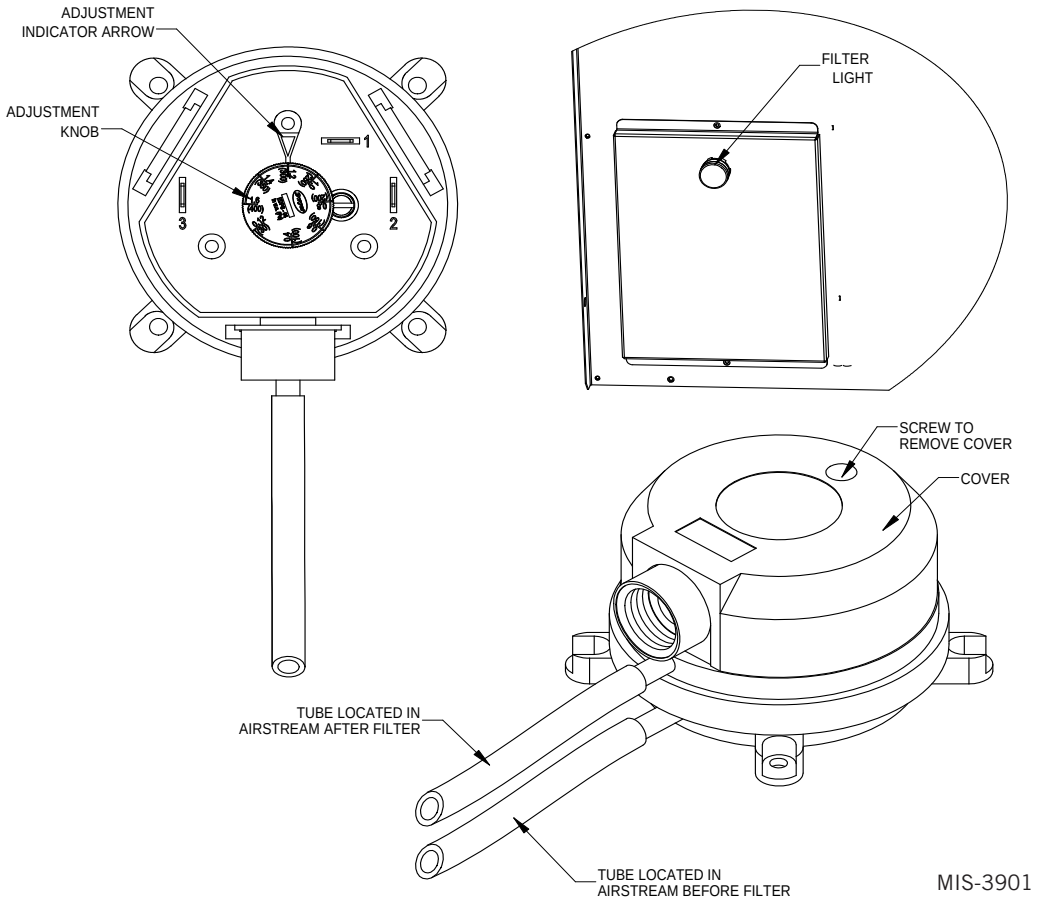
TABLE 9
Filter Switch Pressure Settings

Unit	Filter Blockage %	0%	10%	20%	30%	40%	50%	60%	70%
WR35BP* (Default) High S/T	Switch Static Setting	0.65	0.70	0.75	0.85	0.95	1.05	1.25	1.50
	Evaporator Airflow %	100%	99.0%	97.0%	96.4%	95.5%	92.7%	88.1%	80.6%
WR35BP* Standard	Switch Static Setting	0.40	0.43	0.45	0.50	0.55	0.65	0.75	0.90
	Evaporator Airflow %	100%	99.7%	98.7%	96.8%	96.0%	94.4%	91.6%	85.2%
WR36BP* (Default) High S/T	Switch Static Setting	0.12	0.12	0.12	0.20	0.20	0.35	0.35	0.40
	Evaporator Airflow %	100%	99.3%	99.4%	98.7%	96.5%	92.1%	91.3%	87.9%
WR36BP* Standard Airflow	Switch Static Setting	0.12	0.12	0.12	0.12	0.20	0.20	0.20	0.30
	Evaporator Airflow %	100%	99.3%	99.4%	98.8%	97.3%	91.5%	89.8%	88.3%
WR58BP* (Default) High S/T	Switch Static Setting	0.40	0.50	0.60	0.70	0.75	0.80	0.90	1.00
	Evaporator Airflow %	100%	98.7%	98.1%	97.5%	91.7%	81.3%	79.1%	78.6%
WR58BP* Standard Airflow	Switch Static Setting	0.30	0.35	0.40	0.45	0.50	0.65	0.70	0.90
	Evaporator Airflow %	100%	99.8%	99%	98.5%	96.8%	89.9%	84%	82.2%

All units tested equipped with MERV 8 filters. Appropriate supply (SG) and return (RG) grilles installed during testing. Pressure switch adjustment may be necessary due to variations in filter type, installation and room pressure.

Bard recommends filter switch be set at 50% filter blockage or less. Higher settings may significantly hinder unit performance.

FIGURE 34
Dirty Filter Switch and Filter Indicator Light



6. Press UP or DOWN keys to change **ON** or **OFF** value.
7. Press ENTER key to save.

Blower Speed Control

The blower is capable of changing speeds to best match the requirements of the system depending on which mode the system is in (see Table 5A, 5B or 5C on page 21).

The unit will automatically switch to the required speed for each mode. High sensible mode and dehumidification mode are both communicated separately from the LC. For more information on the high sensible command from LC, please see LC6000 Service Instructions 2100-669.

Additional Indoor Airflow Alarms

Supply Air Temperature Alarm

When the supply air 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 is fixed and cannot be adjusted.

Condenser Fan

Condenser Fan Components

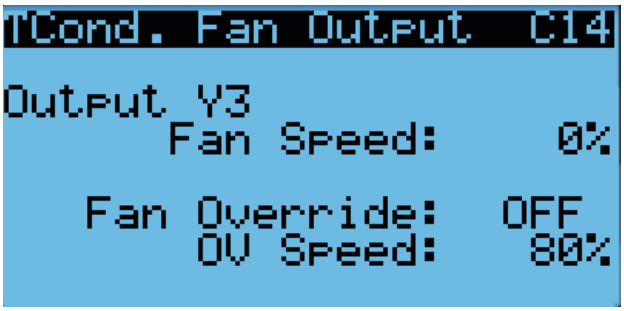
Condenser Fan

The unit is equipped with a condenser fan that is driven by an electronically commutated motor (ECM). This fan is controlled by a 0-10v signal provided from the controller. The fan operates between 100-1200 rpm.

To view the output of the condenser fan:

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 **Cond. Fan Output C14**.
5. Reference **Fan Speed** parameter for the current output to the condenser fan (see Figure 35).

FIGURE 35
Verifying Condenser Fan Output



If required, the condenser fan output can be manually set for 5 minutes for troubleshooting purposes. The override will last for 5 minutes or until the **Fan Override** parameter is set to **OFF** again.

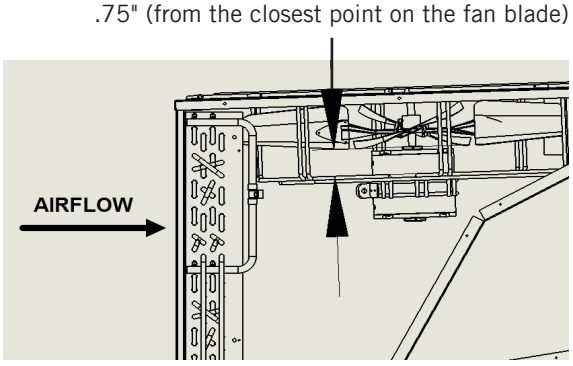
To put the condenser fan into override:

1. Press ENTER key to scroll to the **Fan Override** parameter (see Figure 35).
2. Press UP or DOWN keys to change the value from **OFF** to **ON**.
3. Press ENTER key to save the value and move cursor to **OV Speed**.
4. Press UP or DOWN keys to change the value to the desired override speed.
5. The fan should now run at the selected speed. The output can be verified by again referencing the **Fan Speed** parameter.

NOTE: *If unit is operating at the time the fan override is being enabled, adjustments must be made to* **OV Speed** *first before switching* **Fan Override** *on.*

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 36 for proper clearance adjustment.

FIGURE 36
Fan Blade Setting



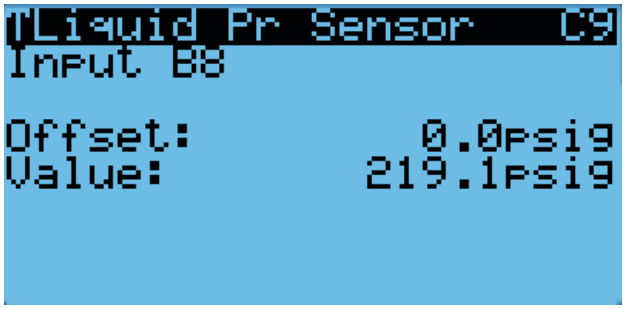
Liquid Line Pressure Transducer

The unit has a pressure transducer installed on the liquid line between the condenser and electronic expansion valve (EEV). The transducer is used for system monitoring of the liquid side system pressures. This information is used to indicate when outdoor coil cleaning is necessary based on outdoor conditions and system pressures. The sensor is also used to adapt the condenser fan speed for high and low ambient conditions. The liquid line transducer is also referred to as the discharge pressure sensor.

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 **Liquid Pr Sensor C9**.
5. Verify the measurement displayed on screen is accurate (see Figure 37).
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 37
Adjusting Liquid Pressure Transducer Values



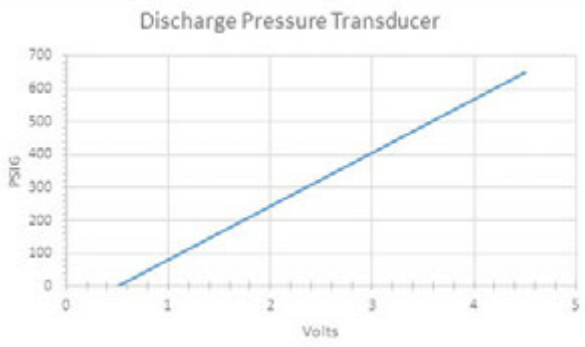
Troubleshooting the Liquid Pressure Transducer

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

Example: 325 psig x .00615 + .5 v = 2.5 volts

Formula for Tech:
Measured Pressure x .00615 + Sensor Offset = Expected Transducer Signal Voltage (see Figure 38 on page 26).

FIGURE 38
Voltage to Pressure:
Liquid Pressure Transducer



Liquid Pressure Transducer Alarm

When the liquid 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.

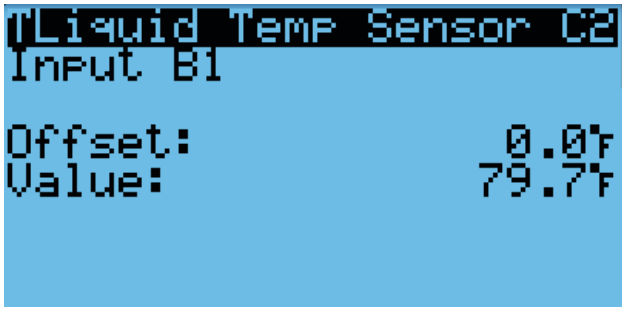
Liquid Temperature Sensor

The unit is equipped with a liquid line temperature sensor to monitor the temperature of the liquid refrigerant leaving the condenser and entering the EEV. The temperature is measured with a 10k ohm NTC thermistor.

The liquid temperature sensor 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 **Liquid Temp Sensor C2**.
5. Reference the **Value** to verify the temperature (see Figure 39).
6. If an offset needs to be applied, press ENTER key to scroll to **Offset**.
7. Press UP or DOWN keys to change the offset to desired value.
8. Press ENTER key to save.
9. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 39
Adjusting Liquid Temperature Values



Condenser Fan Operation

Condenser Fan Speed Control

The unit is equipped with a variable speed ECM (electronically commutated motor) condenser fan which allows the unit to better control head pressures for more efficient operation. The fan will speed up or slow down to attempt to maintain a liquid line pressure. The pressure setpoint that the fan will control to is determined by the outdoor air temperature. The unit will allow the liquid line pressure setpoint to increase for high ambient scenarios or decrease for low ambient scenarios. Because the control is dependent on both the outdoor temperature sensor and the liquid line pressure sensor, the controller will alter its operation if a sensor is not enabled or failed. When the outdoor temperature sensor is not enabled or is considered failed by the controller, a nominal setpoint of 430 psi is used for fan control. When the liquid pressure transducer is not enabled or is considered failed by the controller, a nominal fan speed will be used during a compressor cal (see Figure 40).

The condenser fan requires the compressor to be running in order to operate.

High Pressure Control

Condenser Fan Speed

When the liquid pressure reaches 550 PSI, the condenser fan will speed up, moving as much air as possible in an attempt to reduce system pressures. The condenser fan will operate at increased speed until the liquid pressure reaches 450 PSI. At this point, the fan will return to normal operating speed.

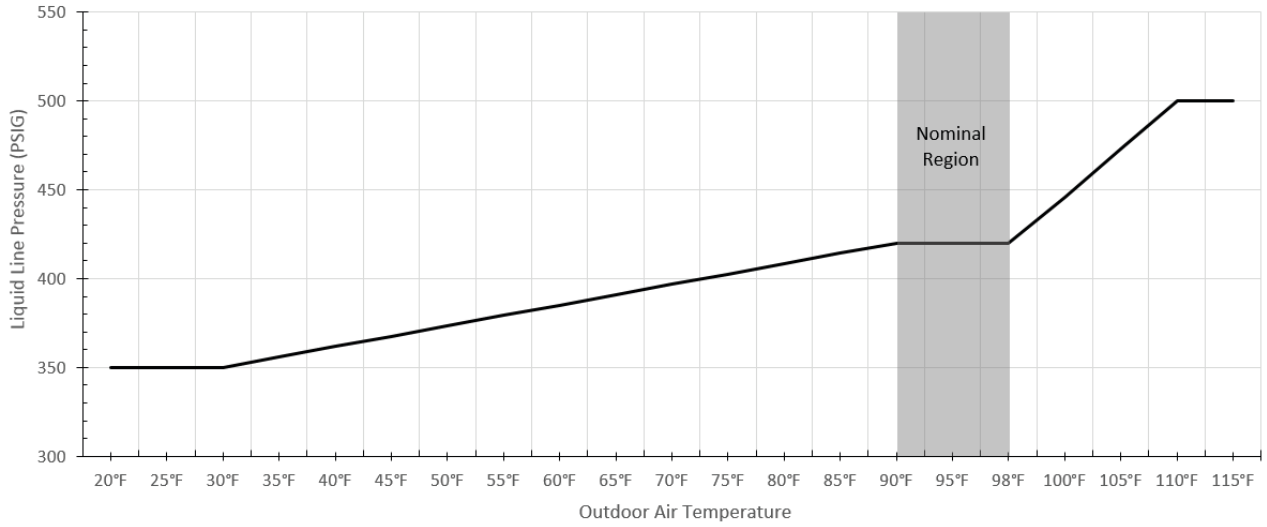
Second Stage Drop Out

If the liquid pressure reaches 620 PSI, the second stage of cooling will be disabled for the remainder of the current cooling call. This reduces the risk of tripping the high pressure switch, while still allowing cooling.

Low Ambient Control

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

FIGURE 40
Liquid Pressure Control Setpoint



conditions. The process for this system is as follows: If the liquid pressure falls below 275 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 liquid 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.

Compressor

Compressor Components

Compressor

Three Phase Scroll Compressor Start Up Information

Scroll compressors, like several other types of compressors, will only compress in one rotational direction. Direction of rotation is not an issue with single phase compressors since they will always start and run in the proper direction.

However, three phase compressors will rotate in either direction depending upon phasing of the power. Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, verification of proper rotation must be made. Verification of proper rotation direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse rotation also results in an elevated sound level over that with correct rotation, as well as substantially reduced current draw compared to tabulated values.

Verification of ***proper rotation*** must be made at the time the equipment is put into service. If improper rotation is corrected at this time, there will be no negative impact on the durability of the compressor. However, reverse operation for over 1 hour may have a negative impact on the bearing due to oil pump out.

NOTE: *If compressor is allowed to run in reverse rotation for an extended period of time, the compressor's internal protector will trip.*

All three phase compressors are wired identically internally. As a result, once the correct phasing is determined for a specific system or installation, connecting properly phased power leads to the same Fusite terminal should maintain proper rotation direction.

The direction of rotation of the compressor may be changed by reversing any two line connections to the wall-mount unit.

Compressor Control Module (CCM)

The compressor control module (CCM) is standard on all models covered by this manual.

Delay-on-Make Timer
Short Cycle Protection/Delay-on-Break
High Pressure Detection
Test Mode
Brownout Protection with Adjustment

The LPC terminals are jumpered in this application. Instead, the low pressure transducer is used for low pressure monitoring.

Delay-on-Make Timer

In the event of power loss, a delay-on-make timer is included to be able to delay startup of the compressor. This is desired when more than one unit is on a structure so that all of the units do not start at the same time which could happen after a power loss or building shutdown. The delay-on-make time period is 2 minutes plus 10% of the delay-on-break time period. To ensure that all of the units do not start at the same time, adjust the delay-on-break timer on each unit to a slightly different delay time.

Short Cycle Protection/Delay-on-Break

An anti-short cycle timer is included to prevent short cycling the compressor. This is adjustable from 30 seconds to 5 minutes via the adjustment knob (see Figure 41). Once a compressor call is lost, the time period must expire before a new call will be initiated.

10% of this time is also considered on the delay-on-make timer (see ***Delay-on-Make Timer***).

High Pressure Detection

High pressure switch monitoring allows for a lockout condition in a situation where the switch is open. If the high pressure switch opens, the CCM will de-energize the compressor. If the switch closes, it will then restart the compressor after the delay-on-break setting has expired on the device. If the switch trips again during the same Y call, the compressor will be de-energized. The ALR terminal will be energized signaling the unit control board that a high pressure event has occurred (see ***Refrigerant High Pressure Alarm*** on page 29).

Test Mode

By rapidly rotating the potentiometer (POT) clockwise (see Figure 41), all timing functions will be removed for testing.

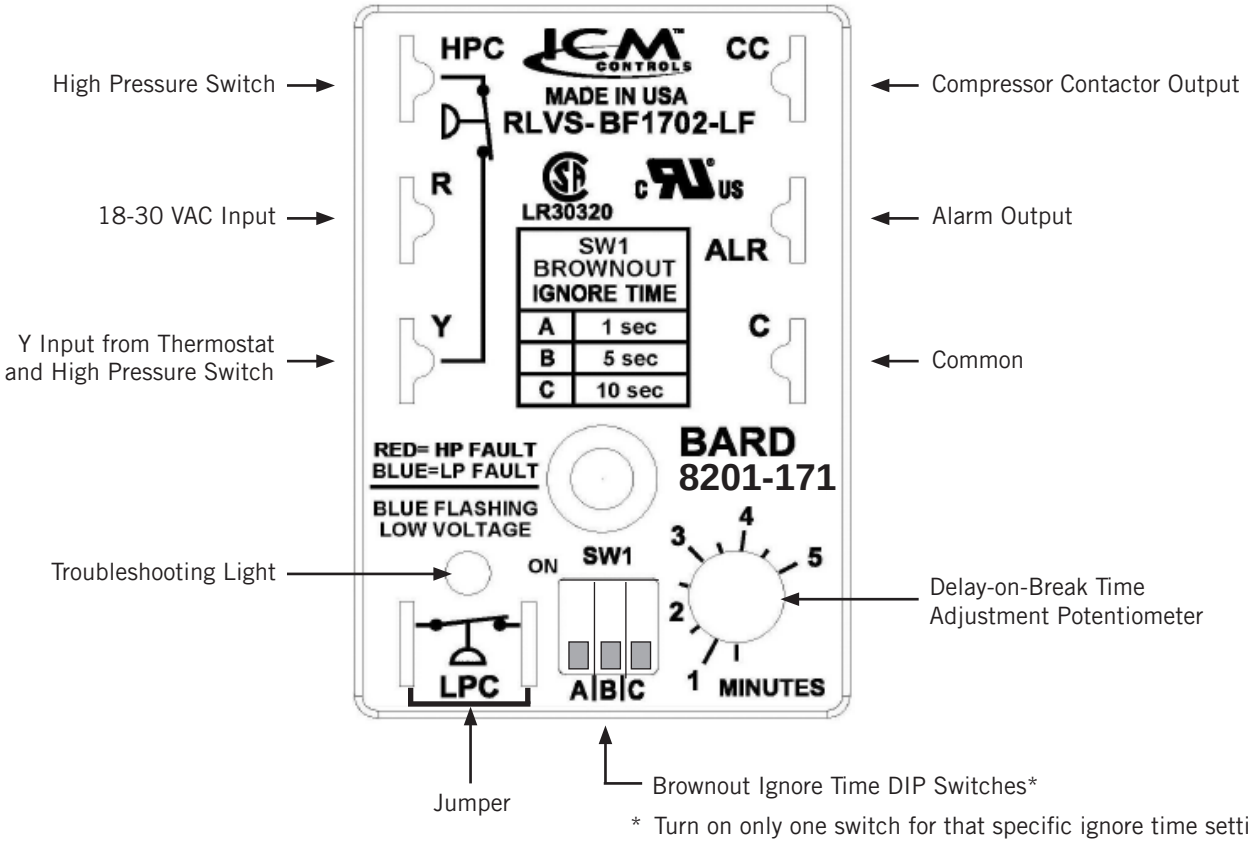
The conditions needed for the unit to enter test mode are as follows: POT must start at a time less than or equal to the 40 second mark. The POT must then be rapidly rotated to a position greater than or equal to the 280 second mark in less than ¼ second. Normal operation will resume after power on reset or after the unit has been in test mode for at least 5 minutes.

Brownout Protection with Adjustment

Brownout protection may be necessary if the utility power or generator power has inadequate power to prevent the voltage from dropping when the compressor starts. This is rare but can happen if the generator is undersized at the site or if the site is in a remote location far from the main power grid. Under normal circumstances, allowing the brownout to be ignored for a time period should not be needed. The 8201-171 is shipped with all the DIP switches in the 'off' or 'do not ignore' position (see Figure 41).

If ignoring the brownout is needed because of the above conditions, three preset timers can be set by DIP switches in order to delay signaling a power brownout for a specific length of time after compressor contactor is energized.

FIGURE 41
8201-171 Compressor Control Module



* Turn on only one switch for that specific ignore time setting. 10 seconds is the maximum brownout ignore time. If all switches are "off", the control is in "do not ignore".

This allows the compressor a time period to start even if the voltage has dropped and allows the voltage to recover. This delay only happens when the CC terminal energizes. The delay can be set to 1 second (A DIP switch), 5 seconds (B DIP switch) or 10 seconds (C DIP switch); time is not cumulative—only the longest setting will apply. If the voltage recovers during the brownout delay period, the compressor will continue running.

If a brownout condition is detected by the 8201-171 at any point while there is a cooling call or power is on at Y, the troubleshooting light will flash blue. The light will continue to flash until the cooling call is satisfied or power is removed from the Y terminal. This condition does not prevent operation, it only indicates that a brownout condition was present at some point during the call. If a brownout condition is detected while CC has an output, CC will be de-energized and will retry after the delay-on-break timer is satisfied, honoring any DIP switch timer chosen when the CC output is re-energized; this process will continue until call is satisfied.

If inadequate utility or generator power continues after the Delay-on-Make or Delay-on-Break timer is fulfilled, the CC output will not energize. This could lead to the compressor never starting. The control will see the brownout immediately and not start.

A common scenario and one that has been seen in the field is when a unit or units switches from utility power to generator power. With slower transfer switches, the time delay between the utility power and generator power didn't cause a problem. The units lost power, shut off and came back on line normally. With the introduction of almost instantaneous transfer switches, the power glitch may be enough that the compressor will start to run backwards.

High Pressure Safety Switch

All units have a high pressure switch as a safety device. This device will open when pressure in the system reaches 650 PSIG. The sensor is directly connected to the dedicated compressor control module (see ***High Pressure Detection*** on page 28).

Refrigerant High Pressure Alarm

When the wall-mount unit receives a signal from the compressor control module (CCM) indicating a high pressure event, the wall-mount unit will generate an alarm. Upon receiving the alarm, the wall-mount unit will remove the "Y" call from the CCM, resetting the status of the CCM. The alarm will stay present on the wall-mount unit until manually cleared with TEC-EYE hand-held diagnostic tool.

In addition to the CCM, the discharge pressure transducer is used to prevent a high pressure event. When the discharge pressure is above the discharge pressure alarm setpoint (set 30 PSI below high pressure switch, which is 650 PSI), the system will disable stage 2 of mechanical cooling.

Phase Monitor

Used only on three phase equipment, the phase monitor is a compressor protection device that will prohibit operation of the compressor if the device senses a possible reverse-rotation situation due to incorrect phasing. On a call for compressor (and only compressor), the device will check incoming phase, check for severe voltage imbalance and check for proper frequency. Under nominal conditions, a green LED light will show on the face of the monitor. If there is improper phasing, voltage imbalance or frequency deviation, the device will show a red LED light and prohibit compressor operation.

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

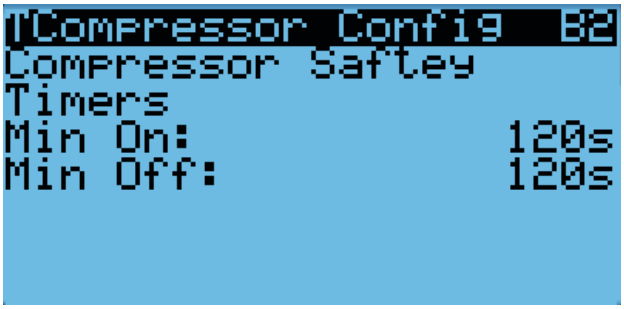
Compressor Operation

The compressor will be enabled when the unit (in orphan mode) or LC provide a cooling stage 1 call. The compressor call from the controller has several delays that may affect the start or stop time of the compressor in regards to the cooling demand. The compressor has a minimum on time of 120 seconds to prevent short cycling the compressor. The compressor also has a minimum off time of 120 seconds to prevent start ups before the pressure in the refrigeration system equalizes. When the second stage is engaged, it also has a minimum run time of 120 seconds to allow the system to stabilize before returning to single stage or shutting down.

These delays can be changed 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 **Adv System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Compressor Config B2**.
5. Press ENTER key to scroll to **Min On** or **Min Off** (see Figure 42).

FIGURE 42
Adjusting Compressor Delays



6. Press UP or DOWN keys to change the value.
7. Press ENTER key to save value and move the cursor to next parameter or top of screen.
8. Press ESCAPE key several times to return to Main Menu screen.

The address-based delay only applies to the wall-mount unit when in orphan mode. The controller will delay the unit compressor based on the value entered on screen B2 multiplied by the unit address. This is intended to keep multiple units from starting their compressors at the same time when there is a quick change in the load. When connected to the LC, this is taken care of by LC logic.

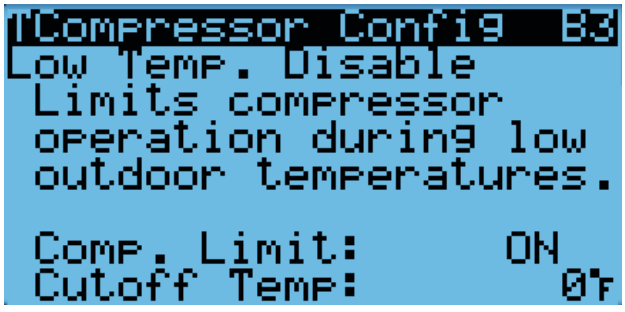
Compressor Low Temperature Limit

The unit has the ability to protect the compressor from refrigerant flood-back in low outdoor temperature conditions (0°F default). This will be automatically enabled, unless the economizer is disabled by the model number. This function can also be enabled/disabled, and limit temp changed by the user.

To adjust compressor low temp limit:

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 **Adv System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Compressor Config B3**.
5. Press ENTER key to scroll to **Comp. Limit** (see Figure 43).
6. Press UP or DOWN keys to change **ON** or **OFF** value.
7. Press ENTER key to save value and move the cursor to **Cutoff Temp**.
8. Press UP or DOWN keys to adjust temperature.
9. Press ENTER key to save value.
10. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 43
Adjusting Compressor Low Temp Limit



Additional Compressor Alarm

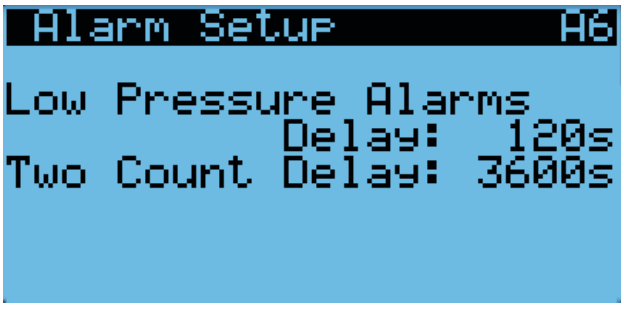
Refrigerant Low Pressure Alarm

When the suction pressure transducer indicates a pressure value below the low pressure alarm setpoint of 40 PSI and the compressor has been running for more than 180 seconds, or the suction pressure is pulled into a vacuum for more than 20 seconds, the controller will disable the compressor. ***NOTE:*** *The second call will be delayed based on the delay off value mentioned in the compressor section.* The controller will try to run the refrigeration system two (2) times within 3600 seconds (1 hour) before the alarm will lock the compressor out. This alarm needs to be manually cleared before compressor operation will resume.

To adjust the low pressure alarm settings:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A6**.
5. Press ENTER key to scroll to **Delay** to adjust how long the compressor waits before turning the compressor off (see Figure 44).
6. Press UP or DOWN keys to adjust the time delay.
7. Press ENTER key to scroll to **Two Count Delay**.
8. Press UP or DOWN keys to adjust the delay value.
9. Press ENTER key to save.
10. Press the ESCAPE key several times to return to Main Menu screen.

FIGURE 44
Adjusting Low Pressure Alarm Settings



Economizer

Economizer Components

Actuator

The actuator rotates up to 90° based on a 2-10v signal sent to it by the controller. The actuator is rated at 90 in-lb and is spring return when power is lost. This component is what opens and closes the damper blade.

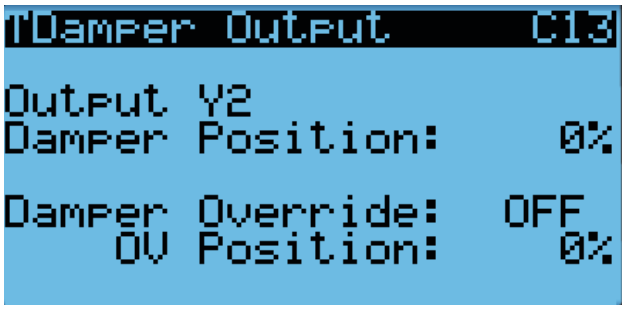
To verify the output from the controller to the actuator:

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 **Damper Output C13**.
5. Reference the **Damper Position** for the current output to the damper (see Figure 45).
6. To override the current position, press ENTER key to scroll to **OV Pos**.
7. Press UP or DOWN keys to change the value to the desired output.
8. Press ENTER key to save the value and move cursor to **Damper Override**.
9. Press UP or DOWN keys to change the value from **OFF** to **ON**.
10. The **Damper Position** will update with the new override value and the damper will travel to that position.

The override will last for 5 minutes or until the **Damper Override** parameter is set to OFF again.

NOTE: *If unit is operating at the time the damper override is being enabled, adjustments must be made to* **OV Speed** *first before switching* **Damper Override** *on.*

FIGURE 45
Damper Output and Override



Dust Sensor

The unit has a dust sensor installed near the outdoor air inlet. The dust sensor checks for excessive particulates in the outdoor air, and will close the economizer if the dust is excessive. The sensor uses a PWM signal converted to 0-5v output to the controller. This sensor is disabled by default and will need to be enabled for the dust alarm to function.

To ensure proper performance, cleaning may be required. Vacuuming or blowing the dust off the sensor with forced air is recommended. ***Avoid inserting any objects into the sensor***.

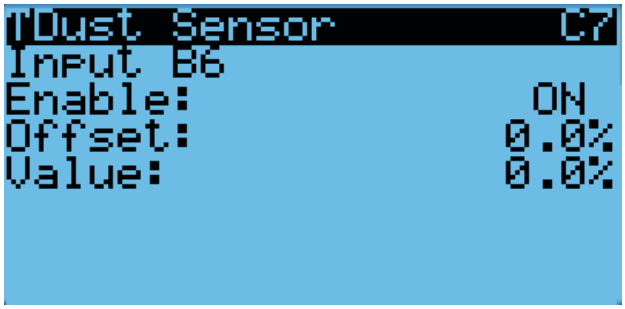
The dust sensor can be verified by:

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 **Dust Sensor C7**.
5. Reference the **Value** for the current sensor reading (see Figure 46).
6. To apply an offset to the current reading, press ENTER key to scroll to **Offset**.
7. Press UP or DOWN keys to adjust the value to the desired value.
8. Press ENTER key to save the value and move cursor back to top of screen.

NOTE: *The sensor can be disabled if required for troubleshooting.*

9. Press ENTER key to scroll to **Enable** parameter.
10. Press UP or DOWN keys to change the value from **ON** to **OFF**.
11. Press ENTER key to save.

FIGURE 46
Dust Sensor



Dust Sensor Failure Alarm

When the sensor reads a value that is outside of the acceptable 0 to 100% range, an alarm will be generated indicating the sensor has failed. This alarm is just a notification and will not disable any other features on the controller.

This alarm is fixed and cannot be adjusted.

High Dust Limit Alarm

When dust content in the air is high and is a risk to prematurely reducing airflow through the filters, the unit will restrict the use of the economizer. The controller has adjustable software setpoints (default to 80%) to indicate dust levels are too high and to disable the economizer operation for 5 minutes (unit default). This alarm is not communicated to the NOC. Once the conditions are no longer present, the alarm will automatically clear.

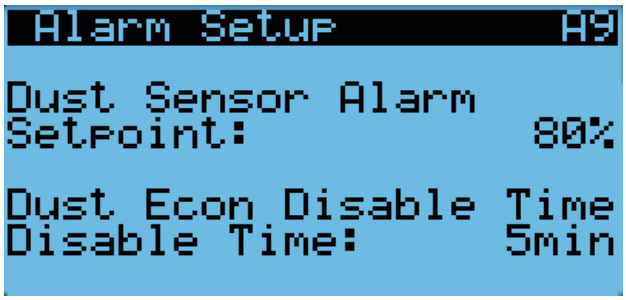
Disabling the dust sensor in **I/O Config** disables this alarm.

To adjust the dust sensor alarm setpoint:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A9**.
5. Press ENTER key to scroll to **Setpoint** (see Figure 47).
6. Press UP or DOWN keys to change to the desired value.
7. Press ENTER key to save the value.

NOTE: *When the temperature outside is measured at or below 0°F, the dust sensor alarm will be disabled to allow economizer operation. This is done because the compressor is disabled below 0°F and the system would not have the capability to cool.*

FIGURE 47
Adjusting Dust Sensor Alarm Setpoint



Damper Blade

The system utilizes three damper blades used to bring in outdoor air and exhaust space air for economizer operation. The damper blades are made of sheet metal and are integrated into the equipment.

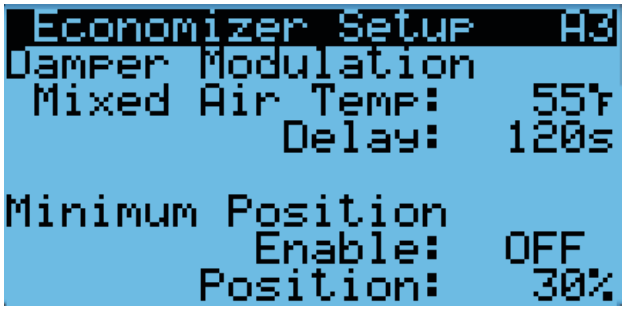
Minimum Damper Position

This unit has a minimum damper position feature to vent the space and intake fresh air whenever the blower is operating. This feature operates separately from free cooling operation and minimum position should not be set to a higher position than needed, as it is not controlled by room or outdoor conditions. This feature is disabled by default, but is available if needed.

To enable/disable/adjust the minimum damper position:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Economizer Setup A3**.
5. Press ENTER key to scroll to **Minimum Position Enable** (see Figure 48).
6. Press UP or DOWN keys to change **ON** or **OFF** value.
7. Press ENTER key to save value and move the cursor to **Position**.
8. Press UP or DOWN keys to adjust the minimum position value.
9. Press ENTER key to save value.
10. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 48
Adjusting Minimum Damper Position



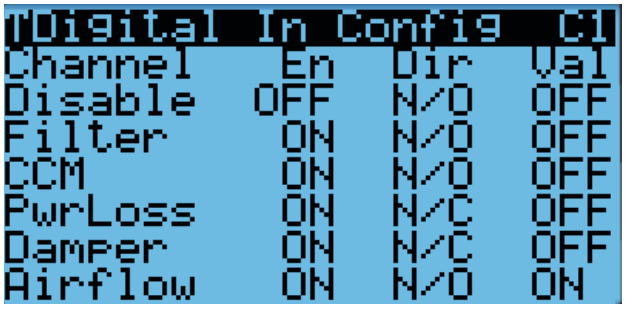
Damper Switch

The economizer utilizes a magnetic switch to determine if the damper is operating correctly. This switch will be closed when the damper is closed and open when the damper is open.

To verify the status of the switch:

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 **Digital In Config C1**.
5. Reference the value located at **Damper** row and **Val** column (see Figure 49).
6. The input will display **ON** when the damper is closed (reflecting closed circuit on damper switch) and will display **OFF** when the damper is open (reflecting open circuit on damper switch).

FIGURE 49
Damper Switch



Damper Failed to Open Alarm

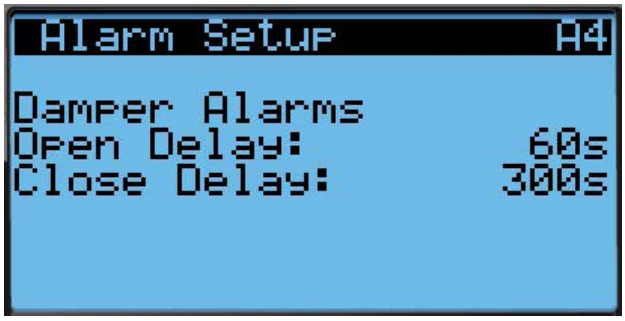
When the controller commands the economizer damper actuator to a position other than 0% and the damper switch indicates the damper is not open, after a delay of 20 seconds the controller will generate a damper failed to open alarm. This alarm is just a notification and will not disable any features on the controller.

Disabling the damper switch in **I/O Config** disables this alarm.

To adjust the damper failed to open delay:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A4**.
5. Press ENTER key to scroll to **Open Delay** (see Figure 50).
6. Press UP or DOWN keys to change to the desired value.
7. Press ENTER key to save the value.

FIGURE 50
Adjusting Damper Alarm Delay



Damper Failed to Close Alarm

When the controller commands the economizer damper actuator to the 0% position and the damper switch indicates the damper is not closed, after a delay of 300 seconds the controller will generate a damper failed to close alarm. This alarm will disable all functions of the unit and the status message will display "Off by Alarm". If the condition is remedied, the alarm will automatically reset and the unit will resume normal operation.

Disabling the damper switch in **I/O Config** disables this alarm.

To adjust the damper failed to close delay:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A4**.
5. Press ENTER key to scroll to **Close Delay** (see Figure 50).
6. Press UP or DOWN keys to change to the desired value.
7. Press ENTER key to save the value.

Outdoor Temperature and Humidity Combination Sensor

The unit is equipped with a combination outdoor temperature and humidity sensor to monitor outdoor conditions for the economizer operation. The temperature is measured with a 10k ohm NTC thermistor. The humidity is measured with a humidity sensor that outputs a 4-20mA signal to the controller. Troubleshooting information for this sensor is included in the Troubleshooting section of this manual.

The outdoor temperature can be verified by:

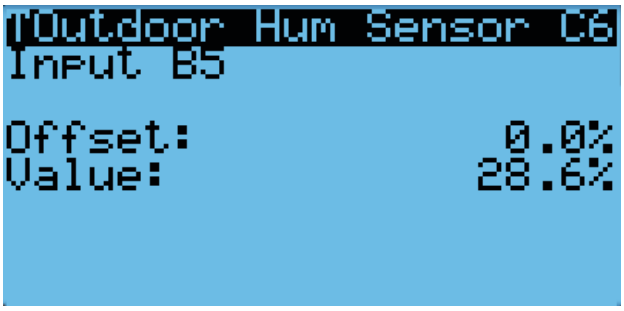
1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **I/O Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Outdoor Air Sensor C3**.
5. Reference the **Value** to see the input of the sensor (see Figure 51 on page 34).
6. To apply an offset, press ENTER key to scroll to **Offset**.
7. Press UP or DOWN keys to change to the desired value.
8. Press ENTER key to save the value.

FIGURE 51
Outdoor Air Sensor

The outdoor humidity can be verified 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 **Outdoor Hum Sensor C6**.
5. Reference the **Value** to see the input of the sensor (see Figure 52).
6. To apply an offset, press ENTER key to scroll to **Offset**.
7. Press UP or DOWN keys to change to the desired value.
8. Press ENTER key to save the value.

FIGURE 52
Outdoor Humidity Sensor



Outdoor Temperature Sensor Failure Alarm

When the sensor reads a value that is outside of the acceptable -41 to 303.0° range, an alarm will be generated indicating the sensor has failed. This alarm condition will disable the economizer.

This alarm is fixed and cannot be adjusted.

Outdoor Humidity Sensor Failure Alarm

When the sensor reads a value that is outside of the acceptable 0 to 100% RH range, an alarm will be generated indicating the sensor has failed. This alarm condition will disable the economizer when the mode is set to temperature and humidity or enthalpy.

This alarm is fixed and cannot be adjusted.

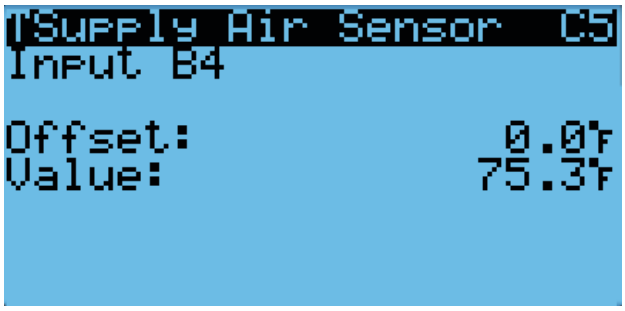
Supply Temperature Sensor

The unit is equipped with a supply air temperature sensor to monitor the leaving air temperature of the unit. The temperature is measured with a 10k ohm NTC thermistor.

The supply air temperature can be verified 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 **Supply Air Sensor C5**.
5. Reference the **Value** to see the input of the sensor (see Figure 53).
6. To apply an offset, press ENTER key to scroll to **Offset**.
7. Press UP or DOWN keys to change to the desired value.
8. Press ENTER key to save the value.

FIGURE 53
Supply Air Sensor



Supply Temperature Sensor Failure Alarm

When the sensor reads a value that is outside of the acceptable -41.0 to 303.0° range, an alarm will be generated indicating the sensor has failed.

This alarm is fixed and cannot be adjusted.

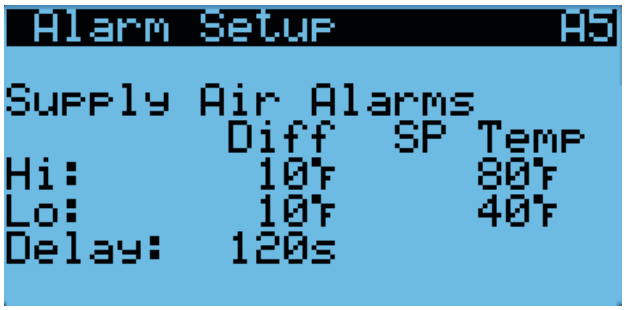
High Supply Air Temperature Alarm

When the supply air temperature is above 80°F for 120 seconds, an alarm will be generated and the economizer will be disabled until the cooling call has been removed. This alarm can only be activated during free cooling and will automatically reset once the economizer is no longer disabled.

To change the high supply air temperature alarm:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A5**.
5. Press ENTER key to scroll to **Hi and Diff** value (see Figure 54).
6. Press UP or DOWN keys to change the differential to the desired value.
7. Press ENTER key to save the value.

FIGURE 54
Adjusting Supply Air Temperature Differential



Low Supply Air Temperature Alarm

When the supply air temperature is below 45°F for 120 seconds, an alarm will be generated and the economizer will be disabled until the cooling call has been removed. This alarm can only be activated during free cooling and will automatically reset once the economizer is no longer disabled..

To change the low supply air temperature alarm:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setup A5**.
5. Press ENTER key to scroll to **Lo and Diff** value (see Figure 54).
6. Press UP or DOWN keys to change the differential to the desired value.
7. Press ENTER key to save value and scroll to **Delay**.
8. Press UP or DOWN keys to adjust the delay value.

NOTE: *This delay is also applied to the high supply air temperature alarm.*

9. Press ENTER key to save.

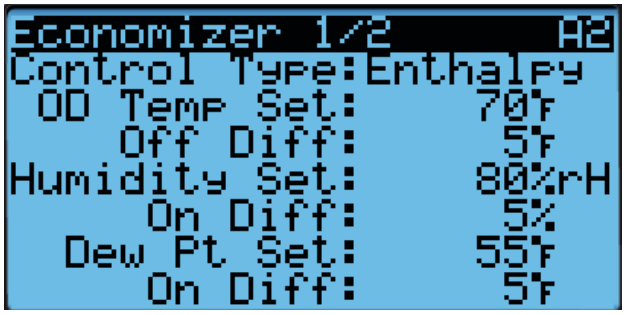
Economizer Operation

The economizer has four types of operation. The first mode is "None" where the economizer is never utilized, except for emergency purposes. The second mode is "Dry Bulb" where the outdoor temperature is the only consideration for economizer use on a free cooling call. The third mode is "TempHum" where the outdoor temperature and humidity are considered for economizer use on a free cooling call. The fourth mode is "Enthalpy" where the outdoor temperature, humidity and calculated dew point are considered for economizer operation on a free cooling call.

To change the economizer type and setpoints:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Economizer 1/2 A2**.
5. Press ENTER key to scroll to **Control Type** (see Figure 55).

FIGURE 55
Economizer 1/2



6. Press UP or DOWN keys to change the **Type** desired value to **None**, **Dry Bulb**, **TempHum** or **Enthalpy**.
7. Press ENTER key to save the value and scroll to the next parameter.

NOTE: *Some of the following parameters may not be present until the control type that it is used with is selected.*

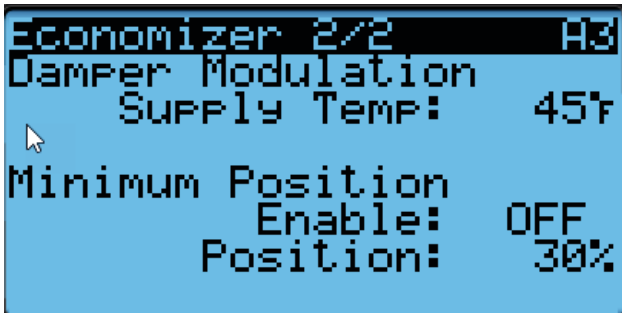
8. If control type is other than **None**, the cursor should now be on the **OD Temp Set** parameter.

9. Press UP or DOWN keys to change the parameter to the desired value.
10. Press ENTER key to save the value and scroll to the next parameter.
11. Press UP or DOWN keys to change the (outdoor temperature) **Off Diff** parameter to the desired value.
12. Press ENTER key to save the value and move to the next parameter.
13. If control type is **TempHum** or **Enthalpy**, the cursor should now be on **Humidity Set** parameter.
14. Press UP or DOWN keys to change the parameter to the desired value.
16. Press UP or DOWN keys to change the (outdoor humidity) **On Diff** parameter to the desired value.
17. Press ENTER key to save the value and move to the next parameter.
18. If control type is **Enthalpy**, the cursor should now be on **Dew Pt Set** parameter.
19. Press UP or DOWN keys to change the parameter to the desired value.
20. Press ENTER key to save the value and move to the next parameter.
21. Press UP or DOWN keys to change the (outdoor dew point) **On Diff** parameter to the desired value.
22. Press ENTER key to save the value.

To change economizer settings:

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 **System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Economizer 2/2 A3**.
5. Press ENTER key to scroll to **Supply Temp** (see Figure 56).

FIGURE 56
Economizer 2/2



6. Press UP or DOWN keys to change the parameter to the desired value.
7. Press ENTER key to save the value.
8. Press ESCAPE key several times to return to Main Menu screen.

See Table 10 for default settings for economizer operation.

When the economizer is activated during a free cooling call only, using any of the previously mentioned modes, a 0-10v analog signal will be sent to the economizer actuator. The actuator will then open and close the damper blades to maintain a supply air temperature of 45°F. If the economizer is active during optimized cooling mode, the actuator will maintain a supply air temperature of 45°F. When the supply air temperature increases, the damper will open and when the supply air temperature decreases, the damper will close.

The economizer may be disabled by the LC if the system determines it needs to enter dehumidification mode. More information about the dehumidification sequence can be found on page 16 and in the latest revision of LC6000 Service Instructions 2100-669. In addition to dehum mode, the economizer may be disabled for 5 minutes (adjustable) if the dust sensor indicates the outdoor air may cause particulate buildup in the air filters. After the time has expired and on a call for cooling, the economizer will open again to sample

TABLE 10
Economizer Default Settings

Mode			Consideration	Economizer Available for Cooling	Economizer Not Available for Cooling
Temp Only			Temperature	When the outdoor air temperature is below 70°F	When the outdoor air temperature is above 75°F
	Temp & Humidity	Enthalpy*	Humidity	***LC Online***: When the outdoor humidity is below 80%	***LC Online***: When the outdoor humidity is above 80%
				LC Offline: When the outdoor humidity is below 60%	***LC Offline***: When the outdoor humidity is above 60%
			Dew Point	When the outdoor dew point is below 55°F	When the outdoor dew point is above 60°F

* In Enthalpy mode, outdoor temperature, humidity and calculated dew point are all considered for economizer operation.

the air. The wall-mount unit will either return to normal operation or remain locked out for another 5 minutes.

Emergency Cooling Mode

If the shelter temperature is above the high temperature alarm setpoint on the LC, the unit will be commanded into emergency cooling mode. In this mode, the unit will operate the economizer regardless of the economizer setup, as long as the outdoor temperature is below the indoor temperature. The cooling demand will be automatically set to 100% in this mode, meaning mechanical cooling should be operating at full capacity while this mode is active. This will stay active until the LC returns the unit to normal operation. This mode is only available when connected to the LC.

Emergency Ventilation Mode

If a hydrogen detector is connected to the LC/WR Series system and there is a hydrogen alarm event, the system will go into emergency ventilation mode. In emergency ventilation mode, the economizers on the wall units will be commanded to 100%. After 2 minutes, the blowers will turn on in order to exhaust any hydrogen gas buildup within the shelter. Once the hydrogen alarm clears, the system will resume normal operation. This mode is only available when connected to the LC.

Model/Serial Number Configuration

FUSION-TEC WR Series wall-mount units configure some settings based on the model number that is input into the unit. The model and serial number are entered at the factory, and should be retained during a software update. However, after a software update, it is best practice to verify that the model and serial number is still present and accurate. If the model and/or serial number is missing or incorrect they will need to be re-entered.

NOTE: *When re-entering the model number, only valid model number entries will be accepted by the PLC.*

To update model/serial numbers:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter ENGINEER password 9254.
3. Press UP or DOWN keys to scroll to **Adv Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Model/Serial Set B1**.
5. Press ENTER key to advance the cursor to the digit that needs changed in the model/serial number.
6. Press UP or DOWN keys to change value of the digit.

NOTE: *The characters are in ASCII format and some digits may not have a character assigned to them. This will required pressing the UP or DOWN key until these characters are passed.*

7. Continue Steps 5 and 6 until the model/serial number(s) are correct and reflect the number on the product label.

For more information on the options and settings available for specific model numbers, please see the model number breakdown in Figure 58 on page 41.

Electric Heat Option

Electric Heat Components

Electric Heating Element

The unit is optionally equipped with a 1.5kw or 5kw heat strip. The heat strip is located next to the blower assembly and uses resistive heat.

Thermal Overload

The heater assembly has a thermal overload wired in series with the heating element. This device has a cycling limit which opens at 130°F and resets at 80°F. The limit is also equipped with a redundant thermal fuse that will open at 150°F.

Electric Heat Operation

The heat strip will be activated on a call for heat. This call can be generated by the LC or the wall-mount unit operating in orphan mode.

Bard Guard Anti-Theft System Option

The unit has the option to be shipped from the factory with a low pressure switch, panel sensors and a speaker. These devices are used with the Bard Guard BG1000 anti-theft controller to provide an anti-theft measure. These sensors and switch form a loop that when connected to the BG1000 controller will cause the system to go into alarm if any of the front panels or coil assemblies are removed without being disarmed. The speaker provides an audible alert that the system is being tampered with. The Bard Guard anti-theft control sensor connection is wired to terminals 7 and 8 on the wall-mount unit. The speaker connection is wired to terminals 5 and 6 on the wall-mount unit. See the latest revision of BG1000 Installation Instructions 2100-672 for directions on connecting the wall-mount units to the BG1000 controller.

Unit Disable Option

The unit is equipped with an input that can be used with a smoke detector or unit disable switch with a dry contact. When this input indicates a smoke event, the system will be shut down. The alarm will automatically clear when the alarm condition is no longer present.

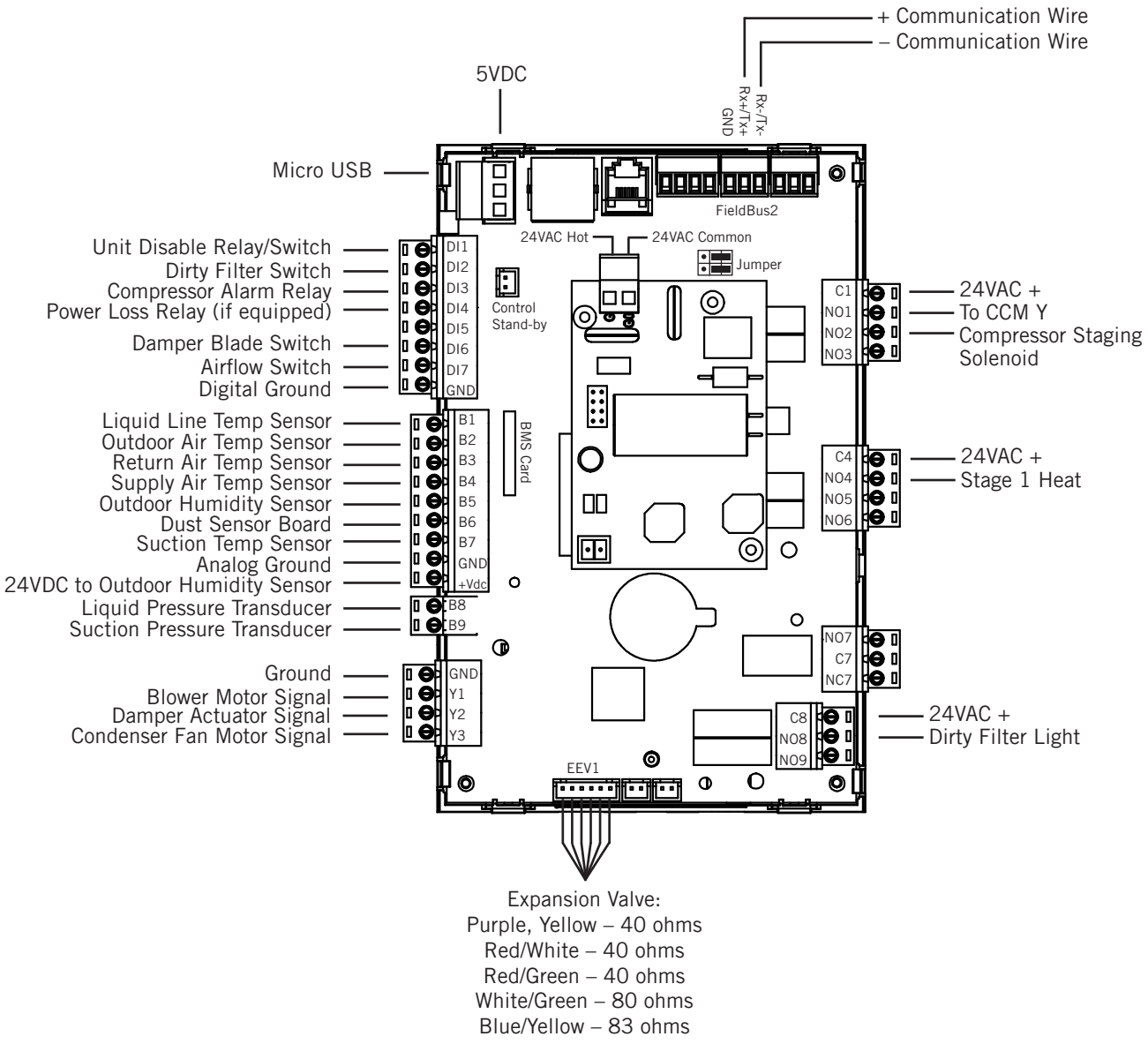
Inverter Option

The inverter is only used in applications where a generator is not present and the wall-mount units must run during a power loss event. The inverter will always keep power available to the wall-mount units during a power outage. In the event of a power outage, a power loss relay in the wall-mount unit will be energized and will only allow

the blower and economizer to run while powering the controller. The inverter converts either 24 VDC or 48 VDC, depending on the model, to 230 VAC. A relay output from the inverter will also communicate an alarm to the supervisory controller in the event of an inverter failure. This variable can be communicated through the Ethernet port for integration into a building management system. The units will continue to run in economizer-only operation until power has been restored or the battery power has been depleted.

When the wall-mount unit is operating under inverter power, shelter economizer cooling will only occur if outside temperatures fall below indoor temperatures and blower speeds are slightly reduced to conserve battery power.

FIGURE 57
FUSION-TEC WR Series Wall-Mount Unit Control Board

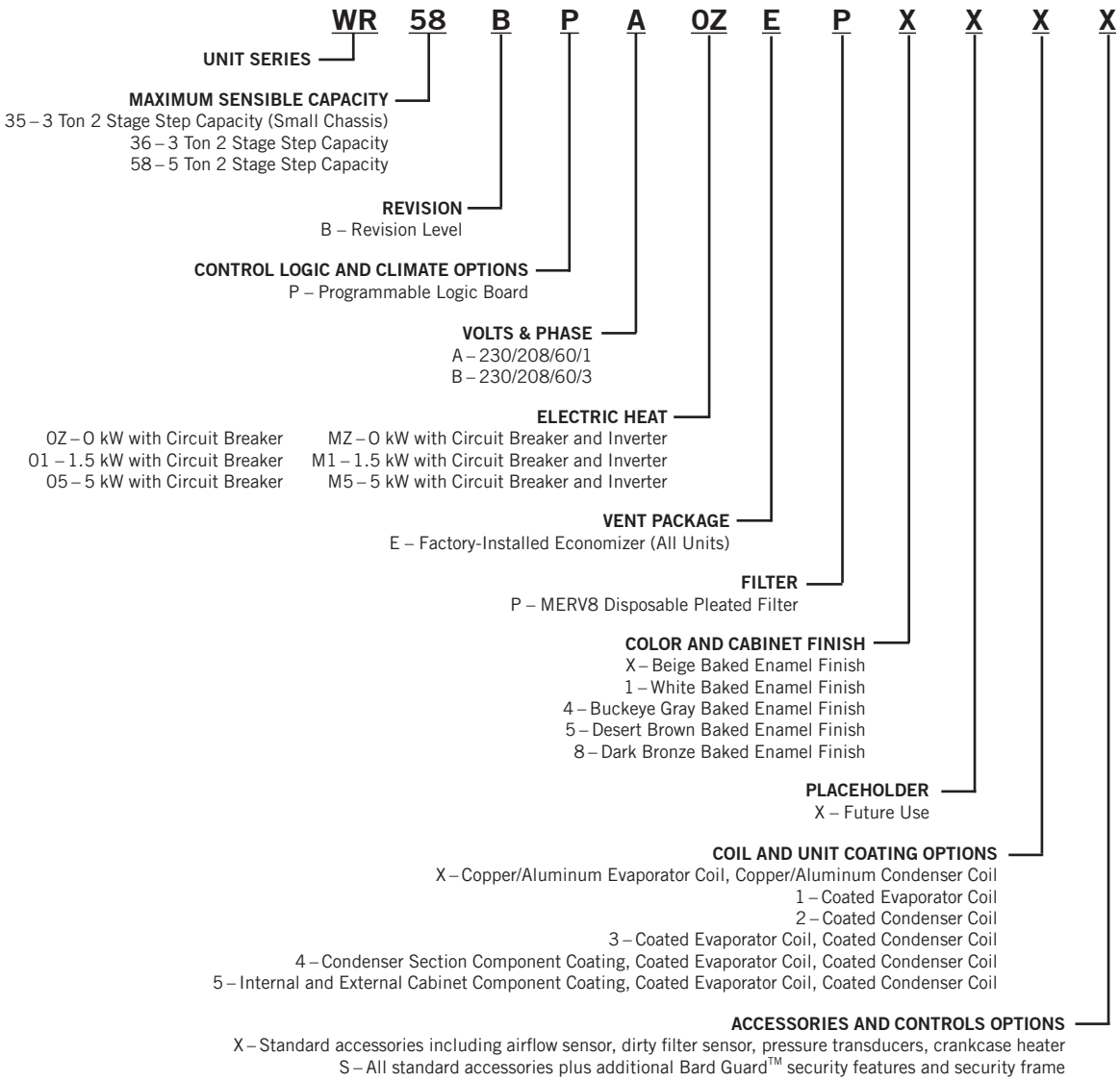


See Table 11 on page 40 for information on control board terminal functions.

TABLE 11
FUSION-TEC WR Series Wall-Mount Unit Control Board Terminals

Terminal	Function	Type	Form
Rx+/Tx+	Communication		
Rx-/Tx-	Communication		
DI1	Unit Disable Relay/Switch	Digital Input	N/C
DI2	Dirty Filter Switch	Digital Input	N/C
DI3	Compressor Alarm Relay	Digital Input	N/C
DI4	Power Loss Relay (if used)	Digital Input	N/C
DI5	Not Used		
DI6	Damper Blade Switch	Digital Input	N/C
DI7	Airflow	Digital Input	N/C
GND	Digital Ground		
B1	Liquid Line Temperature Sensor	Analog Input	10K Ohm Curve J
B2	Outdoor Air Temperature Sensor	Analog Input	10K Ohm Type III (AN)
B3	Return Air Temperature Sensor	Analog Input	10K Ohm Curve J
B4	Supply Air Temperature Sensor	Analog Input	10K NTC Thermistor
B5	Outdoor Humidity Sensor	Analog Input	4mA to 20mA
B6	Dust Sensor Board	Analog Input	0-5VDC
B7	Suction Temperature Sensor	Analog Input	10K Ohm Curve J
GND	Analog Ground		
+VDC	24VDC to Outdoor Humidity Sensor		
B8	Liquid Pressure Transducer	Analog Input	.5VDC to 4.5VDC
B9	Suction Pressure Transducer	Analog Input	.5VDC to 4.5VDC
GND	Ground		
Y1	Blower Motor Signal	Analog Output	0-10VDC
Y2	Damper Actuator Signal	Analog Output	0-10VDC
Y3	Condenser Fan Motor Signal	Analog Output	0-10VDC
C1	24VAC+	Power	
NO1	to CCM "Y"	Relay Output	
NO2	Compressor Staging Solenoid	Relay Output	
NO3	Not Used		
C4	24VAC+	Power	
NO4	Stage 1 Heating	Relay Output	
NO5	Not Used		
NO6	Not Used		
NO7	Not Used		
C7	Not Used		
NC7	Not Used		
C8	24VAC+	Power	
NO8	Dirty Filter Light	Relay Output	
NO9	Not Used		
GO	24VAC Common		
G	24VAC Hot		

FIGURE 58
FUSION-TEC WR Series Wall-Mount Unit 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.

Table 12 shows 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. Figure 59 on page 44 shows fan modulation based upon outdoor temperature and system pressures.

Pressure Service Ports

High and low pressure service ports are installed on all wall-mount units so that the system operating pressures can be observed. Pressures are shown in Table 12.

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

TABLE 12
Cooling Pressures

Full Load Cooling			Air Temperature Entering Outdoor Coil °F											
Model	**Return Air Temp (DB/WB)**	**Pressure**	**65**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**
WR35	75/62	Suction Pressure	131	132	132	133	133	134	135	136	137	138	139	140
		Head Pressure	315	315	315	343	371	400	417	444	471	498	525	552
	80/67	Suction Pressure	140	141	141	142	142	143	144	145	146	147	148	150
		Head Pressure	315	315	315	343	371	400	428	456	483	511	539	566
	85/72	Suction Pressure	145	146	146	147	147	148	149	150	151	152	154	155
		Head Pressure	315	315	315	343	371	400	443	471	500	529	558	586
WR36	75/62	Suction Pressure	131	131	131	134	136	139	140	141	142	143	143	143
		Head Pressure	315	315	315	343	372	400	419	446	473	499	525	550
	80/67	Suction Pressure	140	140	140	142	145	148	150	151	152	153	153	153
		Head Pressure	315	315	315	343	372	400	429	457	485	512	538	564
	85/72	Suction Pressure	143	143	143	146	149	152	155	157	158	158	158	158
		Head Pressure	315	315	315	343	372	400	444	473	502	530	557	584
WR58	75/62	Suction Pressure	125	126	127	128	129	130	131	133	134	135	137	138
		Head Pressure	315	315	342	366	392	408	434	462	490	520	551	582
	80/67	Suction Pressure	133	134	136	137	138	139	140	142	143	145	146	148
		Head Pressure	315	315	342	366	392	418	445	474	503	533	565	597
	85/72	Suction Pressure	138	139	140	141	143	144	145	147	148	150	151	153
		Head Pressure	315	315	342	366	405	433	461	490	521	552	585	618

Part Load Cooling			Air Temperature Entering Outdoor Coil °F											
Model	**Return Air Temp (DB/WB)**	**Pressure**	**65**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**
WR35	75/62	Suction Pressure	136	138	138	139	140	141	142	143	145	146	147	149
		Head Pressure	315	315	315	343	372	400	417	442	464	484	500	513
	80/67	Suction Pressure	146	147	148	149	150	151	152	153	155	156	158	159
		Head Pressure	315	315	315	343	372	400	428	453	476	496	513	527
	85/72	Suction Pressure	151	152	153	154	155	156	157	159	160	162	163	165
		Head Pressure	315	315	315	343	372	400	443	469	493	513	531	545
WR36	75/62	Suction Pressure	131	135	137	138	140	142	143	144	145	147	147	148
		Head Pressure	315	315	315	343	372	400	417	442	463	482	498	511
	80/67	Suction Pressure	140	144	146	148	150	151	153	154	156	157	158	159
		Head Pressure	315	315	315	343	372	400	428	453	475	494	511	524
	85/72	Suction Pressure	145	149	151	153	154	156	158	160	161	162	163	164
		Head Pressure	315	315	315	343	372	400	443	469	492	512	529	542
WR58	75/62	Suction Pressure	126	129	130	132	133	135	136	138	139	140	142	143
		Head Pressure	315	315	315	343	372	400	403	419	445	472	500	529
	80/67	Suction Pressure	134	138	139	141	142	144	146	147	149	150	152	153
		Head Pressure	315	315	315	343	372	400	410	429	456	484	513	543
	85/72	Suction Pressure	139	142	144	146	147	149	151	152	154	155	157	158
		Head Pressure	315	315	315	343	372	400	417	444	472	501	531	562

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

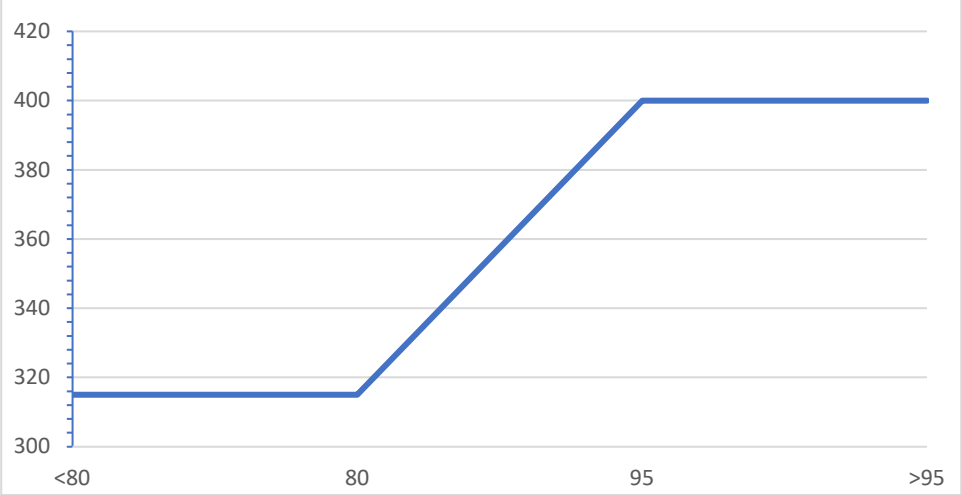
Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operating charge being in the system, the charge should be removed and system evacuated and recharged to serial plate charge weight.

NOTE: *Pressure table based on high speed condenser fan operation. If condensing pressures appear elevated check condenser fan wiring. See "Condenser Fan Operation" on page 26.*

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.

FIGURE 59
Condenser Fan/Head Pressure Setpoints



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. Disable system from LC6000 controller (see latest revision of LC6000 Service Instructions 2100-669).
2. Turn off AC breakers at wall-mount units.
3. Check inlet sides of condenser and evaporator coils for obstructions/debris—clean if necessary using a quality manufactured coil cleaning product specific for the evaporator or condenser coil.
   - Condenser coil: Remove the upper side panels from the condenser section. This will give clear access to the inlet side of the coil for cleaning. 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: 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. 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.
4. Manually spin fan and blower motors to ensure they turn freely. All motors are permanently lubricated, so no oil is necessary.
5. Inspect free cooling damper actuator and linkage.
6. Install new air filter; check for additional filter grilles internal to the structure.
7. Inspect the control panel of the system.
   - Look for insect or rodent activity and remove any nesting materials.
   - Manually push contactor closed, observe for movement—contactor points should have minimal discoloration, no spalling or other signs of arcing. Replace if doubtful.
   - Check field and factory wiring for tightness and look for signs of overheating (discoloration of terminals or wire insulation).
8. Ensure that supply and return registers are not obstructed, and more importantly, are not recycling the air to one another. Adjust supply louvers if necessary to direct discharge air away from any direct route to the return grille.
9. Re-assemble wall-mount unit, turn breakers back on.
10. Enable system to LC6000 controller (see latest revision of LC6000 Service Instructions 2100-669).
11. Repeat steps for additional wall-mount units.

Bard Guard Anti-Theft System Option

While the system is powered, push DISARM/RESET button to disarm the system. Once the button is pushed, the blue LED will illuminate. As long as the blue LED is illuminated, the Bard Guard system is disarmed and will remain disarmed depending on the preset time for up to 250 minutes (default approximately 15 minutes). After the preset time expires, the system will rearm automatically.

For situations that require an individual unit to be disconnected from the Bard Guard security system for an extended period of service time (longer than the maximum 250 minutes disarm time), place a jumper across the appropriate terminals on the BG1000 terminal block to temporarily remove the unit from the security system. **Be sure to remove the jumper from the terminals after service has been completed.**

See the latest revision of BG1000 Installation Instructions 2100-672 for information on operating the BG1000 controller.

8301-067 Outdoor Temperature/Humidity Sensor

8301-067 Sensor Connections

This unit utilizes a two wire 4-10mA 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 Figure 60 and Figure 61 for sensor wiring and terminal location.

Tables 13 and 14 on pages 47 and 48 are correlation charts for troubleshooting the sensor with a test meter:

Table 13: Temperature to Thermocouple Resistance
Table 14: Relative Humidity to Humidity Sensor Current Output

FIGURE 60
8301-067 Sensor Electrical Connections

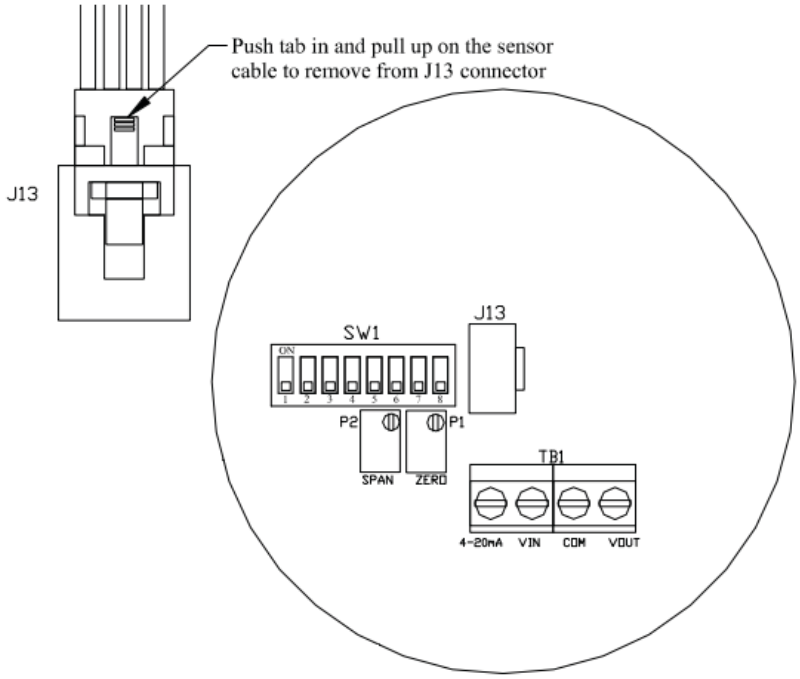


FIGURE 61
8301-067 Sensor Terminal Connections

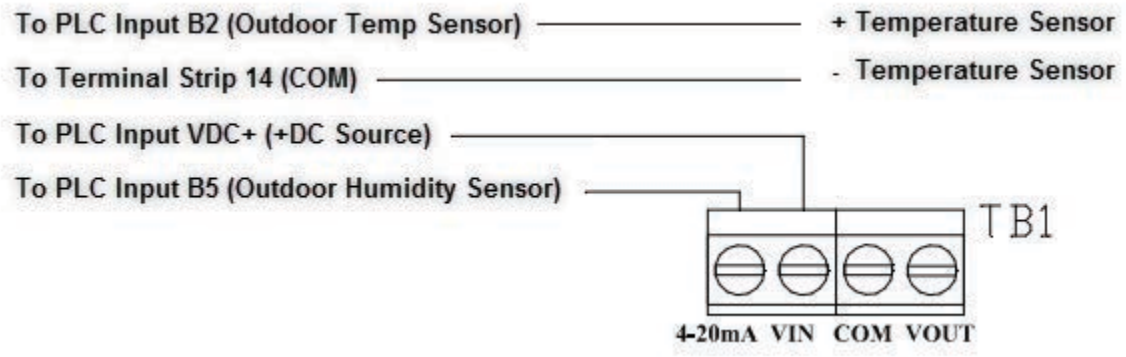


TABLE 13
8301-067 Sensor: Temperature to Thermocouple Resistance

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

TABLE 14
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

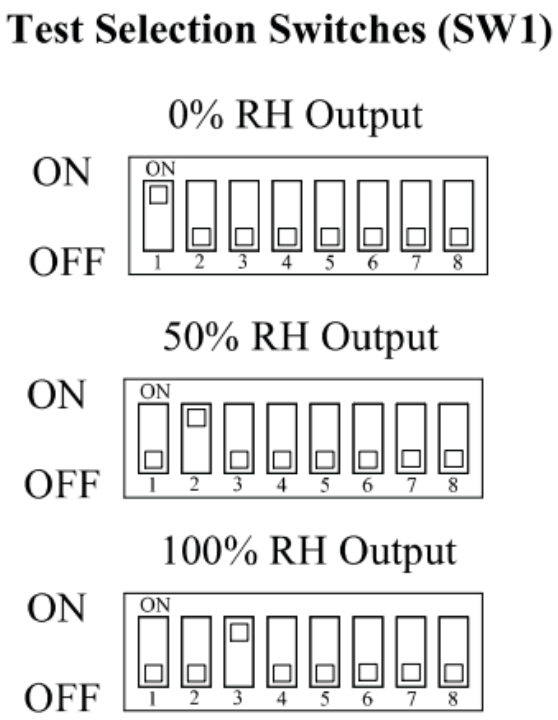
Humidity	Signal
% RH	mA
68	14.880
69	15.040
70	15.200
71	15.360
72	15.520
73	15.680
74	15.840
75	16.000
76	16.160
77	16.320
78	16.480
79	16.640
80	16.800
81	16.960
82	17.120
83	17.280
84	17.440
85	17.600
86	17.760
87	17.920
88	18.080
89	18.240
90	18.400
91	18.560
92	18.720
93	18.880
94	19.040
95	19.200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

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 62 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 62
8301-067 DIP Switch/Output Configuration

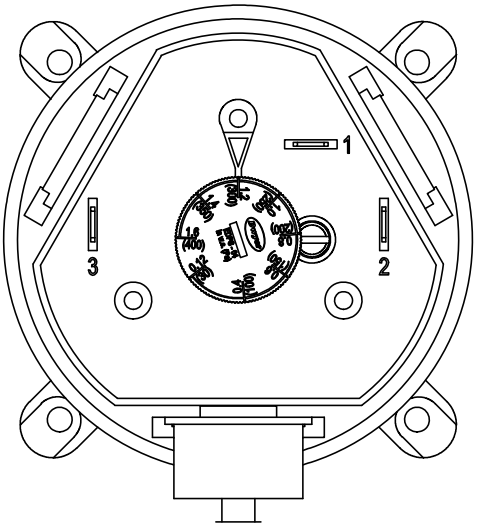


8301-067 Humidity Sensor Calibration

The 8301-067 sensor has the ability to be calibrated via the sensor control board through the use of the DIP switches and/or the use of ZERO P1 or SPAN P2. It is not advised to calibrate this sensor through these means. Any calibration for the unit operation can be done by applying an offset to the sensor input channel using the TEC-EYE service tool.

8301-057 Blower Status Switch/Dirty Filter Switch

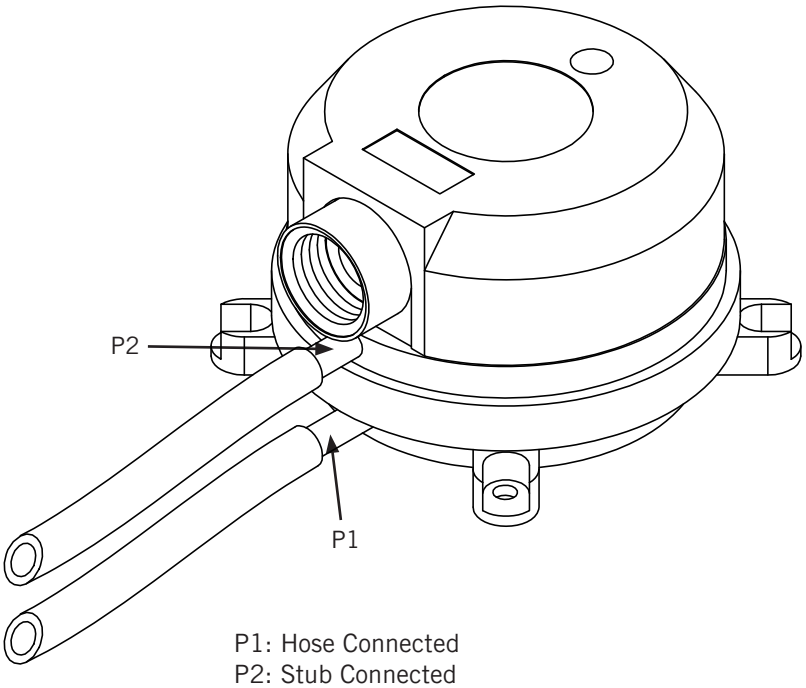
FIGURE 63
8301-057 Air Differential Switch Terminals



Terminals

1 – Normally Closed
2 – Normally Open
3 – Common

NOTE: *Contact position is in resting state.*



P1: Hose Connected
P2: Stub Connected

8301-073 Dust (Particulate) Sensor

TABLE 15
8301-073 Sensor: Dust/Volts

Dust	Signal	Dust	Signal	Dust	Signal
ppm	Vdc	ppm	Vdc	ppm	Vdc
0	0.00	105	1.70	210	3.40
3	0.05	108	1.75	213	3.45
6	0.10	111	1.80	216	3.50
9	0.15	114	1.84	219	3.54
12	0.19	117	1.89	222	3.59
15	0.24	120	1.94	225	3.64
18	0.29	126	1.99	228	3.69
21	0.34	126	2.04	231	3.74
24	0.39	129	2.09	234	3.79
27	0.44	132	2.14	237	3.83
30	0.49	135	2.18	240	3.88
33	0.53	138	2.23	243	3.93
36	0.58	141	2.28	246	3.98
39	0.63	144	2.33	249	4.03
42	0.68	147	2.38	252	4.08
45	0.73	150	2.43	255	4.13
48	0.78	153	2.48	258	4.17
51	0.83	156	2.52	261	4.22
54	0.87	159	2.57	264	4.27
57	0.92	162	2.62	267	4.32
60	0.97	165	2.67	270	4.37
63	1.02	168	2.72	273	4.42
66	1.07	171	2.77	276	4.47
69	1.12	174	2.82	279	4.51
72	1.17	177	2.86	282	4.56
75	1.21	180	2.91	285	4.61
78	1.26	183	2.96	288	4.66
81	1.31	186	3.01	291	4.71
84	1.36	189	3.06	294	4.76
87	1.41	192	3.11	297	4.81
90	1.46	195	3.16	300	4.85
93	1.50	198	3.20	303	4.90
96	1.55	201	3.25	306	4.95
99	1.60	204	3.30	309	5.00
102	1.65	207	3.35		

8612-061 Dust (Particulate) Sensor Control Board

8612-061 Control Board Output Signal Not Responsive to Dust

1. With a voltmeter, verify 24VAC present across 24VAC pin terminals.
   A. If 24VAC is not present, trace back wires to source.
2. Inspect and re-seat the dust sensor communication cable.
   A. Carefully remove the dust sensor communication cable from the dust sensor connector on the dust sensor alarm board and the dust sensor.
   B. Inspect communication cable for the following:
      i. Wires pulled out of the connectors.
      ii. Scars in insulation exposing bare wire.
   C. If communication cable is damaged:
      i. Replace communication cable.
   D. If communication cable is not damaged:
      i. Carefully reconnect the dust sensor communication cable to the dust sensor connector on the dust sensor alarm board and the dust sensor.
3. With a voltmeter, measure voltage between the following terminals:
   A. Component U1 pin 2 and terminal block pin 4 (see Figure 65).
      i. Should read 12VAC
   B. Component U1 pin 3 and terminal block pin 4 (see Figure 65).
      i. Should read 24VAC
   C. If voltage readings are correct:
      i. Replace 8301-073 dust sensor.
   D. If voltage readings are not correct:
      i. Replace 8612-061 dust sensor alarm board.

FIGURE 64
8612-061 Dust Sensor Alarm Board

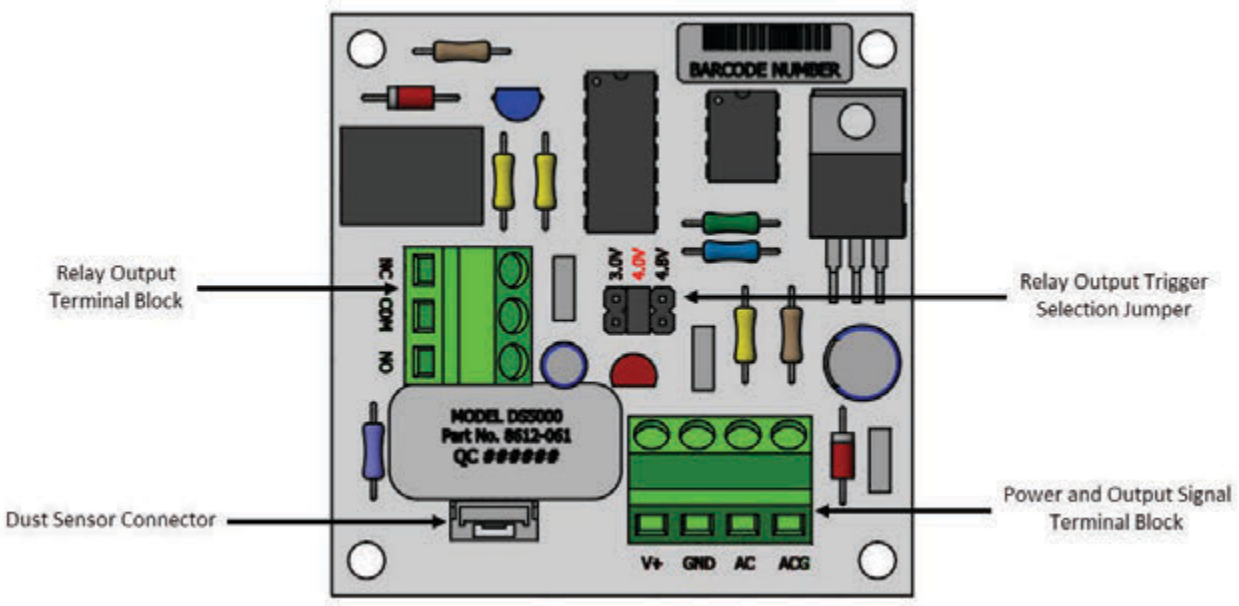
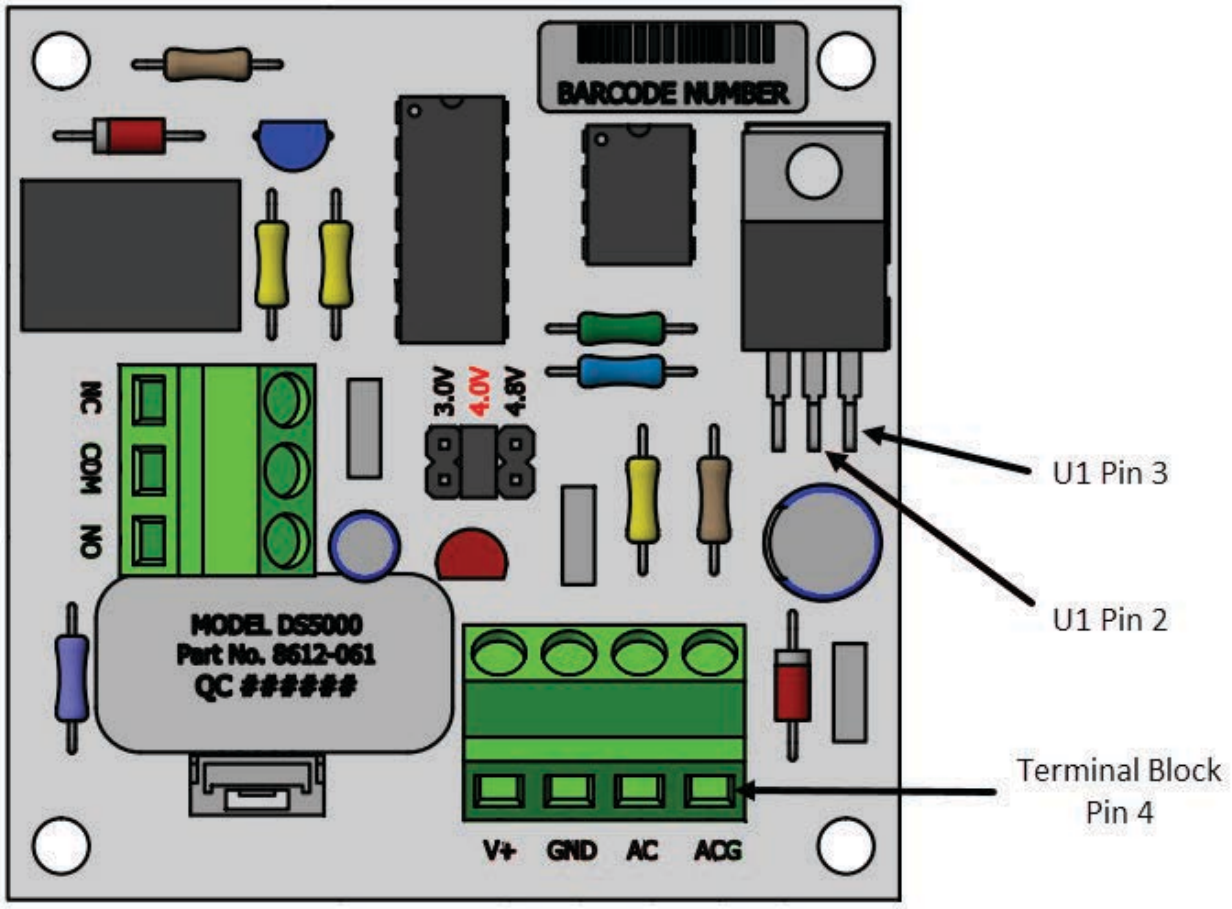


FIGURE 65
Dust Sensor Alarm Board Power Supply Check



8408-044 Return Air Sensor/Suction Sensor

TABLE 16
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 17
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

TABLE 18
8406-157 0-650psi 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 19
8406-158 0-250psi 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

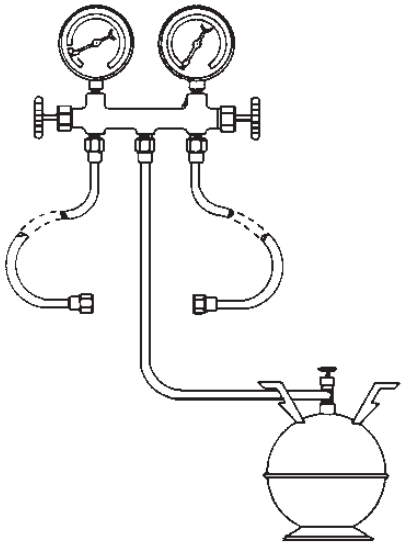
Pressure		Signal
PSI	Bar	Vdc
64	4.4	1.524
66	4.5	1.556
68	4.6	1.588
70	4.8	1.620
72	4.9	1.652
74	5.0	1.684
76	5.2	1.716
78	5.3	1.748
80	5.4	1.780
82	5.6	1.812
84	5.7	1.844
86	5.9	1.876
88	6.0	1.908
90	6.1	1.940
92	6.3	1.972
94	6.4	2.004
96	6.5	2.036
98	6.7	2.068
100	6.8	2.100
102	6.9	2.132
104	7.1	2.164
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

SERVICING PROCEDURE

R-410A
LEAK TEST EVACUATION
CHARGING



Bard Manufacturing Company, Inc.
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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

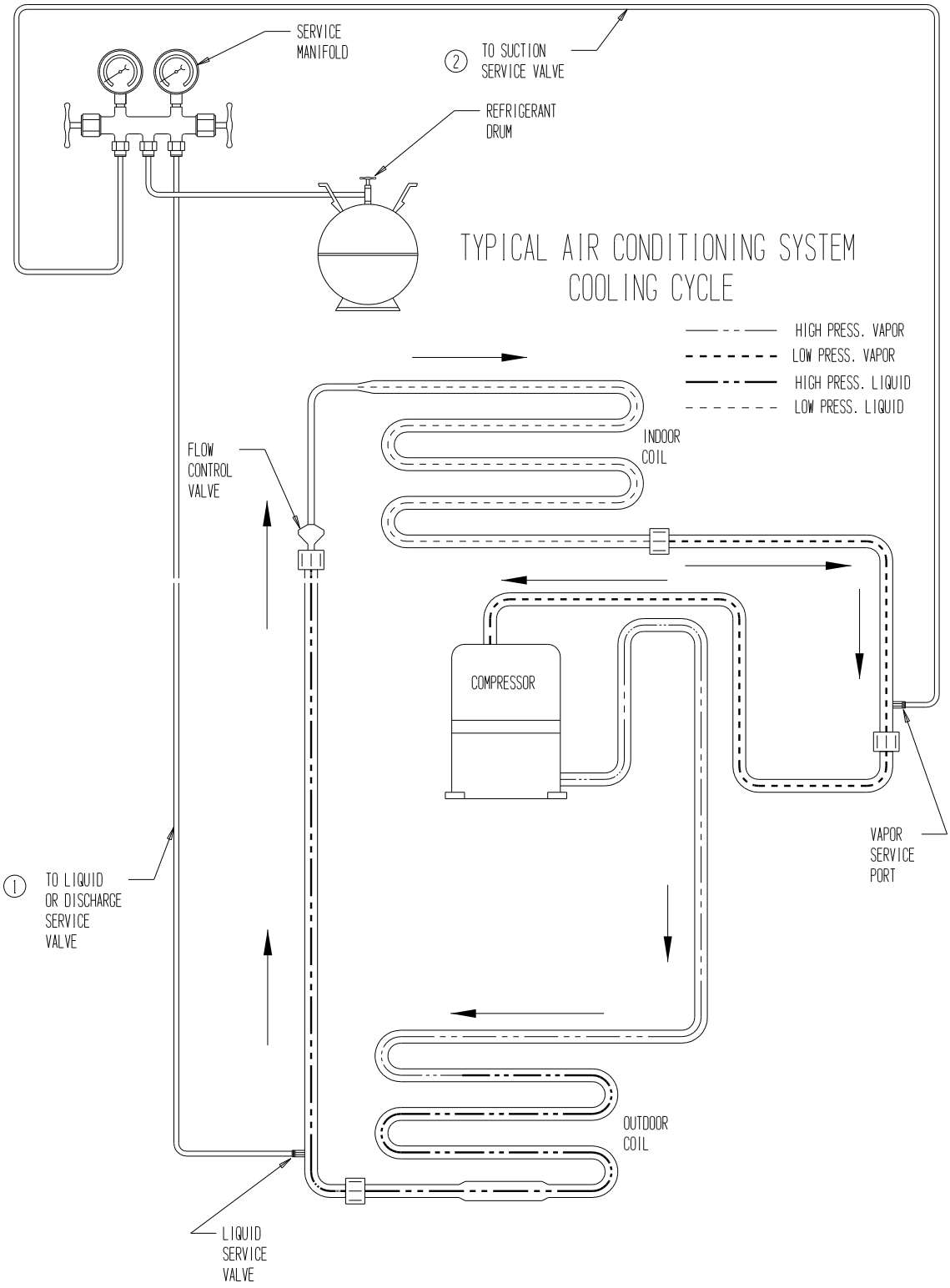
If the system has been open to the atmosphere, the filter dryer should be replaced and then evacuated. Then proceed as follows:

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

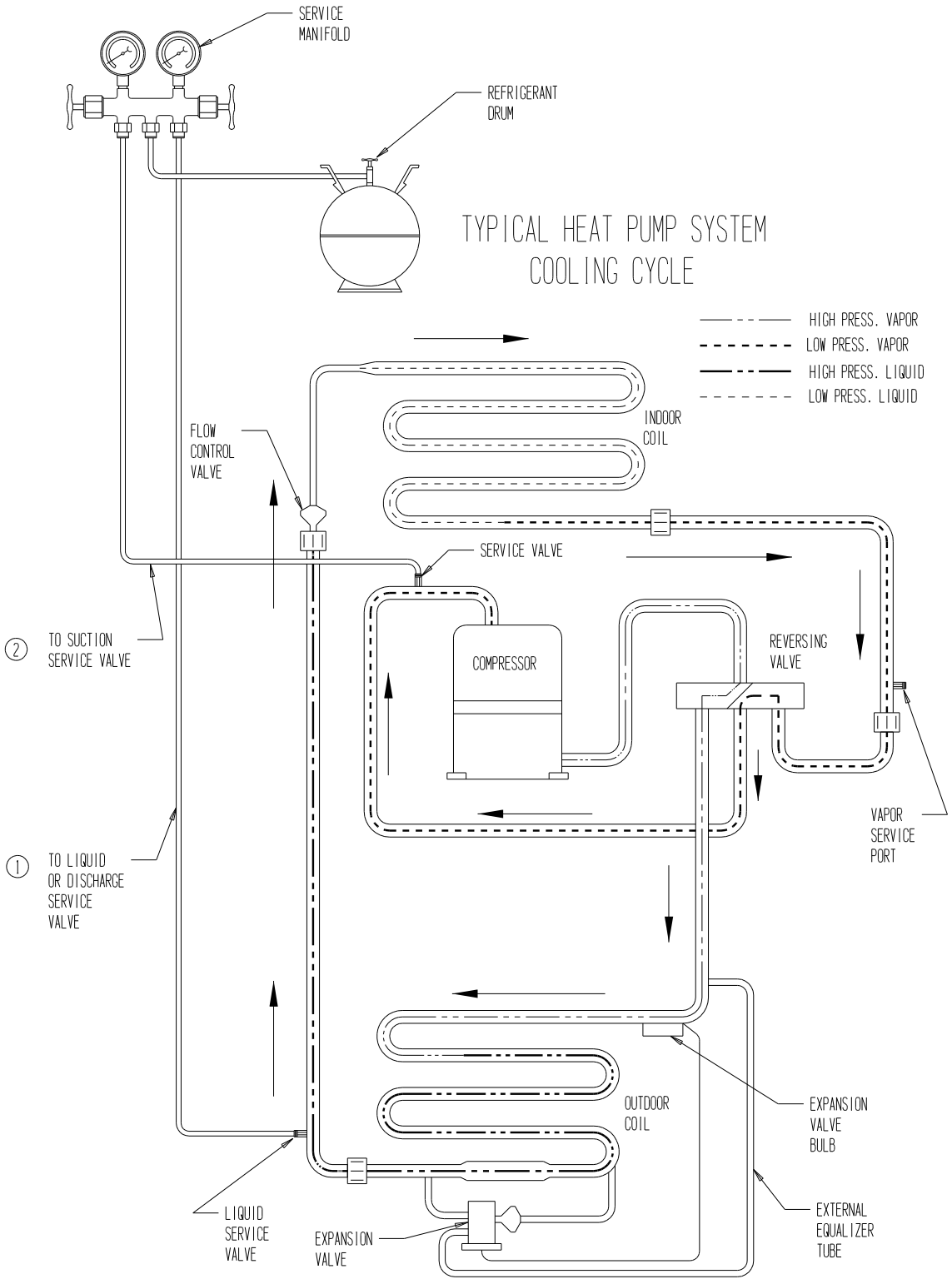
1. Connect manifold as instructed.
2. Place refrigerant drum upright on scale and determine exact weight of the refrigerant and cylinder.
3. With manifold suction valve closed and manifold discharge valve open, open refrigerant cylinder liquid valve and allow pressure in system to balance with pressure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

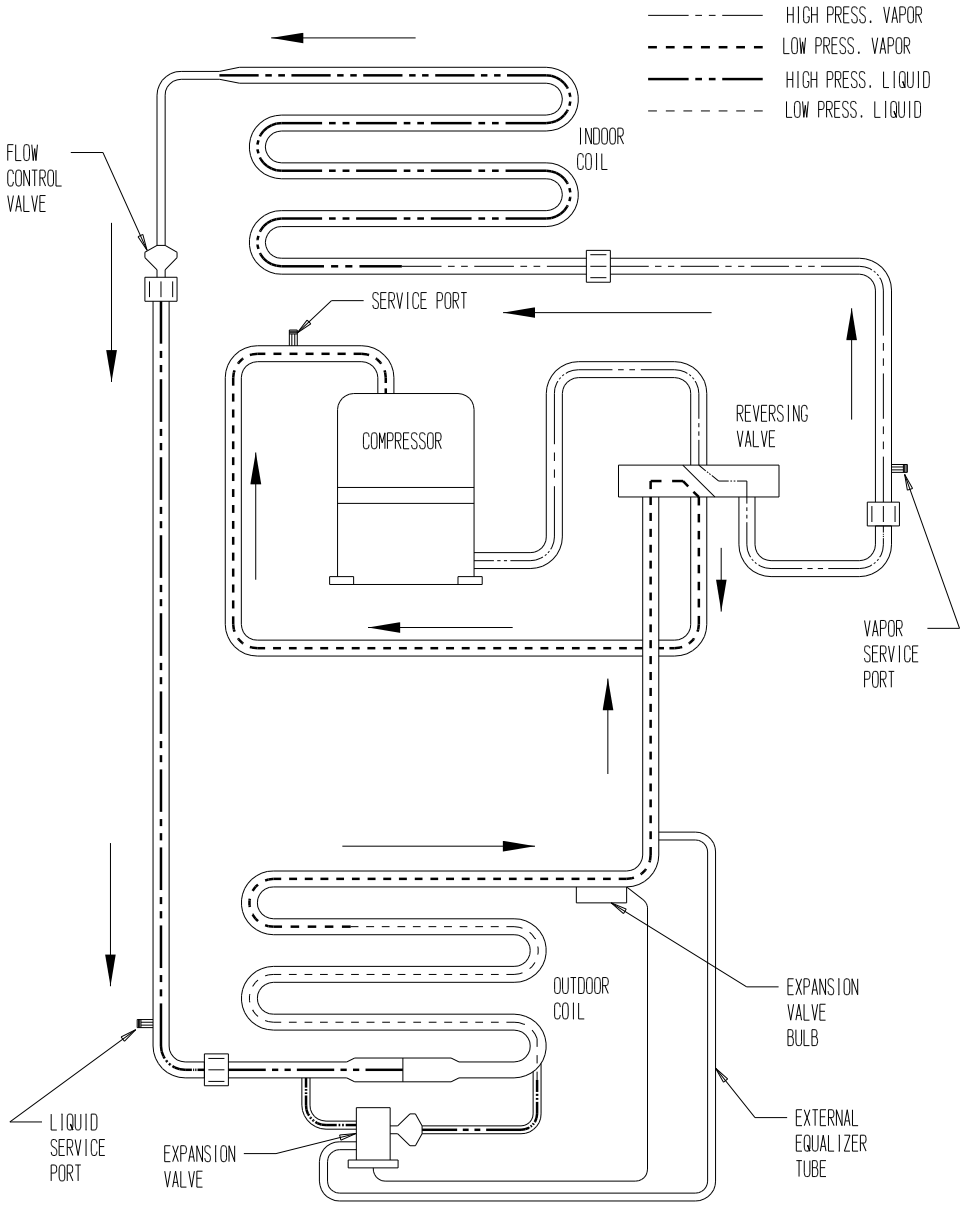


MIS-368

⚠ 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.

Power Supply

	Meter to Line Side of Contactor								Load Side of Contactor to Motor Terminal									
	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	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
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 (Control Circuit) / Motors

	Control Circuit									Motors			
	Faulty Wiring	Loose Terminals	Control Transformer	Low Voltage	Thermostat	Contactor Coil	Pressure Control	Condenser Fan Relay	Evaporator Fan Relay	Compressor Motor	Condenser Motor	Evaporator Motor	Compressor Off on Internal Overload
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					●								

High Pressure Side of System

	Compressor						System Operation								
	Hold Down Bolts	Defective Compressor Bearings	Seized Compressor	Defective Compressor Valves	Compressor Oil Level	Open or Short Motor Windings	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
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				◆			●				●				

High Pressure Side of System (Condenser Air) / Low Side / General

	Condenser Air					Evaporator Air (Low Side)						General					
	Condenser Fins Dirty or Plugged	Condenser Fan Belt Slipping	Condenser Air Short Circuiting	Low Condenser Air Volume	Condenser Air Temperature Low	Plugged or Restricted Metering Device	Evaporator Fins Dirty or Plugged	Evaporator Belt Slipping	Low Evaporator Air Volume	Dirty Filters	Ductwork Small or Restricted	Restrictions	Thermostat Setting	Thermostat Location	Stratified Air in Space	Incorrect Refrigerant Piping	System Too Small
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						◆	●	●	●	●	●		●	◆	◆	■	●

TROUBLESHOOTING CHART FOR AIR TO AIR HEAT PUMPS

- ● Denotes common cause.
- ◆ Denotes occasional cause.

Power Supply

		Line Voltage												Control Circuit							
Cycle	Symptom	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	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	●	●	●	●		◆	◆	◆	◆				●	●	●	◆	◆	●	●	
	Compressor will not run O.D. fan motor runs			●	●	●	◆	◆		●	●	●	●								
	Compressor "hums" but will not start			●	●	●	●	◆	◆		●	●	●								
	Compressor cycles on overload			●	●	●	◆	◆	◆	●	●	●	●								
	Compressor off on high pressure control																			◆	●
	Compressor noisy																				
	Head pressure too high																				
	Head pressure too low																				
	Suction pressure too high																				
	Suction pressure too low																				
	I.D. blower will not start	●	●	●	●									●	●	●	◆	◆			●
	I.D. coil frosting or icing-																				
	High compressor amps					●															
Cooling Cycle	Compressor runs continuously—no cooling																				
	Liquid refrigerant flooding back to compressor																				
Heating Cycle	Compressor runs continuously—no heating																				
	Defrost cycle initiates no ice on coil																				
	Reversing valve does not shift			●	●																
	Ice build up on lower part of O.D. coil																				
	Liquid refrigerant flooding back to compressor																				
	Auxiliary heat on I.D. blower off			●	●									●	●			◆			●
	Excessive operating costs			◆	◆													◆			
	Excessive ice on O.D. coil			◆	◆																

Outdoor Section

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

Indoor Section / Aux. Heat

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

Jobsite Startup and Commissioning Report

Shelter (Name/Number): _____

Commissioned By (Name): _____

Installation By (Company): _____

Installer Address/Phone No.: _____

Date Commissioned: _____

Shipping Inspection – Inspect each unit for the following:		
Yes	No	Do any of the units have visible damage from falling over during transit?
Yes	No	Are any of the Condenser Coils located at the upper front of each unit Damaged?
Yes	No	Are any of the Condenser fan assemblies located in the top of each unit damaged?
Yes	No	Inspect the lower front door and side panels of each unit. Are all door panels intact and air/water tight?
Yes	No	Inspect the blower wheel/housing by looking into the supply opening of each unit. Is the blower wheel centered and able to spin inside the blower housing?
Yes	No	Inspect all accessories including supply and return louvers. Are they free of damage?

Model and Serial Numbers of HVAC units		
Unit	Model Number	Serial Number
#1		
#2		
#3		
#4		

Model and Serial Number of Controller	
Model Number	Serial Number

HVAC Unit Installation – Verify the following:		
Yes	No	Verify rain flashing is installed at the top of each unit. Has caulk or sealant been applied per installation instructions to avoid water intrusion into each unit?
Yes	No	Verify all high voltage wire routing requirements are met. Are all conduit connections tightened and sealed for weatherization?
Yes	No	Verify all communication wire routing requirements are met. Are all conduit connections tightened and sealed for weatherization?
Yes	No	Are all HVAC Unit outdoor service and airflow clearances on the sides, front, bottom, and top met?
Yes	No	A 24” minimum distance is needed between the supply and return openings and equipment in the room. Are all HVAC Unit indoor supply and return clearances met?

Controller and Unit Communication Wiring – Verify the following:

Yes	No	Are EMI filters installed on the 2 wire shielded cable ran from the controller to the units?
Yes	No	A continuity check between the 2 communications wires with a multimeter will verify proper “+” and “-“connections have been made for the 2 wire shielded cable. This may be checked at the unit or controller. No continuity should be observed. If continuity is observed, check communications wire “+” and “-“connections for reversal. Has a continuity check been performed with a multimeter?
HVAC Unit #1 Setup – Verify the following:		
Yes	No	Is unit addressed as #1 using the TEC-EYE service tool?
Yes	No	Indoor blower, economizer, compressor, condenser fan, electric heat is operational?
		High Pressure (psi) measurement from TEC-EYE service tool.
		Low Pressure (psi) measurement from TEC-EYE service tool.
		Measure Voltage at unit circuit breaker with Multimeter. If power is below 220 Volts, disconnect power and move red wire on low voltage transformer to 208V terminal.
HVAC Unit #2 Setup – Verify the following:		
Yes	No	Is unit addressed as #2 using the TEC-EYE service tool?
Yes	No	Indoor blower, economizer, compressor, condenser fan, electric heat is operational?
		High Pressure (psi) measurement from TEC-EYE service tool.
		Low Pressure (psi) measurement from TEC-EYE service tool.
		Measure Voltage at unit circuit breaker with Multimeter. If power is below 220 Volts, disconnect power and move red wire on low voltage transformer to 208V terminal.
HVAC Unit #3 Setup – Verify the following:		
Yes	No	Is unit addressed as #3 using the TEC-EYE service tool?
Yes	No	Indoor blower, economizer, compressor, condenser fan, electric heat is operational?
		High Pressure (psi) measurement from TEC-EYE service tool.
		Low Pressure (psi) measurement from TEC-EYE service tool.
		Measure Voltage at unit circuit breaker with Multimeter. If power is below 220 Volts, disconnect power and move red wire on low voltage transformer to 208V terminal.
HVAC Unit #4 Setup – Verify the following:		
Yes	No	Is unit addressed as #4 using the TEC-EYE service tool?
Yes	No	Indoor blower, economizer, compressor, condenser fan, electric heat is operational?
		High Pressure (psi) measurement from TEC-EYE service tool.
		Low Pressure (psi) measurement from TEC-EYE service tool.
		Measure Voltage at unit circuit breaker with Multimeter. If power is below 220 Volts, disconnect power and move red wire on low voltage transformer to 208V terminal.
Jobsite Temperature Measurements – Record the following:		

		Outdoor Ambient Temperature
		Indoor Room Temperature
Controller Setup – Verify the following:		
Yes	No	Are all hard wired alarms (NOC) and/or Ethernet cable connected and functional?
Yes	No	Are all remote indoor temperature and humidity sensors connected and operational?
Yes	No	Is the time and date set in the controller?
Yes	No	Warm the indoor temperature and humidity sensor with a blow dryer or heat gun. Be careful not to overheat and damage the sensor. Do all units operate?
Yes	No	Clear all alarms in the controller. Do all alarms stay inactive (alarms clear)?
Yes	No	Are the supply and return grilles the correct model for the product?
Yes	No	Are all supply grille fins adjusted to force air towards the room floor?
		Record indoor temperature displayed on the controller.
		Record indoor humidity displayed on the controller.
		Power Supply Voltage at unit controller measured with Multimeter.
Controller Software Version:		
Final Jobsite review – Verify the following:		
Yes	No	Are all installation tools including driver bits, pliers, and screwdrivers accounted for?
Yes	No	Are all HVAC unit panels secured including control panel, filter, and front doors?
Yes	No	Are all alarms cleared from the controller?
Yes	No	If the site is monitored, have external parties received notification the job is complete?

Warranty Registration
Trained installers and contractors are eligible for an extended warranty. Go to www.bardhvac.com and select “Distributor Access”. Log into the extended warranty program using your username and password provided at the end of the training class. Standard warranty registration is available at www.bardhvac.com under “Warranty Registration”. ***When completed, store this document in the shelter with manuals for future reference.***

3D Barcode for Extended Warranty

3D Barcode for Standard Warranty

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®
SINCE 1914
Climate Control Solutions

Literature Assembly
911-0771-2
BOOK 2 OF 2

Contains the following:

2100-704(F)	Fusion Tec A/C Install Inst WR
2100-709	Fusion Tec Quick Start Guid WR
2110-1547(O)	Replacement Parts Manual

INSTALLATION INSTRUCTIONS

Bard Air Conditioning System

FUSION-TEC®
WR Series
Wall-Mount
Air Conditioner

LC6000-200
Supervisory
Controller

Bard® SINCE 1914
Climate Control Solutions

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

Manual: 2100-704F
Supersedes: 2100-704E
Date: 10-22-21

CONTENTS

FIGURES

TABLES

⚠ WARNING

Electrical shock hazard.

Have a properly trained individual perform these tasks.

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

⚠ WARNING

Fire hazard.

Maintain minimum 1/4" clearance between the supply flange and combustible materials.

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

⚠ CAUTION

Cut hazard.

Wear gloves to avoid contact with sharp edges.

Failure to do so could result in personal injury.

GENERAL INFORMATION

Air Conditioning System

This Bard air conditioning system is composed of FUSION-TEC WR Series wall-mounted air conditioners matched with an LC6000 lead/lag controller. The wall mounts are specifically engineered for telecom/motor control center rooms.

NOTE: *The LC6000 lead/lag controller and FUSION-TEC WR Series wall-mount units are designed specifically to work together. The controller cannot run other Bard models or other brands of systems, nor can other controllers run the WR Series wall-mount units. They are a complete system, and must be used together.*

Wall-Mount Air Conditioner Units

The Fusion-TEC WR Series wall-mount units operate on VAC power. The units will supply 100% of rated cooling airflow in free cooling mode with ability to exhaust the same amount through the unit itself without any additional relief openings in the shelter.

Each of these units are fully charged with refrigerant and may have optional auxiliary heat.

Controller

LC6000 controller and accessories are shown below.

LC6000-200 Series Controller and Accessories Included with Controller

(1) LC6000 Programmable Logic Controller

(1) TEC-EYE™ Hand-Held Diagnostic Tool
Bard P/N 8301-059

(1) Remote Temperature/Humidity Sensor[1]
Bard P/N 8403-079

(1) 35' 5-Wire 18 Gauge Shielded Cable

(2) Communication EMI Filters
Bard P/N 8301-055

Optional Sensors:

Outside Air
Temperature/Humidity Sensor
Bard P/N 8301-090

Remote
Temperature/Humidity Sensor[1]
Bard P/N 8403-079

Remote
Temperature Only Sensor
Bard P/N 8301-058

[1] One remote temperature/humidity sensor is included with the LC6000 controller. If the site in which the LC6000 controller will be used has more than one zone (maximum three zones per LC6000), additional remote temperature/humidity sensors (one sensor per zone) will need to be purchased and installed in the additional zones. One additional temperature-only sensor (Bard P/N 8301-058) may also be used in Zone 1 but will also need to be purchased separately. Additional temperature/humidity sensors require field-supplied 5-wire 18 gauge shielded cable. Temperature-only sensors require field-supplied 2-wire 18 gauge shielded cable.

General

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

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

The unit is designed for use without duct work. Flanges are provided for transition from unit to wall grilles. A field-supplied wall sleeve may be necessary between the supply and return flanges and grilles.

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 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.

Sizing of systems for proposed installation should be based on heat loss and heat gain calculations made according to methods of Air Conditioning Contractors of America (ACCA). The supply flange 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 cartons 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. These units must remain in upright position at all times.

Additional Publications

These publications can help when installing the air conditioner. 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 Residential Winter and Summer Air Conditioning..... ACCA Manual J

For more information, contact these publishers:

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

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

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

National Fire Protection Association (NFPA)
Batterymarch Park
P. O. Box 9101
Quincy, MA 02269-9901
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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.

LIST OF NECESSARY MATERIALS/TOOLS

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.

List of Materials/Tools

- Personal protective equipment/safety devices/ anti-static wrist straps
- SGR-5W Supply Grille and RGR-5W Return Grille
- Field-fabricated sleeves (if necessary)
- Bottom mounting bracket #113-140 (optional)
- Fasteners sufficient for mounting the units such as 5/16" diameter anchor/lag bolts
- 7/8" diameter washers
- Fasteners appropriate for the shelter wall construction to attach the controller to the wall
- Commercial grade outdoor silicone sealant
- Miscellaneous hand and power tools and jobsite or shop materials
- Lifting equipment with the necessary capacity and rigging to safely move/install the systems
- Water to prime drain traps
- Electrical supplies
  - Various size circuit breakers for the shelter AC breaker box (see Table 3 on page 18)
  - High-voltage wire of various gauges (see Table 3)
  - 16 gauge minimum, 14 gauge maximum power wire to connect controller to shelter power source
  - 5-wire, 18 gauge shielded cable for remote temperature and humidity sensors (2-wire, 18 gauge shielded cable for temperature-only sensors)
  - Communication wire: 2-wire, 18 gauge, shielded with drain
  - 18 gauge non-shielded wire for connecting smoke detector, hydrogen detector and/or generator, if applicable, to controller
  - CAT 6 Ethernet cable of field-determined length (for remote communication, if applicable)
  - 2 hole grounding lug (to be used with supplied 1/4" bolts and nuts for grounding controller box)
  - Miscellaneous electrical supplies including rigid/flexible conduit and fittings, 2" x 4" junction boxes (one per temperature/humidity sensor), wire connectors and supports

Model Identification

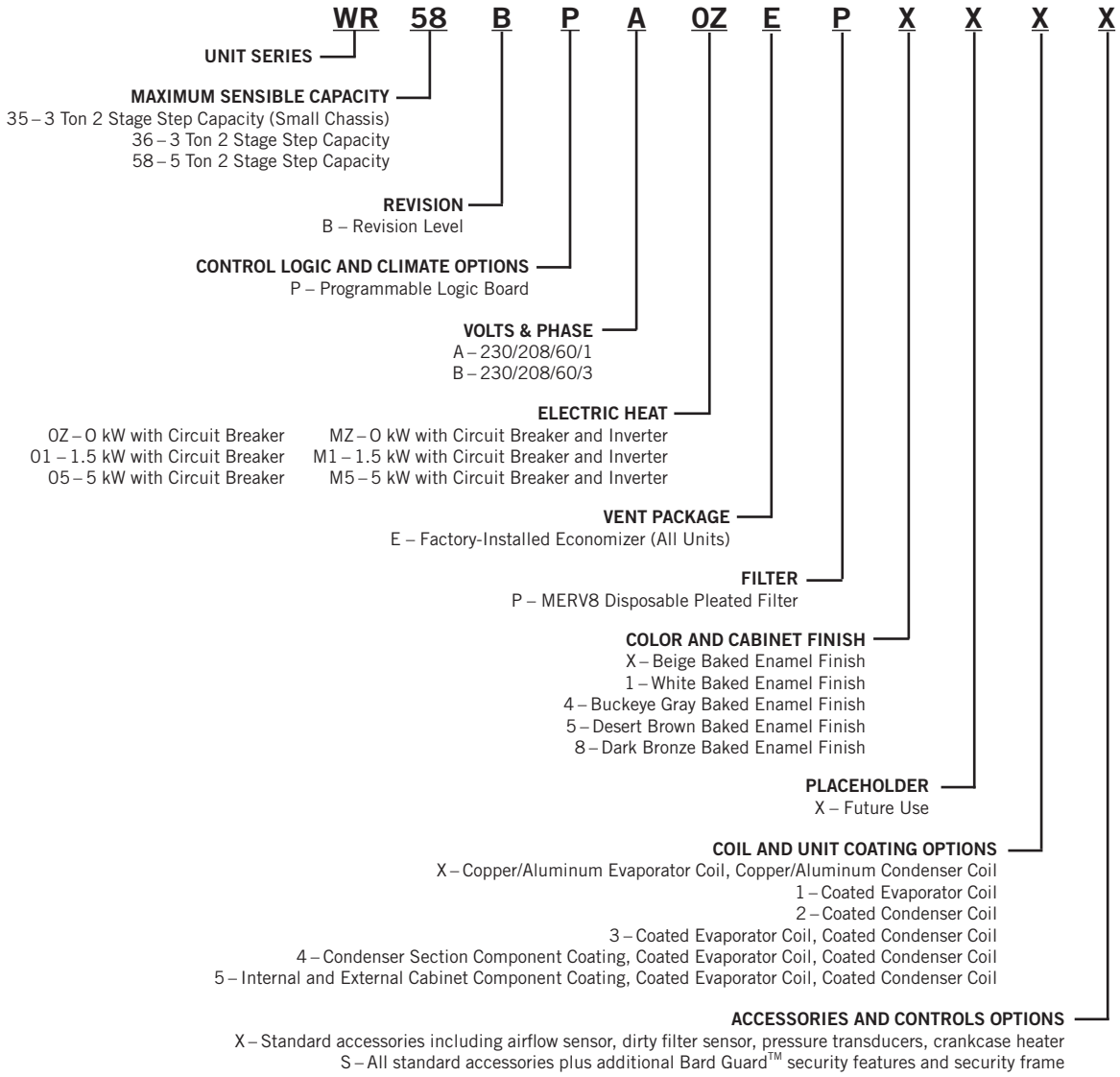
Identify the specific model using the model nomenclature information found in Figure 1 and the model/serial tag found on the unit. See Figure 2 on page 9 for dimensions and critical installation requirements.

New Shelter Installation vs. Retrofit Installation

These installation instructions cover both new shelter installations and retrofit installations. Each installation is unique and may require special accommodations and modifications. Although Bard Manufacturing follows a long-established tradition of manufacturing equipment using industry standard dimensions for building penetration, it is occasionally necessary to move or enlarge supply and return openings when replacing non-standardized equipment in a retrofit application.

IMPORTANT: *All retrofit installations require any existing supply and return grilles be removed and discarded. This is a counterflow unit and requires specified grilles to ensure proper system performance.*

FIGURE 1
FUSION-TEC WR Series Wall-Mount Unit Model Nomenclature



Minimum Clearance

Counter flow wall-mount air conditioner models have a removable lower front service panel that allows access to the control panel, blower, compressor, circuit breakers and heat strip. There is a hinged access panel on both sides for filter change and evaporator coil service.

The upper side panel is removable to allow access to condenser fan, condenser coil and filter drier. The design allows for installations to place units within close proximity without complicating maintenance and repair.

To maintain full serviceability, side-by-side installations require 15" of clearance between units.

The condenser discharge air exits through the top of the unit. Although this reduces the potential for recirculation, it is still critical to system performance that any obstruction, shrubbery or structure adhere to minimum clearances listed (see Table 1).

For overhangs not exceeding 12" from exterior wall, minimum allowable clearance from top of unit to bottom of overhang should be no less than 5". For overhangs greater than 12" from exterior wall, minimum allowable clearance from top of unit to bottom of overhang should be no less than 10".

Clearance to Combustibles

The unit itself is suitable for 0" clearance, but the supply air flange requires a minimum of 1/4" clearance to combustible material. However, it is generally recommended that a 1" clearance is used for ease of installation and maintaining the required clearance to combustible material. See Figure 8 on page 13 for details on opening sizes.

⚠ WARNING

Fire hazard.

Maintain minimum 1/4" clearance between the supply flange and combustible materials.

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

TABLE 1
Clearance Required for Service Access and Adequate Condenser Airflow

Model	Side(s)	Discharge (Top) Overhang 12" or less	Discharge (Top) Overhang Exceeding 12"	Intake (Base)	Front of Unit	Shelter Equipment from Supply Grille
WR35 WR36 WR58	15"	5"	10"	15" from Snowline	36"	24"

TABLE 2
Minimum Clearances Required to Combustible Materials

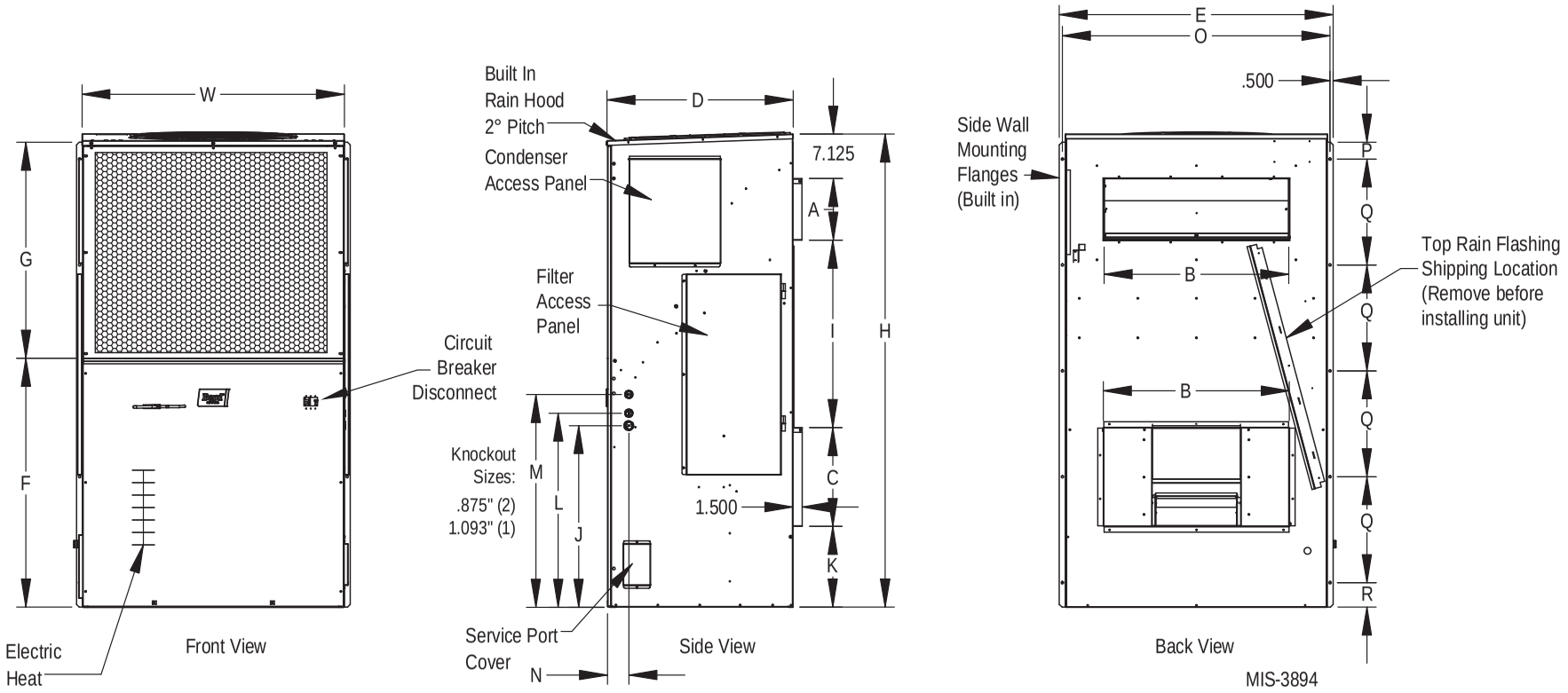
Model	Supply Air Flange	Cabinet
WR35 WR36 WR58	1/4"	0"

FIGURE 2

Dimensions of Basic Unit for Architectural and Installation Requirements (Nominal)

Model	Width (W)	Depth (D)	Height (H)	Return		Supply														
				A	B	C	B	E	F	G	I	J	K	L	M	N	O	P	Q	R
WR35	36.86	27.33	71.61	7.75	27.75	13.77	27.75	38.94	41.88	29.73	18.06	31.08	21.27	33.08	36.08	3.45	37.92	2.33	16.00	3.92
WR36 WR58	42.00	30.00	76.00	9.88	29.88	15.88	29.88	44.00	40.00	34.13	30.00	29.13	13.00	31.13	34.13	3.50	43.00	2.69	17.00	3.88

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



WALL-MOUNT UNIT MOUNTING

Mounting the Units

⚠ WARNING

Heavy item hazard.

Use more than one person to handle unit.

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

NOTE: *It may be best to spot some electrical knockouts (such as those located on the sides of the wall-mount unit) before units are mounted and access is unavailable or limited (see Figure 2 to locate pre-punched knockouts).*

Two holes for the supply and return air openings must be cut through the wall as shown in Figure 8 on page 13. On wood frame walls, the wall construction must be strong and rigid enough to carry the weight of the unit without transmitting any unit vibration. All walls must be thoroughly inspected to ensure that they are capable of carrying the weight of the installed unit.

In retrofit (unit replacement) installations, the openings cut for the original equipment may not line up exactly with needs of this installation. Modifications may need to be made, such as increasing or decreasing the size of the wall cutouts. The existing bolt placement may not line up in which case the original bolts would need to be removed or cut away.

These units are secured by full-length mounting flanges built into the cabinet on each side. An optional bottom mounting bracket (purchased separately) is available, but not required.

The unit itself is suitable for 0" clearance, but the supply air flange requires a minimum of 1/4" clearance to combustible material. However, it is generally recommended that a 1" clearance is used for ease of installation and maintaining the required clearance to combustible material. See Figure 8 for details on opening sizes.

IMPORTANT: *When removing the shipping pallet from beneath the wall unit,* ***do not*** *loosen or remove any of the screws from either side of the unit.*

1. Locate and mark lag bolt locations on both sides and location for optional bottom mounting bracket, if desired (see Figure 8).

NOTE: *Top rain flashing is attached to back of unit for shipping purposes. Be sure to remove this flashing before installing unit.*

2. If desired, hook top rain flashing under back bend of top.
3. Position unit in opening and secure with fasteners sufficient for the application such as 5/16" lag/anchor bolts; use 7/8" diameter flat washers on the lag bolts. It is recommended that a bead of commercial grade outdoor silicone sealant caulk be placed behind the side mounting flanges.

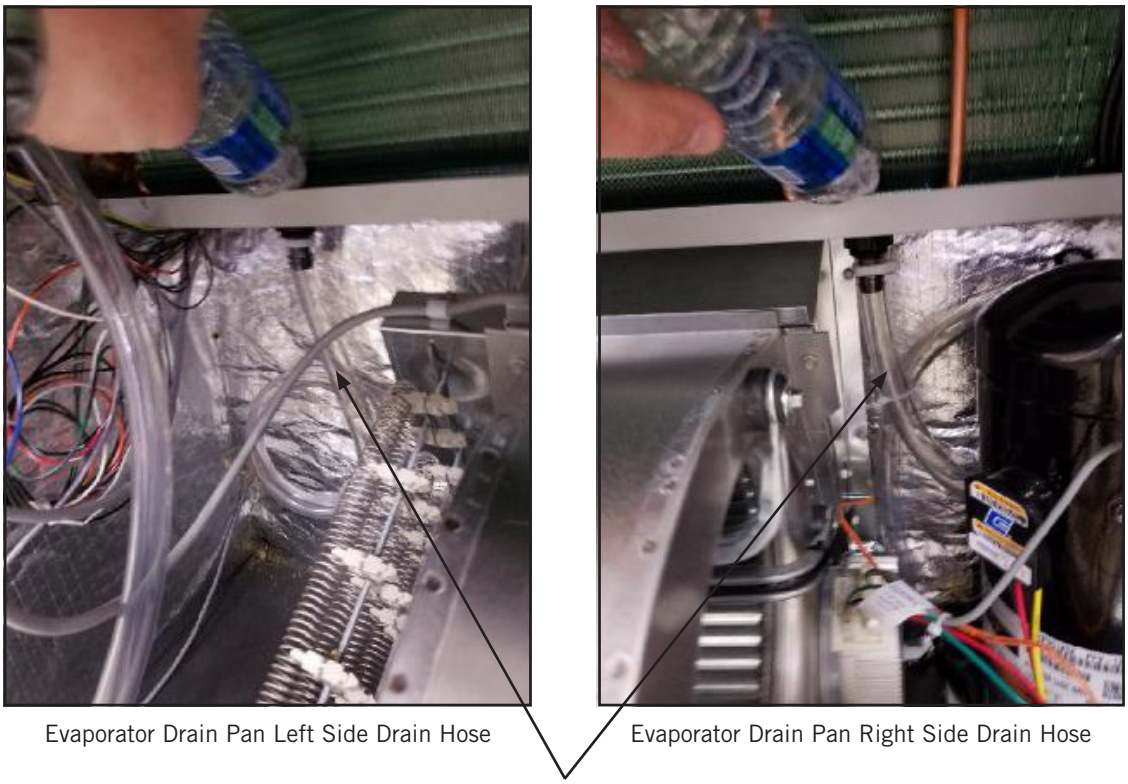
NOTE: *Opening and removing the filter access door from each side may make fastening unit to wall easier.*

4. Secure optional rain flashing to wall and caulk around entire unit (see Figure 8).
5. 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 observe required clearance if combustible wall.
6. Four plastic drain hoses extend from the condenser and evaporator drain pans. The drain hoses are secured to fittings mounted to the unit base.

NOTE: *At the time of installation, Bard highly recommends prefilling of the traps on both of the indoor drain pan hoses to ensure proper unit drainage at start. The water traps can easily be seen with the front service panel removed. To fill traps, pour water into both sides of evaporator drain pan until the drain hoses are visibly full (see Figure 3).*

A unique feature of the FUSION-TEC WR Series wall-mount unit is the ability to hang the front service panel on the unit in a position that allows full access to the control panel (see Figure 4) while the unit remains fully functional for troubleshooting and testing. To do this, remove the panel and hook top lip of panel into bottom channel of control panel. For added front panel stability, use several of the screws that were removed to temporarily connect the panel to the unit.

FIGURE 3
Prefilling Traps on Indoor Drain Pan Hoses



Evaporator Drain Pan Left Side Drain Hose

Evaporator Drain Pan Right Side Drain Hose

Pour water into evaporator drain pan directly above left and right drain fittings until coiled drain tubes in blower section are visibly full.

FIGURE 4
Hanging Front Access Panel to Allow Access to Control Panel

Supply Air Grill Installation

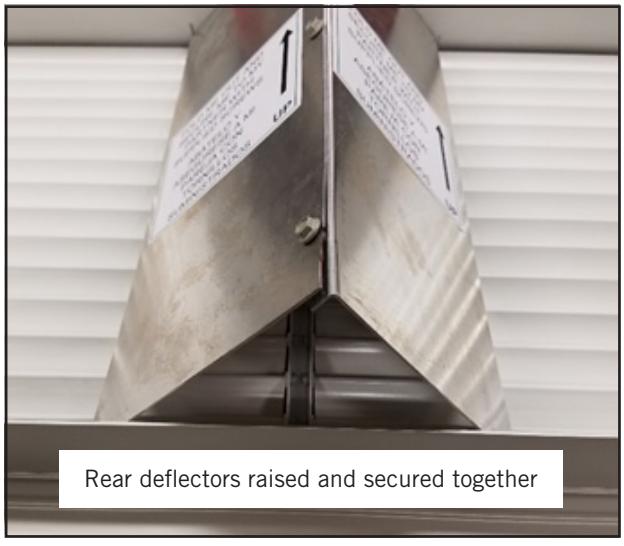
Bard model SGR-5W grille is custom designed for utilization with Bard wall-mount unit WR**BP* for optimizing the air flow pattern and distribution to minimize recirculation issues, and optimizing airflow patterns within the shelter. It is engineered to ensure that the distributed air is forced in a downward and outward direction to eliminate obstructions and such from causing the distributed air from stratifying close to the unit and getting drawn back into the return air opening. With the optimized air pattern, the shelter should experience distributed air at the opposite end of the room.

To accomplish this, the grille has two special features:

1. The grille has a specialty fold-out diverter on the backside of the grille that directs the supply airflow in an outward pattern, thereby eliminating the potential for the obstruction of supply air if equipment would be directly mounted in front of the unit. The rear deflectors must be folded out and secured by the installer with the supplied screws (see Figure 5).
2. The grille is also equipped with downward curved diverter blades to ensure a smooth and efficient means of directing the air pattern in a downward pattern, and away from being drawn back into the return air opening. The curved diverter blades are shipped in the flat position and need to be folded out to between 75-90° (best tuned to each individual structure). See Figures 6 and 7.

FIGURE 5
Fold-Out Diverter

Rear deflectors as shipped



Rear deflectors raised and secured together

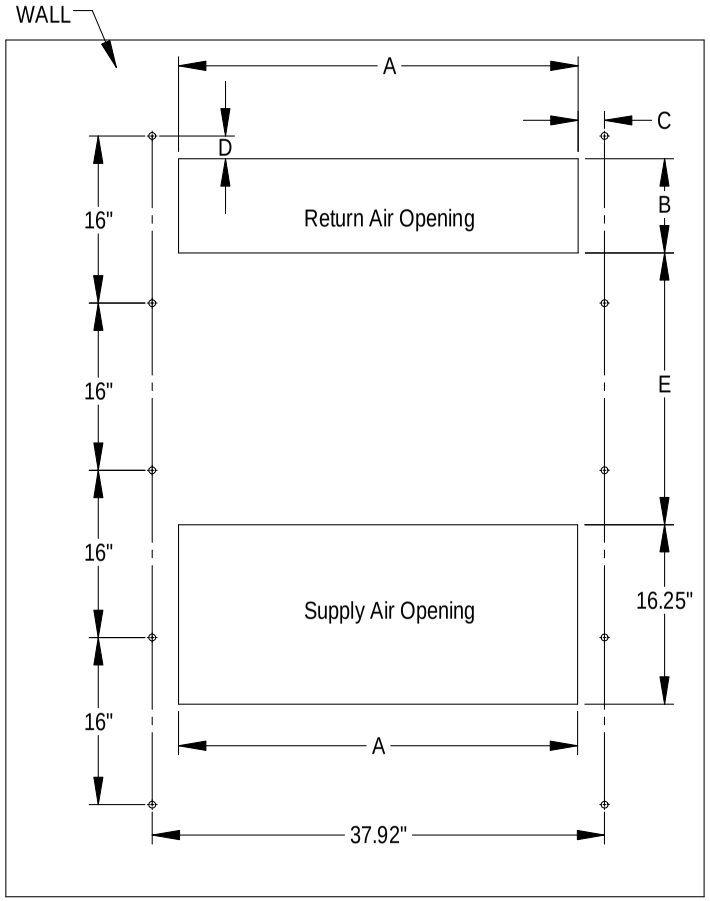
FIGURE 6
Downward Curved Diverter Blades

Diverter blades as shipped (left), and after raising (right)

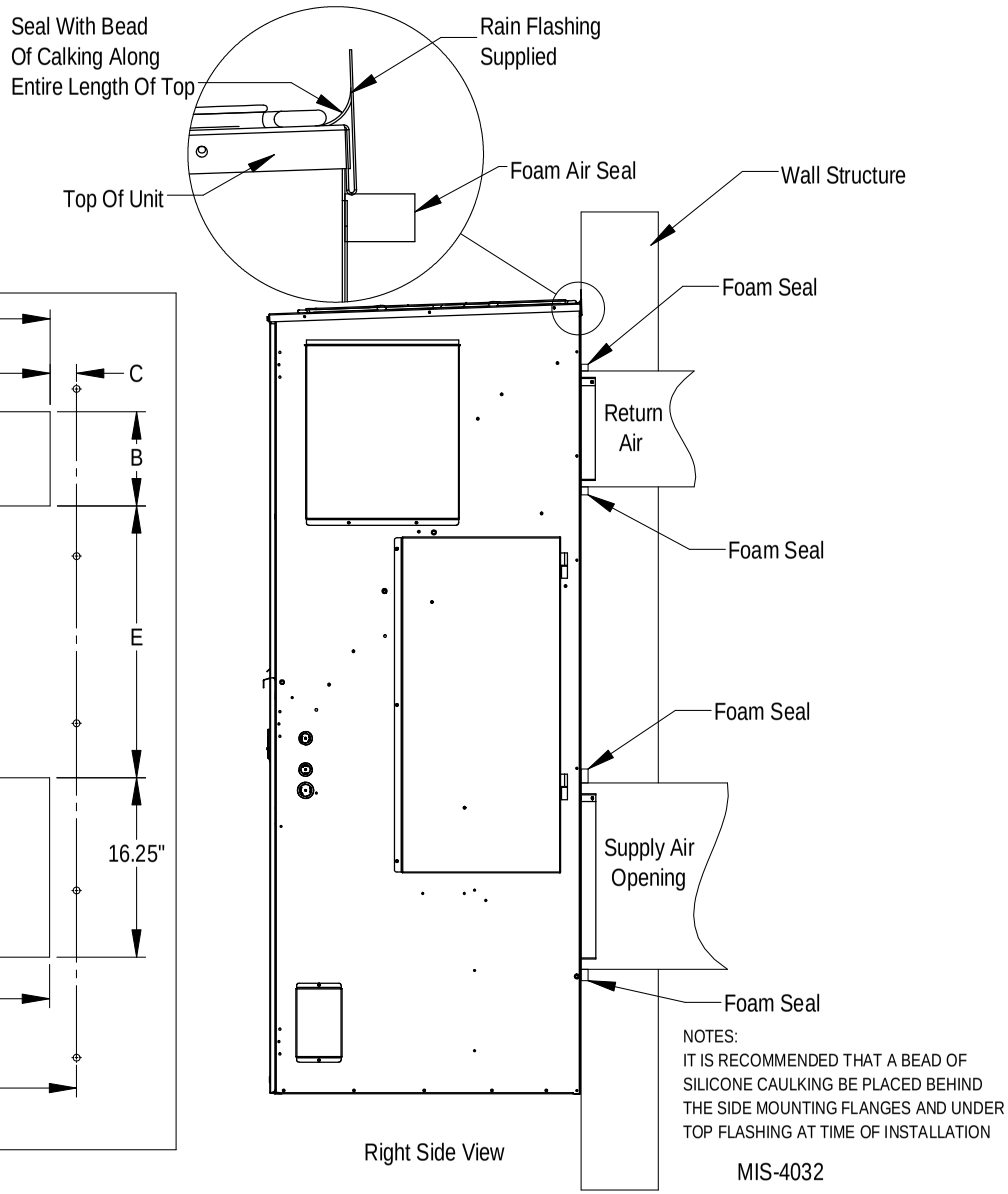
FIGURE 7
View of Installed Grille (as seen from above)

FIGURE 8
WR35 Mounting Instructions

	A	B	C	D	E
REQUIRED DIMENSIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	$28\frac{3}{8}$	$8\frac{3}{8}$	$4\frac{3}{4}$	$6\frac{3}{4}$	$17\frac{5}{8}$
REQUIRED DIMENSIONS TO MAINTAIN 1" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	$29\frac{7}{8}$	$9\frac{7}{8}$	4"	6"	$16\frac{7}{8}$



Wall Opening and Hole Location View



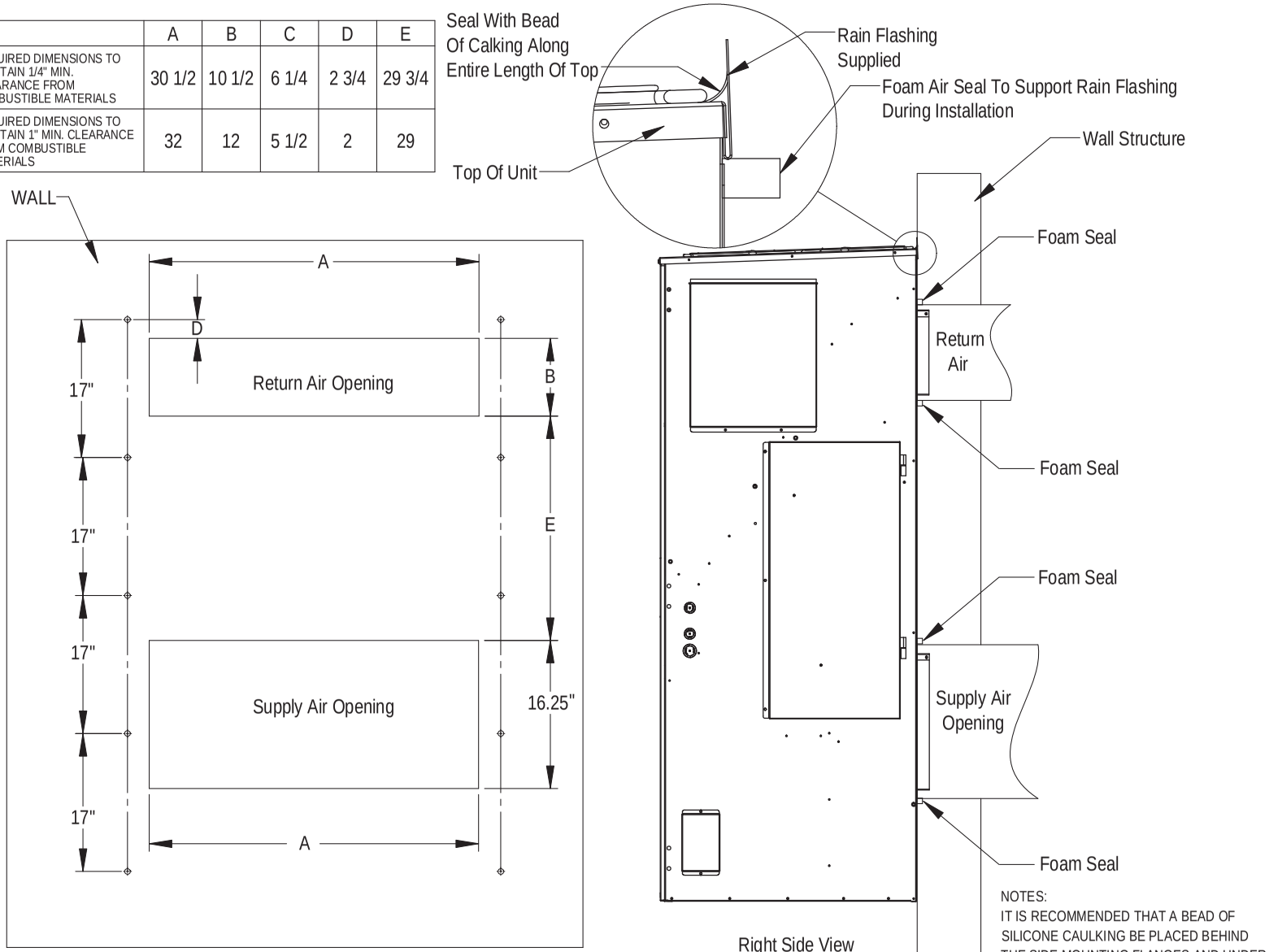
Right Side View

NOTES:
IT IS RECOMMENDED THAT A BEAD OF SILICONE CAULKING BE PLACED BEHIND THE SIDE MOUNTING FLANGES AND UNDER TOP FLASHING AT TIME OF INSTALLATION

MIS-4032

FIGURE 9
WR36/WR58 Mounting Instructions

	A	B	C	D	E
REQUIRED DIMENSIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	30 1/2	10 1/2	6 1/4	2 3/4	29 3/4
REQUIRED DIMENSIONS TO MAINTAIN 1" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	32	12	5 1/2	2	29



Wall Opening and Hole Location View

MIS-3898

FIGURE 10
Electric Heat Clearance

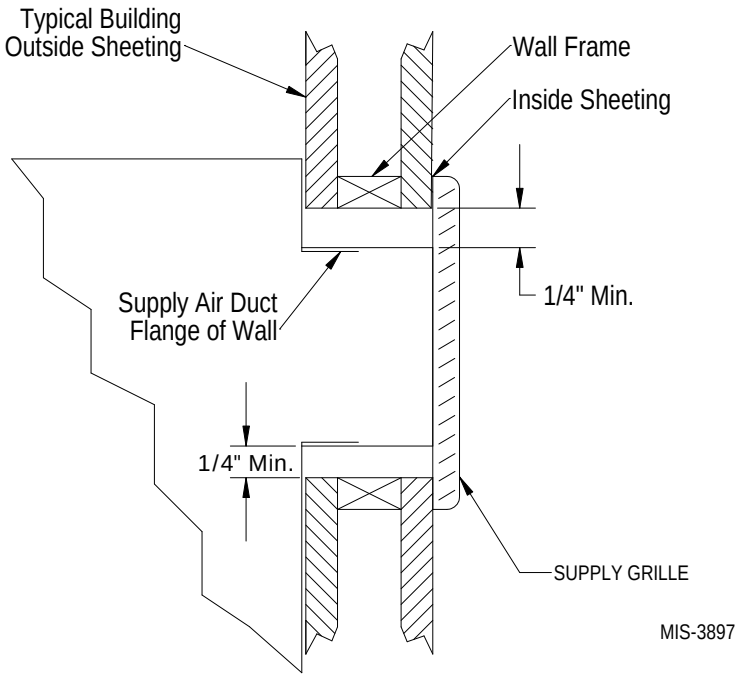
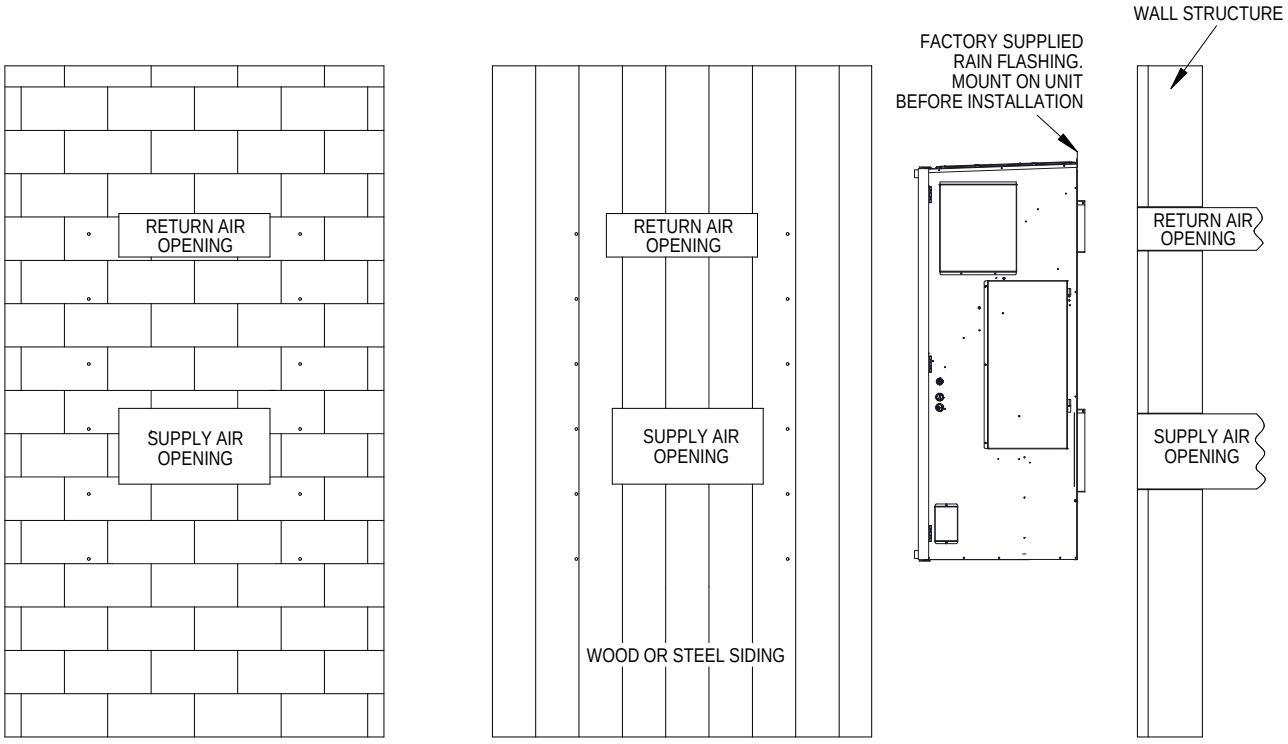


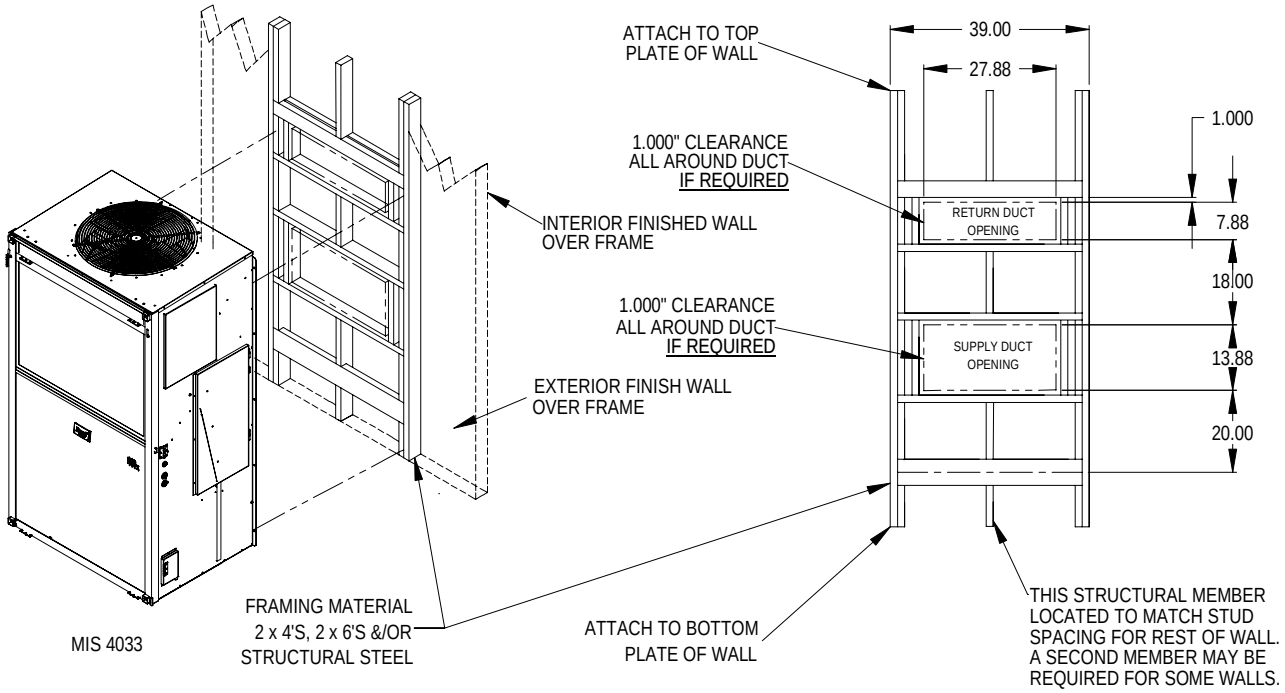
FIGURE 11
Wall Mounting Instructions



CONCRETE BLOCK WALL INSTALLATION *WOOD FRAME WALL INSTALLATION* *SIDE VIEW* MIS-3896

FIGURE 12
Wall Mounting Instructions

WR35 Models



WR36/WR58 Models

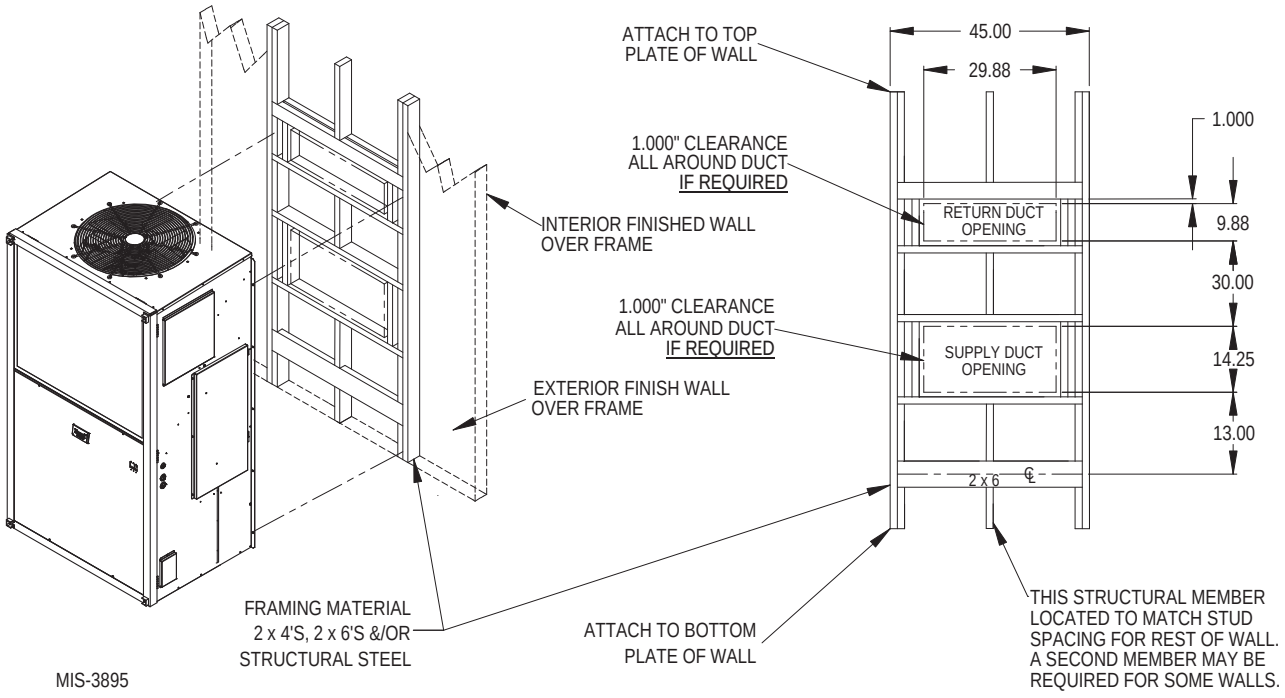
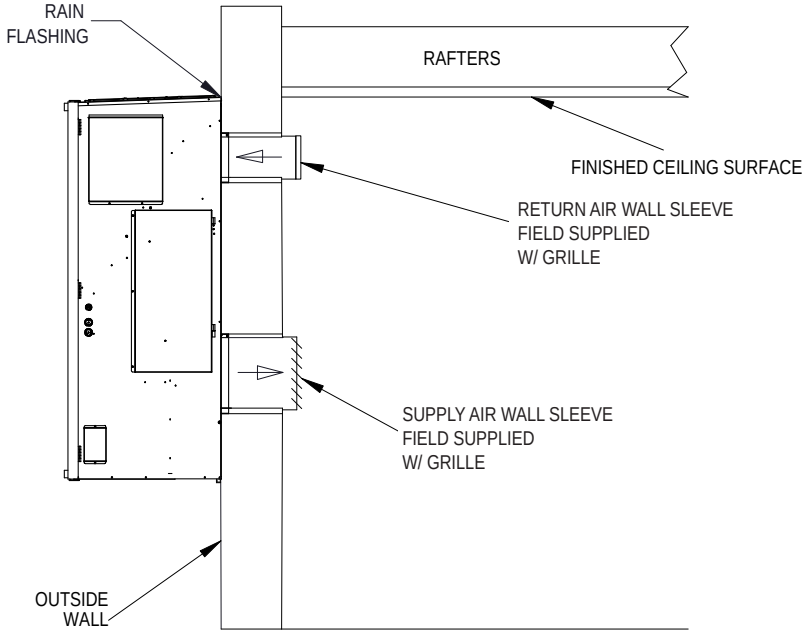


FIGURE 13
Common Wall Mounting Installation



FREE AIR FLOW
NO DUCT

MIS-3899

WALL-MOUNT UNIT WIRING

⚠ WARNING

Electrical shock hazard.

Have a properly trained individual perform these tasks.

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

Main Power Wiring

Refer to the unit rating plate or Table 3 for wire sizing information and maximum fuse or circuit breaker size. Each outdoor unit is marked with a "Minimum Circuit Ampacity". 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 rating 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 unit rating plate and Table 3 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 circuit breaker or fuse that is to be used with the equipment. The correct 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.

TABLE 3
Electrical Specifications

Model	Rated Volts & Phase	No. Field Power Circuits	Single Circuit			
			③ Minimum Circuit Ampacity	① Maximum External Fuse or Circuit Breaker	② Field Power Wire Size	② Ground Wire
WR35 A0Z, AMZ	230/208-1	1	26	35	8	10
A01, AM1		1	26	35	8	10
A05, AM5		1	30	35	8	10
HR35 B0Z	230/208-3	1	25	30	10	10
B05		1	25	30	10	10
WR36 A0Z, AMZ	230/208-1	1	26	35	8	10
A01, AM1		1	26	35	8	10
A05, AM5		1	30	35	8	10
HR36 B0Z	230/208-3	1	25	30	10	10
B05		1	25	30	10	10
WR58 A0Z, AMZ	230/208-1	1	43	60	8	10
A01, AM1		1	43	60	8	10
A05, AM5		1	43	60	8	10
HR58 B0Z	230/208-3	1	30	45	8	10
B05		1	30	45	8	10

① Maximum size of the time delay fuse or circuit breaker for protection of field wiring conductors.
② Based on 75°C copper wire. All wiring must conform to the National Electrical Code and all local codes.
③ 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 current carrying conductors are in a raceway.

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.

The main unit circuit breaker disconnect access is located on the front panel of the unit. Located at the upper right corner of this panel is the rubber circuit breaker boot. This allows unit power to be disconnected without panel removal.

Route all field power wires in channel under the control panel as shown in Figure 14. See Figure 15 to reference VAC landing points.

FIGURE 14
Wire Routing

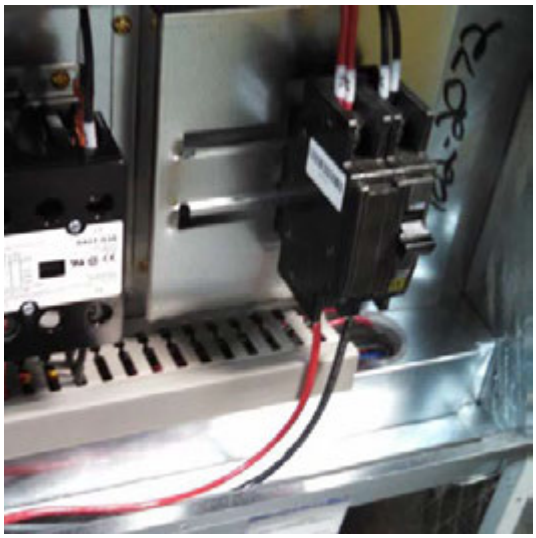
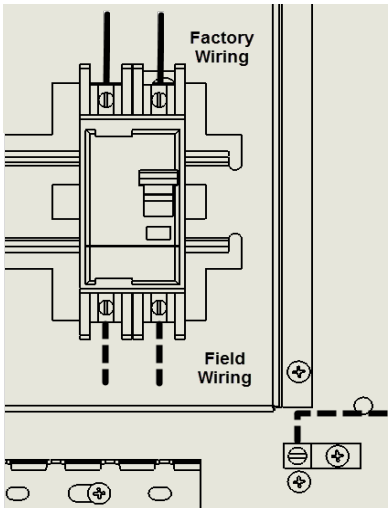


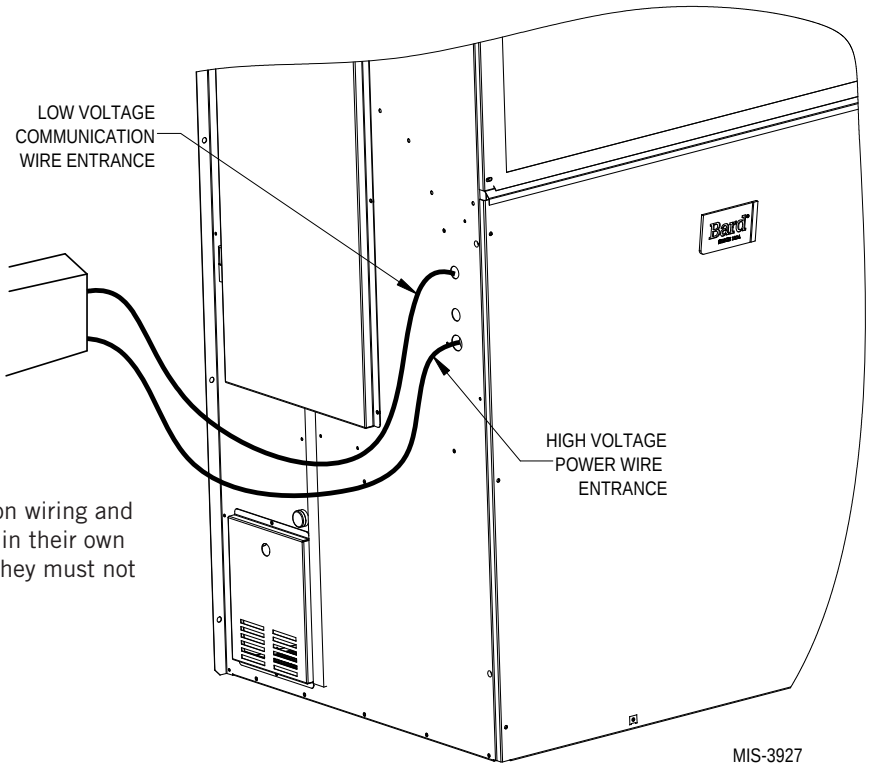
FIGURE 15
VAC Supply Wiring Landing Points



Route wires into unit through recommended side entrances (see Figure 16). Optional rear entry points are also available (see Figure 17 on page 20).

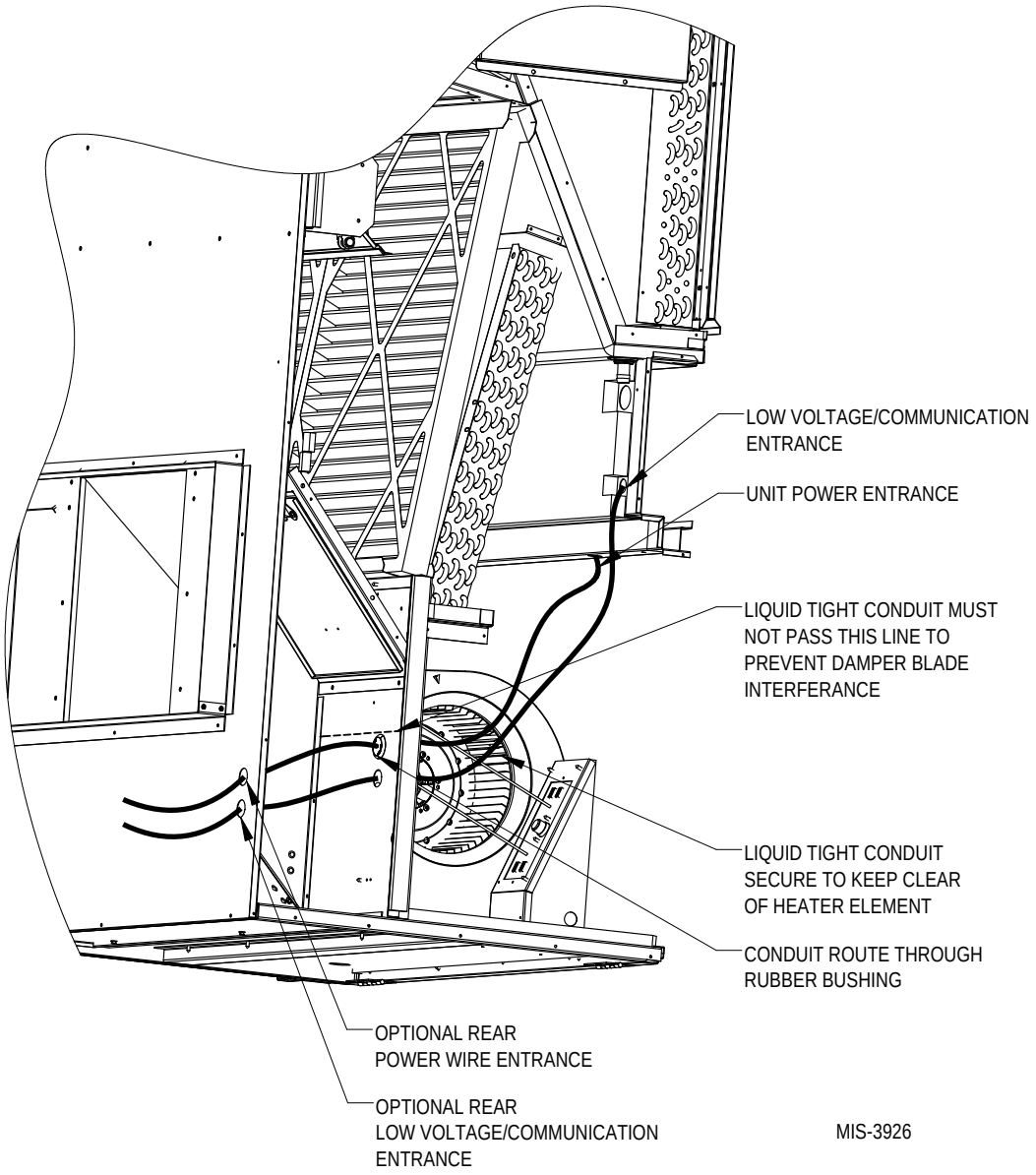
When running wires to unit from shelter, be careful to not place wiring and conduit where it will interfere with opening filter access doors.

FIGURE 16
Side Communication and Power Wire Entrances (Recommended)



Route communication wiring and power supply wiring in their own separate conduits. They must not be run together.

FIGURE 17
Rear Communication and Power Wire Entrances (Optional)



Unit Control Voltage Wiring

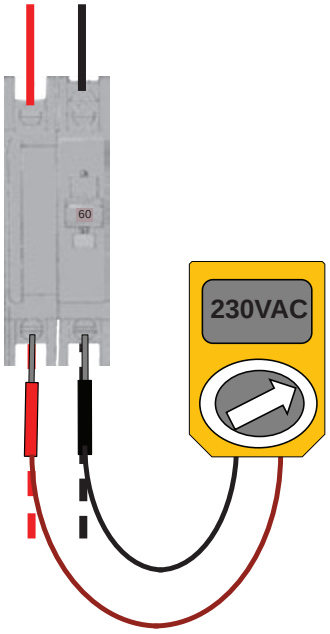
230/208V 1 phase and 3 phase equipment use dual primary voltage transformers. All equipment leaves the factory wired on 240V tap. **It is very important that the correct voltage tap is used.** For 208V operation, reconnect from 240V to 208V tap. The acceptable operating voltage range for the 240 and 208V taps are: 240V tap (253 – 216) and 208 tap (220 – 197). To verify voltage and adjust voltage tap (if necessary), see Figure 18.

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.*

FIGURE 18
Adjusting the 230/208 VAC Transformer

230/208V 1 phase and 3 phase equipment use 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 (220 – 197).

1. Verify incoming AC voltage: Multimeter set to VAC



Shelter supply breaker in ON position

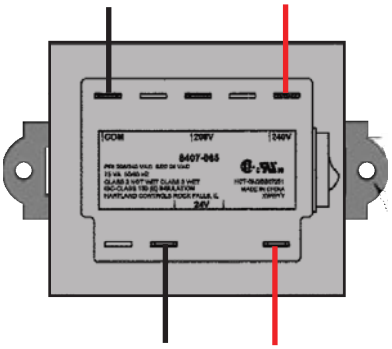
Bard system breaker in OFF position

240V/208V Single Phase Voltage Range:
197VAC – 253VAC

240V/208V Three Phase Voltage Range:
197VAC – 253VAC
(not shown)

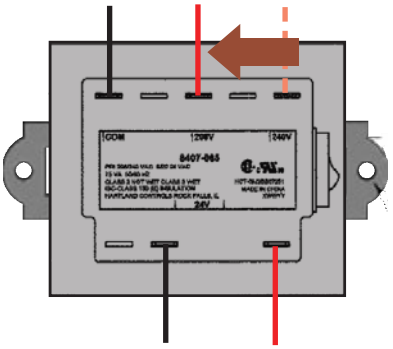
2. If incoming AC voltage is 220VAC or above...

...do not adjust transformer



3. If incoming AC voltage is below 220VAC...

...shut off AC breaker to unit
and move factory "240V" wire to "208V" terminal



Running in Orphan Mode

FUSION-TEC WR Series wall-mount units have the capability to run without the LC6000 controller attached—this feature is called orphan mode. This keeps the shelter between 60°F and 77°F (factory default settings) by the use of the factory-installed return air sensor in each wall-mount unit. In orphan mode, no auxiliary temperature measurement devices are required for operation. The wall-mount unit automatically uses a continuous blower setting to circulate room air into the return air inlet and uses the return air temperature sensor to control room temperature.

To verify or change the wall-mount unit cooling and heating setpoints in orphan mode:

1. Connect the TEC-EYE diagnostic tool to the control board located in the unit.
2. From the Status screen, press UP or DOWN key until Quick Menu displays Setpoints (Set) icon. Press ENTER key.
3. Press ENTER key to scroll to the selected choice (see Figure 19).
4. Press UP or DOWN key on desired value until value displays correctly.
5. Press ENTER key to save and scroll to next parameter.
6. Press ESCAPE key until Main Menu screen is displayed.

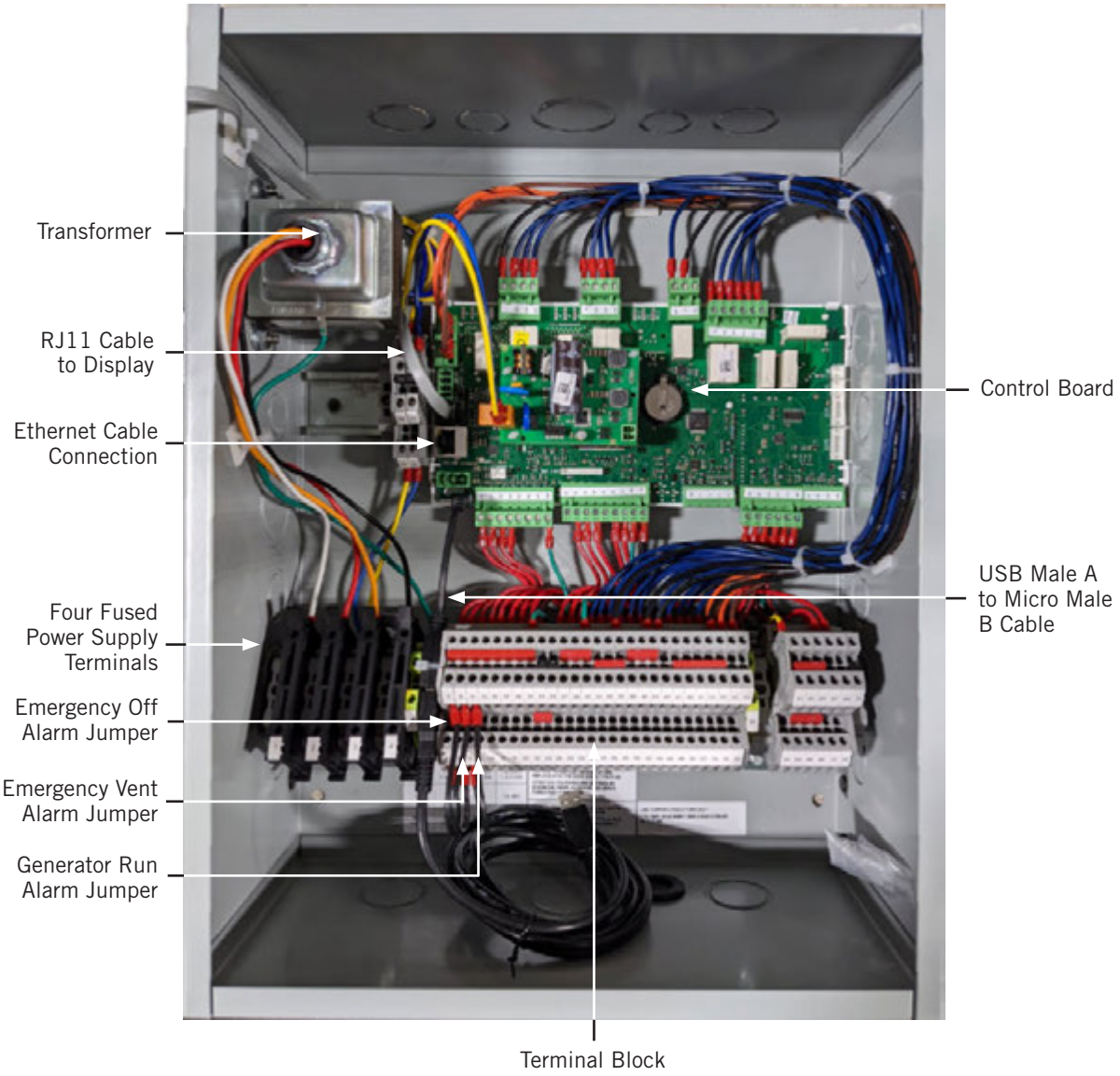
During installation, the ability to run in orphan mode allows deactivation of one of the existing, older wall-mount units, while keeping the shelter cool with the other unit still operating. Once the first of the Bard FUSION-TEC WR Series wall-mount units is installed and powered on, it will operate in orphan mode—keeping the climate inside the shelter stable and the installers comfortable while the remainder of the older equipment is removed and the remaining Bard FUSION-TEC WR Series wall-mount units and LC6000 controller are installed.

Additionally, should any or all of the FUSION-TEC WR Series wall-mount units lose communication with the LC6000 controller (such as during maintenance), they will continue to serve the shelter's needs until a repair can be made.

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

FIGURE 19
Cool and Heat Setpoints

FIGURE 20
Typical LC6000-200 Component Location



⚠ WARNING

Electrical shock hazard.

Disconnect VAC power supplies before servicing.

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

IMPORTANT: *When working with circuit board components, Bard recommends the use of an anti-static wrist strap to prevent static electricity shorts to electronic controls.*

LC6000 Controller

The LC6000 controller is part of this air conditioning system. It is used to control up to 14 wall-mount air conditioners from one controller. The microprocessor control provides an easy-to-read interface with large LCD graphical display. It provides control for redundancy for the structure and equal wear on all units.

Conduit is recommended for all wiring. Route communication wiring and power supply wiring in their own separate conduits.

The LC6000 controller is not weatherproof and is intended for use in a weathertight structure.

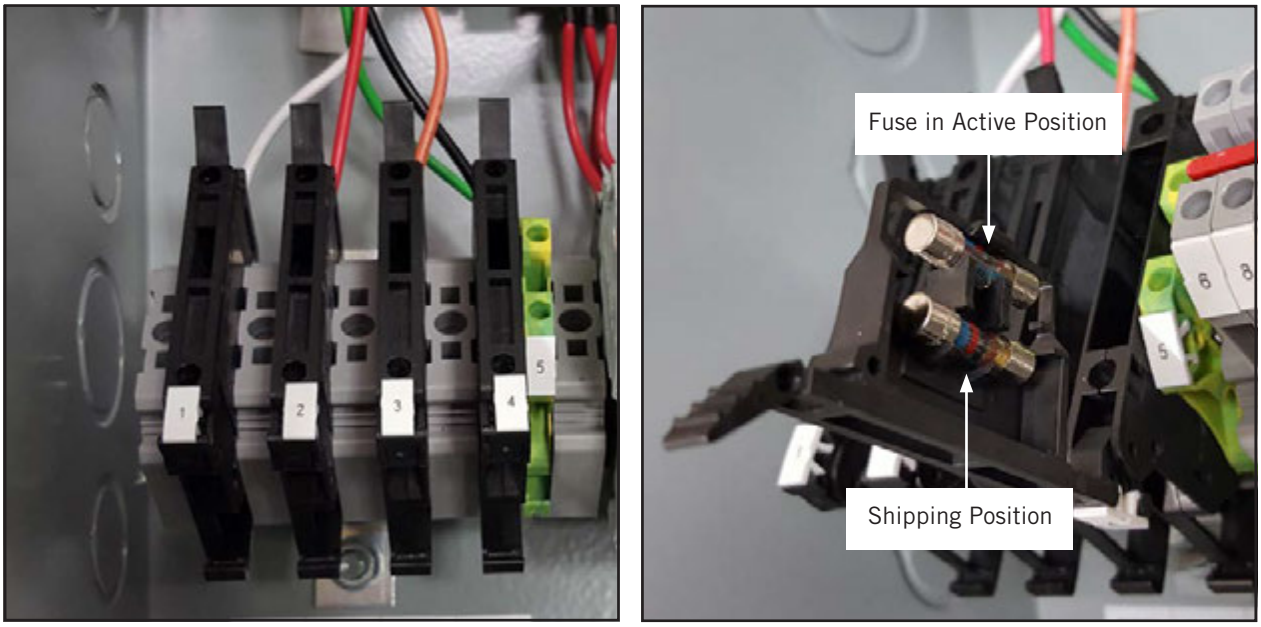
Mounting the LC6000 Controller

The dimensions of the LC controller are 16" x 12" x 6".

Because the LC6000 controller utilizes a remote temperature sensor as opposed to one located in the controller box, the controller itself can be installed in any indoor location that is suitable, preferably at eye level. Four (4) mounting holes are provided for mounting to the wall and holes for conduit connections are provided in the base, sides and top of the controller.

The LC6000 controller includes four fused power supply terminals in the terminal block. Before connecting wires to the terminal block, confirm that the fuse in each of the four fuse holders is in the proper position (active) as shown in Figure 21.

FIGURE 21
LC6000 Fused Power Supply Terminals



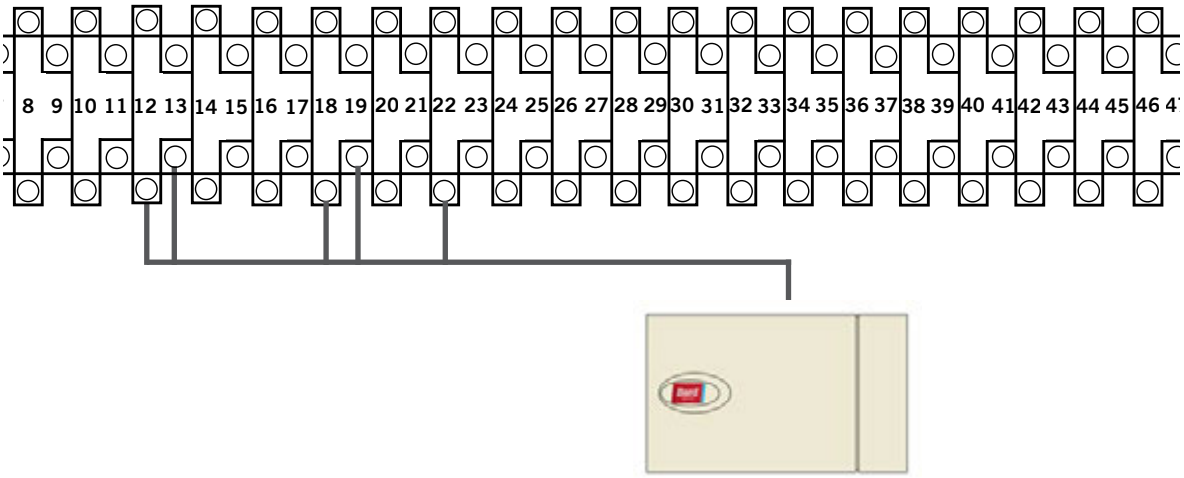
Installing Remote Indoor Temperature/Humidity Sensor(s)

One remote indoor temperature/humidity sensor and 35' of 18 gauge 5-conductor shielded cable is included with the controller. This sensor must be installed for proper operation. Mount the temperature/humidity sensor in a location least likely to be affected by open doors, rack-mounted fans, radiant heat sources, etc. Locating the sensor between both return grilles is often the best location, but every installation is unique. Location height should be approximately 60" above the floor. The sensor should be installed on a 2" x 4" junction box to allow for control wire conduit. Use shielded cable to connect to controller.

FIGURE 22
Remote Indoor Temperature/Humidity Sensor Installation

1. Connect wires from the 18 gauge shielded cable to terminals #12, #13, #18, #19 and #22.

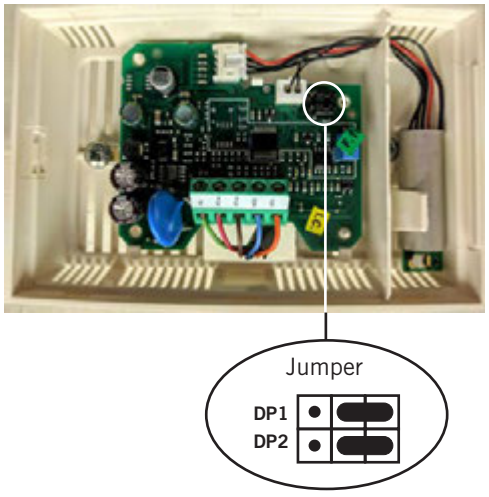
TB#	Wire Mark	Sensor	Description
18	B6	NTC OUT	Indoor Remote Sensor (Zone 1)
19	GND	NTC OUT	Ground
12	B2	OUT H	Remote Indoor Humidity Sensor: 0-1 VDC (Zone 1)
13	GND	M (GO)	Ground
22	+VDC	+ (G)	Power for B2

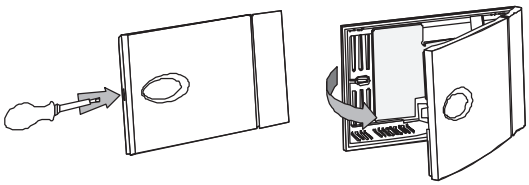


2. Connect the other end of the shielded cable to the sensor terminals. Be sure wires are connected to proper terminals as shown in table above.

   Sensor jumpers need to be positioned for 0-1 V. With sensor oriented as shown in image to right, move both jumpers to right position (DP1 and DP2 set to OFF). **This applies to all indoor temperature/humidity sensors connected to the LC controller.** See illustration mounted inside of sensor cover for further detail on jumper position.

   Earlier versions of this sensor may be mounted in a different orientation which would affect the positioning of the sensor jumpers. See page 47 for additional information on sensor orientation.





For proper operation, the remote indoor temperature/humidity sensor (and any additional sensors) must be configured properly with the controller as shown in Step 2 on page 25. An additional remote indoor temperature-only sensor can be purchased and installed in Zone 1. If the site in which the LC6000 controller will be used has more than one zone (maximum three zones per LC6000), additional remote temperature/humidity sensors (one per zone) will need to be purchased and installed in the additional zones. All installed sensors must be enabled in the controller menu (see **Configure Sensors** beginning on page 40).

FIGURE 23
Additional Remote Temperature and Temperature/Humidity Sensor Installation

One additional temperature sensor can be added to Zone 1 and additional temperature/humidity sensors may be added to Zones 2 and 3 (one per zone). **Be sure the sensors are connected to the proper terminals on the terminal block and sensor as listed below.**

Zone 1:
Optional Remote
Temperature Sensor
Terminals 20 & 21*

TB#	Wire Mark	Description
20	B7	Indoor Remote Sensor (Zone 1 – optional)
21	GND	Ground

* The two wire connections for the optional remote temperature sensor are not polarity sensitive.

Zone 2:
Optional Remote
Temperature/Humidity Sensor
Terminals 26, 27, 14, 15 & 23
IMPORTANT: *Note jumper position in Figure 21*

TB#	Wire Mark	Sensor	Description
26	B8	NTC OUT	Indoor Remote Sensor (Zone 2)
27	GND	NTC OUT	Ground
14	B3	OUT H	Remote Indoor Humidity Sensor: 0-1 VDC (Zone 2)
15	GND	M (GO)	Ground
23	+VDC	+ (G)	Power for B3

Zone 3:
Optional Remote
Temperature/Humidity Sensor
Terminals 28, 29, 16, 17 & 24
IMPORTANT: *Note jumper position in Figure 21*

TB#	Wire Mark	Sensor	Description
28	B9	NTC OUT	Indoor Remote Sensor (Zone 3)
29	GND	NTC OUT	Ground
16	B4	OUT H	Remote Indoor Humidity Sensor: 0-1 VDC (Zone 3)
17	GND	M (GO)	Ground
24	+VDC	+ (G)	Power for B4

Zones 2 and 3 can also use temperature-only sensors in place of the temperature/humidity sensors. Zone 2 will connect to TB# 26 and 27. Zone 3 will connect to TB# 28 and 29. The wire connections for the temperature-only sensors are not polarity sensitive.

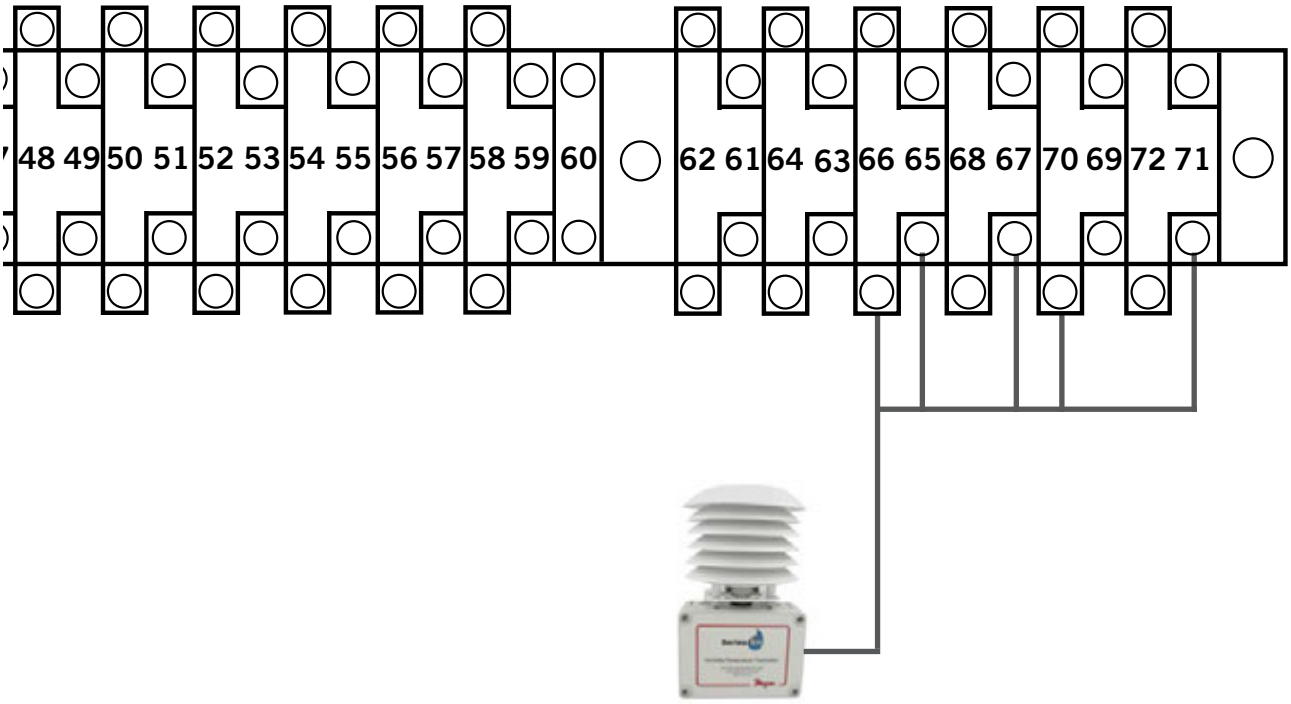
Installing Optional Outdoor Temperature/Humidity Sensor

One optional outdoor temperature/humidity sensor (8301-090) can be installed. Follow the manufacturer's mounting instructions. Use 18 gauge 5-conductor shielded cable to connect to controller.

FIGURE 24
Remote Outdoor Temperature/Humidity Sensor Installation

1. Connect wires from the 18 gauge shielded cable to terminals #65, #66, #67, #70 and #71.

TB#	Wire Mark	Sensor	Description
70	B12	4	Remote Outdoor Temperature Sensor
71	ND	5	Ground
67	B11	1	Remote Outdoor Humidity Sensor: 0-10 VDC
66	GND	3	Ground
65	+VDC	2	+VDC

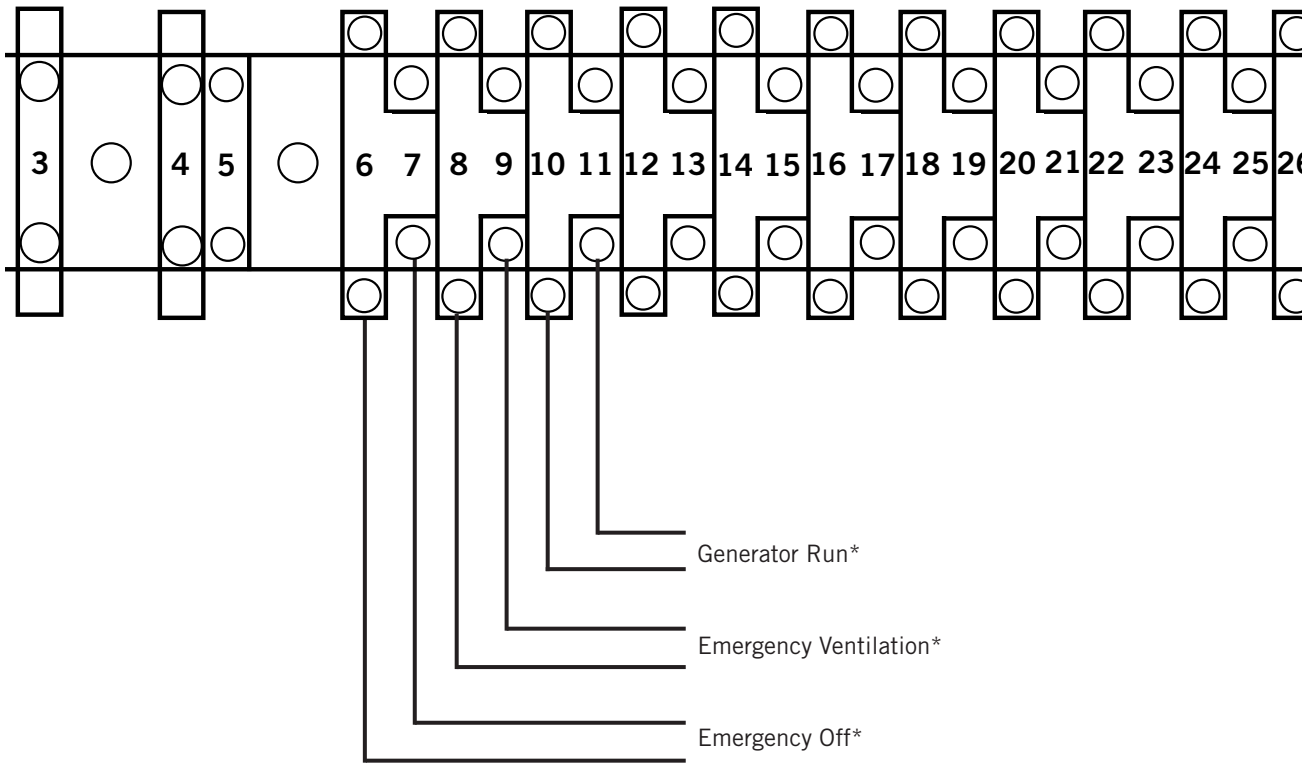


2. Connect the other end of the shielded cable to the sensor terminals. Be sure wires are connected to proper terminals as shown in table above.

Emergency Off, Emergency Ventilation and Generator Run Connections

The LC6000-200 controller is shipped with emergency off, emergency ventilation and generator run contacts. There are factory-installed jumpers across terminals #6 and #7 (emergency off), #8 and #9 (emergency ventilation) and #10 and #11 (generator run). Remove the factory-installed jumpers before making the connections.

FIGURE 25
LC6000-200 Series Connection for Emergency Off, Emergency Ventilation and Generator Run (If Applicable)



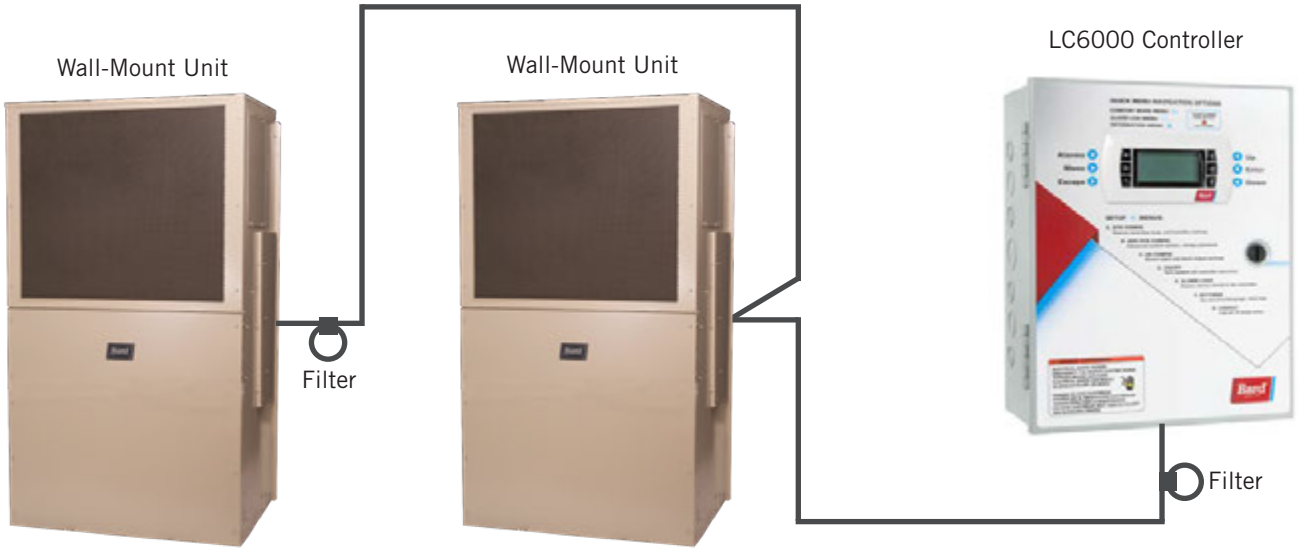
* Normally closed (NC) contacts required.

By default:
Closed = No Alarm
Open = Alarm

Communication Wiring

Connect the communication wiring from the wall-mount units to the controller in the manner shown in Figures 26, 27 or 28. **The daisy chain does not need to follow the addressing order.** The communication wire should be 2-wire, 18 gauge shielded cable with drain. Any color can be used. Be sure to match "+" and "-" symbols on controller terminal blocks to unit control terminal block (see Figures 30 and 31 on pages 32 and 33). Attach communication wire filters as shown in Figures 26, 27 or 28. Filters go inside the unit or controller box; they are shown out of unit for identification purposes only. **Do not run communication wiring in same conduit as supply wiring. Route communication wiring and power supply wiring in their own separate conduits.**

FIGURE 26
Communication Wiring (Daisy Chain Method)



In addition to the "daisy chain" method of connecting the communication wiring shown in Figure 26, the wall-mount units can also be connected in the manner shown in Figure 27. If connecting wall-units this way, be sure to place the communication wire filters in the positions shown in Figure 27. See Figure 2 on page 30 for more information on the correct placement of the communication wire filters depending on the wiring method used.

FIGURE 27
Communication Wiring (Alternate Method)

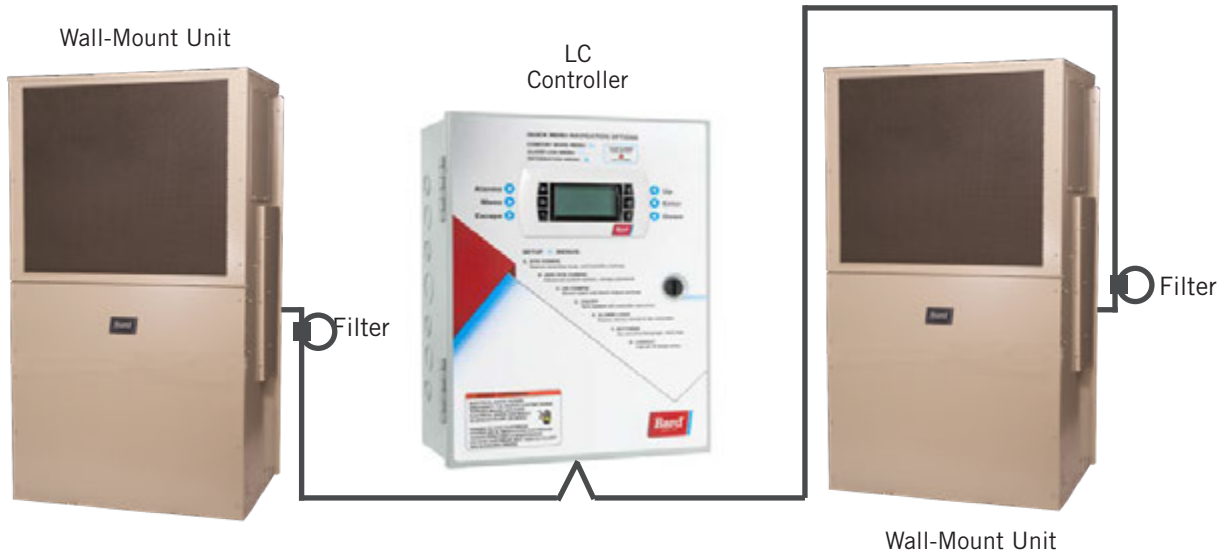
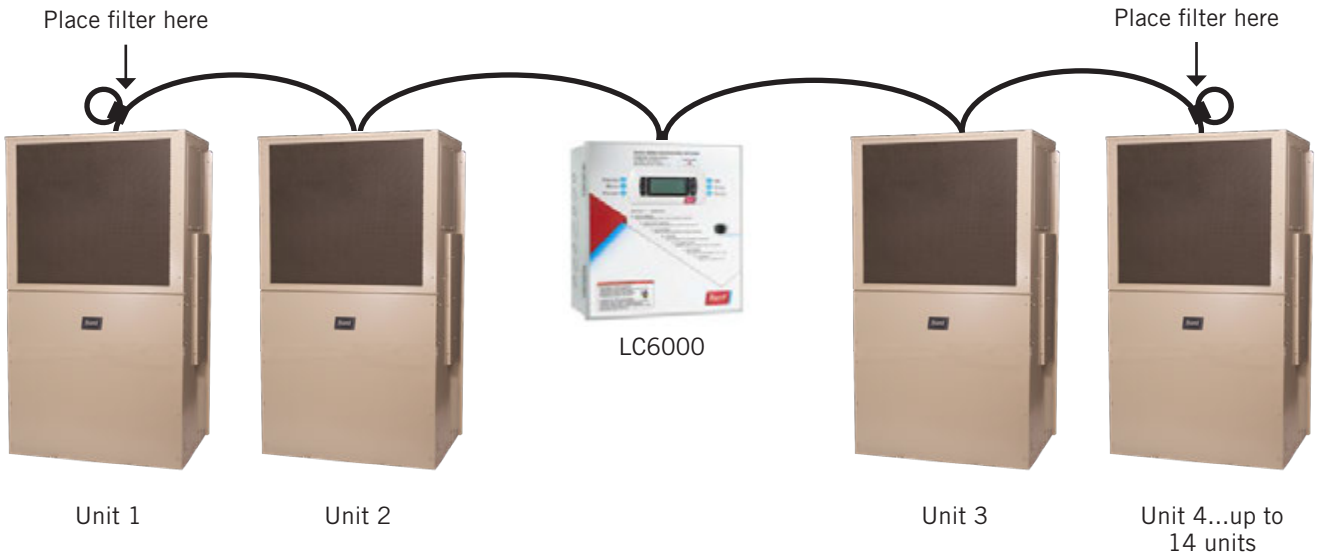


FIGURE 28
Placement of Communication Wire Filters (Daisy Chain and Alternate Methods)

Daisy Chain Wiring (up to 14 units)

Alternate Wiring (up to 14 units)

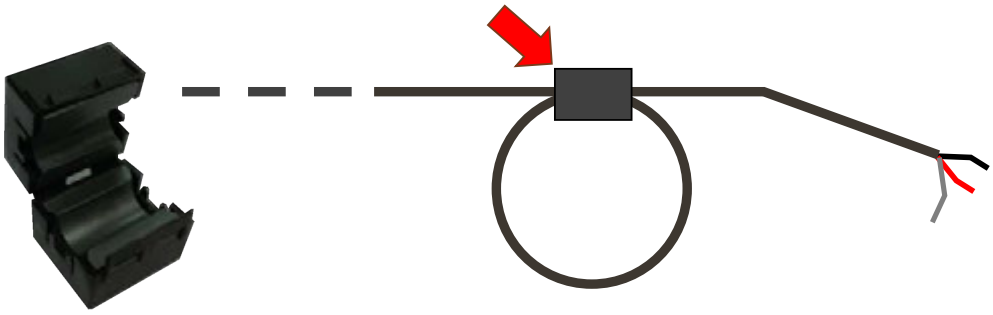


NOTE: *Line filters can be on either the unit or controller, whichever device is on the end of the chain. No matter how many units there are, the two end devices will only have ONE communication cable, whereas the center devices will all have TWO (as shown above). Maximum two wires in each terminal. Filters go inside the unit or controller; shown out of unit above for identification only.*

The steps outlined on the following pages show how to connect the communication wiring using the daisy chain method shown in Figure 26 on page 29. If using the alternate method (as shown in Figure 27 on page 29), the connections to the controller and each wall-mount unit will be the same but the filters need to be placed in the positions shown in Figure 28.

FIGURE 29
Communication Wiring: Termination at the Controller

1. Using the field-provided shielded cable, make a small service loop after entering the controller and attach the provided EMI filter at the intersection of the loop.



2. Connect one wire to terminal #56 (negative), the other wire to terminal #57 (positive) and the drain wire to ground terminal #60.

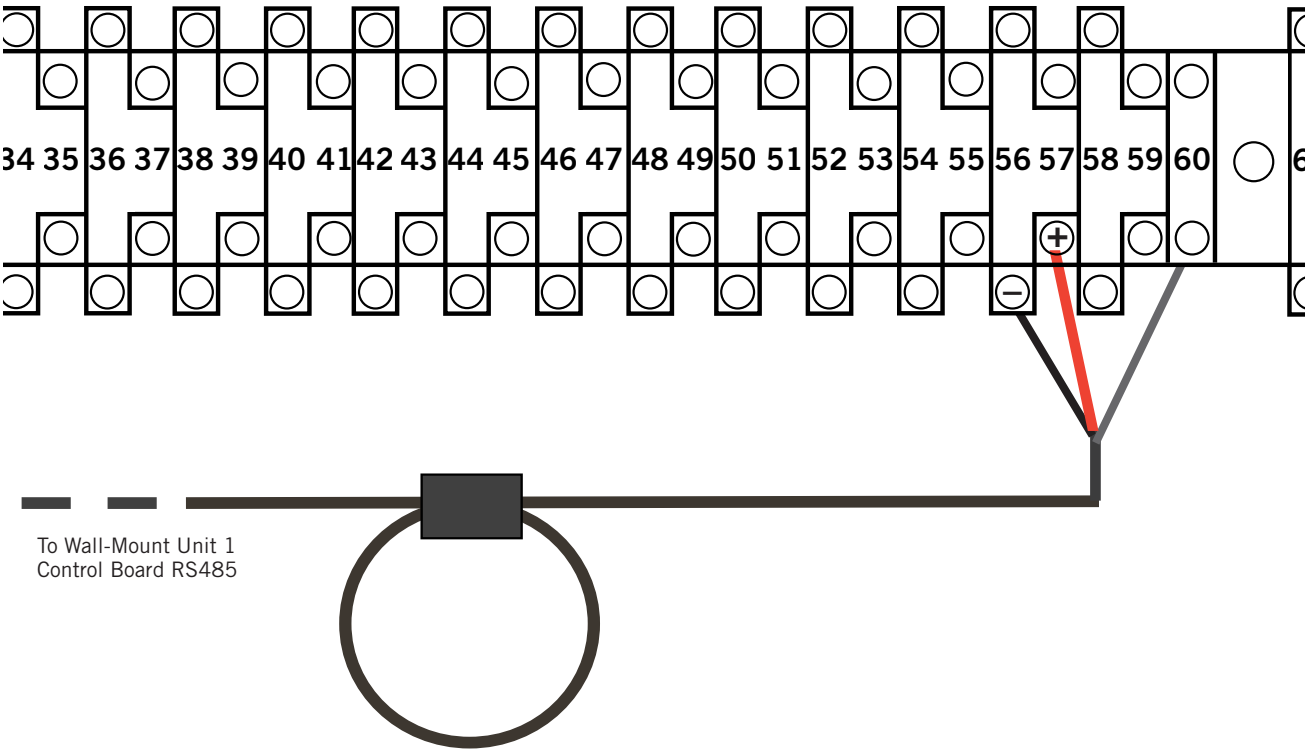
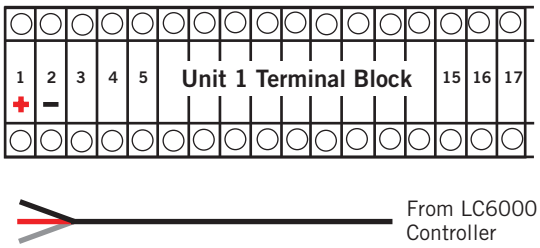
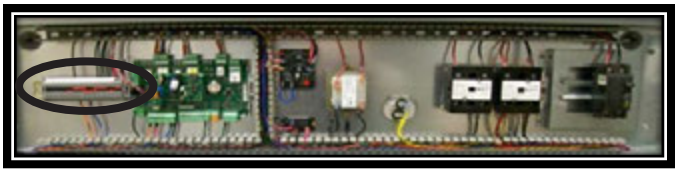


FIGURE 30
Communication Wiring: Termination at the First Wall-Mount Unit



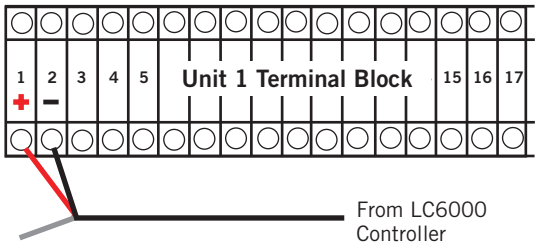


Wall-Mount Unit 1

1. From the controller, extend the shielded cable through a separate conduit and route to the provided terminal block next to the wall-mount control board.

   These connections are polarity-sensitive. Two-wire communication from control board is prewired to terminal block. Make sure to match "+" and "-" symbols on controller terminal block.

2. Connect the wires matching the terminal designations (+/-) of the controller terminals. Leave the drain wire loose.



3. Connect another cable in a similar fashion (“daisy chain”) to route in conduit to the second wall-mount unit. Connect both drain wires with wire nut.

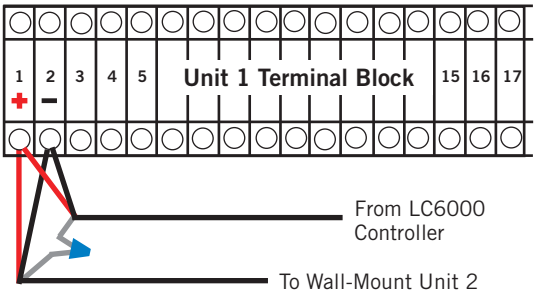
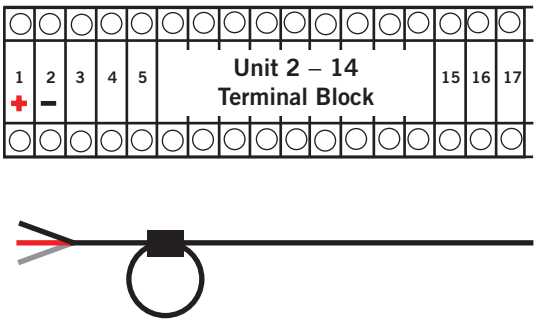


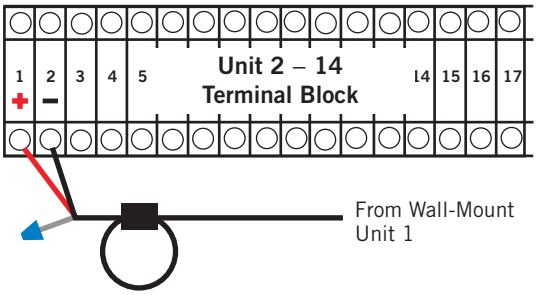
FIGURE 31
Communication Wiring: Termination at Additional Wall-Mount Units



Wall-Mount Unit 2

1. Route the cable from the first wall-mount unit to the terminal block of the second wall-mount unit. If this is the last unit to be connected, make a small service loop and attach EMI filter as shown.

2. Connect the wires matching the terminal designations (+/-) of the controller terminals. Cap the loose drain with a wire nut or electrical tape.



3. Continue daisy chaining units by connecting "+" to "+", "-" to "-" and wire nutting drain together until last unit which is capped with a wire nut. **Attach EMI filter as shown above at last unit.** Up to 14 wall-mount units can be connected and controlled by one LC6000 controller.

Supply Wiring

The LC6000 controller is powered by 120, 208 or 240 volts from the shelter. Field-supplied supply wiring should be minimum 16 gauge, maximum 14 gauge (see Figure 32). A reliable earth ground must be connected in addition to any grounding from conduit. Grounding bolts and nuts are included with the controller for this purpose; a 2 hole grounding lug must be field supplied. Install as shown in Figure 33. **Failing to ground the controller box properly could result in damage to the equipment.**

FIGURE 32
LC6000 Controller Supply Wiring

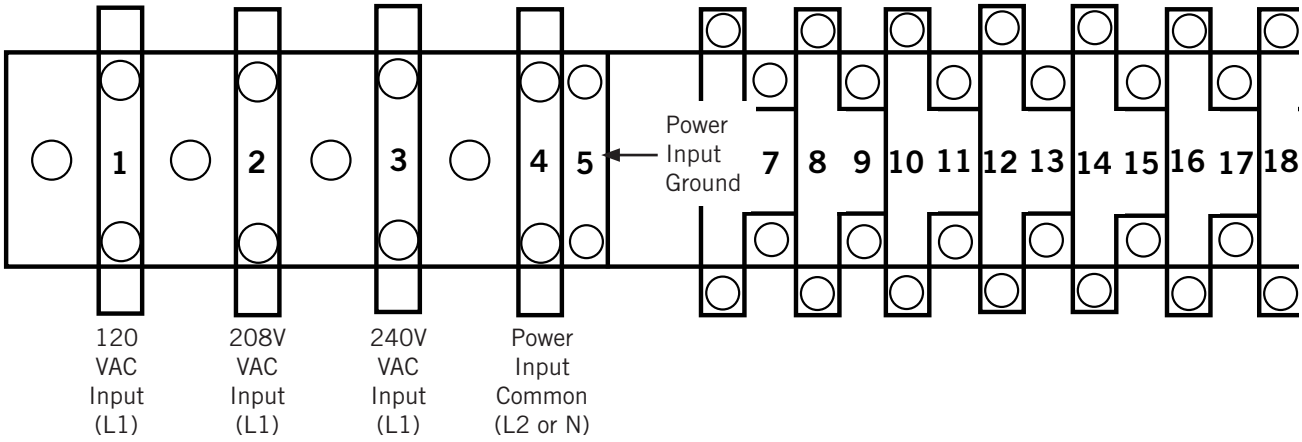
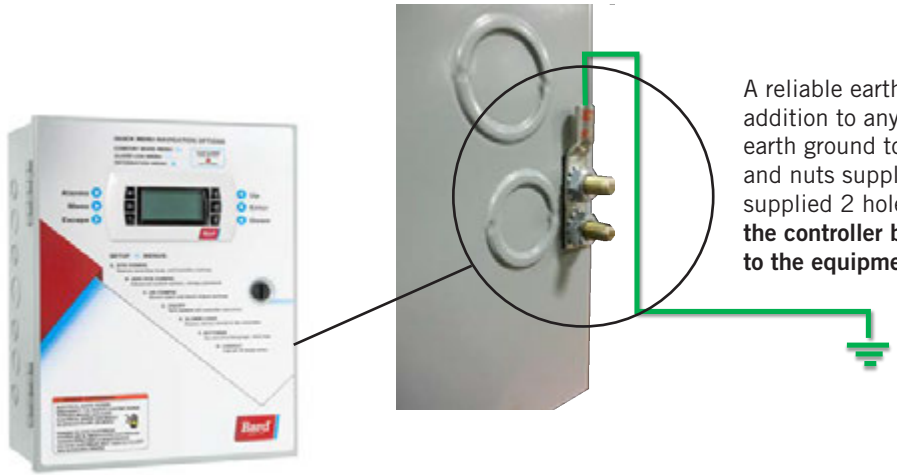


FIGURE 33
Controller Grounding Posts



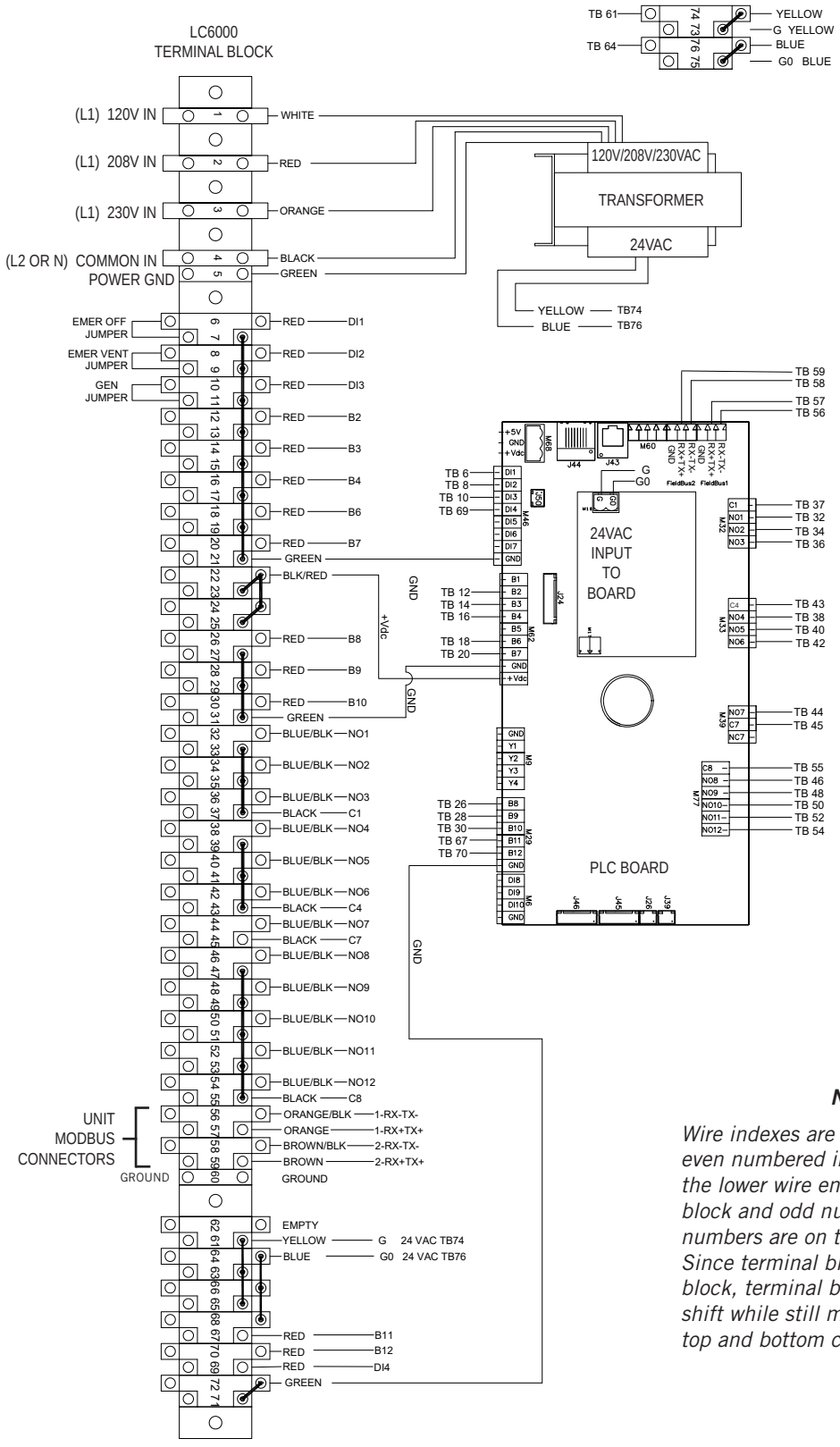
A reliable earth ground must be connected in addition to any grounding from conduit. Attach earth ground to side of controller box using bolts and nuts supplied with controller and field-supplied 2 hole grounding lug. **Failing to ground the controller box properly could result in damage to the equipment.**

TABLE 4
LC6000-200 Terminal Block Index

TB#	Wire Mark	Description
1	-	120 VAC Input
2	-	208 VAC Input
3	-	230 VAC Input
4	-	Power Input Common
5	-	Power Input Ground
6	DI1	Emergency Off Input
7	GND	Emergency Off Common
8	DI2	Emergency Vent Input
9	GND	Emergency Vent Common
10	DI3	Generator Run Input
11	GND	Generator Run Common
12	B2	Zone 1 Indoor Remote Humidity Sensor
13	GND	Ground
14	B3	Zone 2 Indoor Remote Humidity Sensor
15	GND	Ground
16	B4	Zone 3 Indoor Remote Humidity Sensor
17	GND	Ground
18	B6	Zone 1 Indoor Temperature Sensor
19	GND	Ground
20	B7	Zone 1 Indoor Remote Temperature Sensor
21	GND	Ground
22	VDC+	Power for B2 (Z1 Humidity)
23	VDC+	Power for B3 (Z2 Humidity)
24	VDC+	Power for B4 (Z3 Humidity)
25	VDC+	Power for B10 (Pressure)
26	B8	Zone 2 Indoor Remote Temperature Sensor
27	GND	Ground
28	B9	Zone 3 Indoor Remote Temperature Sensor
29	GND	Ground
30	B10	Indoor Space Pressure
31	GND	Ground
32	NO1	Humidifier 1
33	C1	Common
34	NO2	Humidifier 2
35	C1	Common
36	NO3	Humidifier 3
37	C1	Common
38	NO4	Emergency Off Alarm

TB#	Wire Mark	Description
39	C4	Common
40	NO5	Emergency Vent Alarm
41	C4	Common
42	NO6	Generator Run Alarm
43	C4	Common
44	NO7	Indoor Humidity Alarm
45	C7	Common
46	NO8	High Indoor Temperature Alarm
47	C8	Common
48	NO9	Low Indoor Temperature Alarm
49	C8	Common
50	NO10	Zone 1 Unit Alarm
51	C8	Common
52	NO11	Zone 2 Unit Alarm
53	C8	Common
54	NO12	Zone 3 Unit Alarm
55	C8	Common
56	FB1R-	RS485 RX- / TX- (Fieldbus 1) ***UNIT CONNECTION***
57	FB1R+	RS485 RX+ / TX- (Fieldbus 1) ***UNIT CONNECTION***
58	FB2R-	RS485 RX- / TX- (Fieldbus 2)
59	FB2R+	RS485 RX+ / TX- (Fieldbus 2)
60	--	Power Input Ground
61	24 VAC+	24 VAC Supply
62	--	Not Used
63	24 VAC+	24 VAC Supply
64	24 VAC-	24 VAC Ground
65	24 VAC+	24 VAC Supply for Outdoor Humidity Sensor
66	24 VAC-	24 VAC Ground for Outdoor Humidity Sensor
67	B11	Signal for Outdoor Humidity Sensor
68	24 VAC+	24 VAC Supply
69	D14	Bard Guard Alarm Signal
70	B12	Signal for Outdoor Temperature Sensor
71	GND	Ground for Outdoor Temperature Sensor
72	GND	Ground for Bard Guard Alarm Signal
73	G	Orange Power Connector
74	24 VAC+	24 VAC Supply
75	G0	Orange Power Connector
76	24 VAC-	24 VAC Ground

FIGURE 34
LC6000-200 Wiring Diagram



NOTE:

Wire indexes are identified such that even numbered index numbers are on the lower wire entries of the terminal block and odd numbered index numbers are on the top wire entries. Since terminal block 60 is a ground block, terminal blocks 61 thru 72 shift while still maintaining the same top and bottom configuration.

The LC6000 controller and TEC-EYE hand-held diagnostic tool will both be used to set up the Bard air conditioning system.

TEC-EYE™ Hand-Held Diagnostic Tool

The microprocessor control used in the WR Series wall-mount air conditioners allows for complete control and monitoring through the use of the provided TEC-EYE 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. See latest version of WR Series Service Instructions manual 2100-695 for more information on using the TEC-EYE.

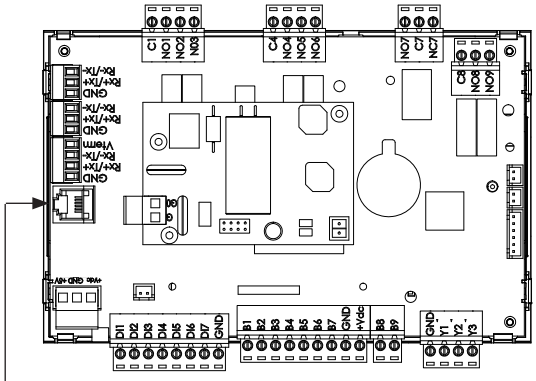
The TEC-EYE connects to the wall-mount unit control board via an RJ11 modular connector as shown in Figure 35.

When not being used, the TEC-EYE hand-held diagnostic tool should be stored inside or near the LC6000 controller. Do not let the TEC-EYE leave the shelter.

TEC-EYE Status Screen

The Status 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.

FIGURE 35
TEC-EYE Connection to Unit Control



The wall-mount unit address is displayed in the upper right corner on the Status screen (see Figure 36). The Status screen also shows the current date, time, return air temperature, mixed air temperature, outdoor air temperature, outdoor humidity and outdoor dew point conditions. Blower speed, condenser fan speed, damper position and unit status are also displayed. See Table 6 on page 46 for wall-mount unit status messages.

FIGURE 36
TEC-EYE (Bard P/N 8301-059) Display and Interface (Status 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

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

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/

Setting Up Wall-Mount Units for Operation

The TEC-EYE hand-held diagnostic tool is needed to set up the wall-mount unit(s).

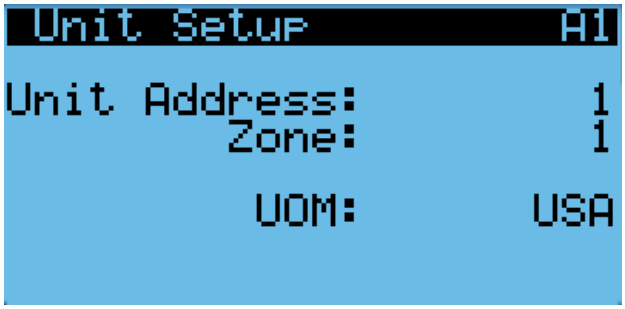
1. Address Each Wall-Mount Unit

Each unit must have a unique address for the system to operate correctly with the LC controller (*Ex: 1, 2, 3, ...14 depending on the number of units*). The unit only needs the address to be changed for the communication to work properly. The wall-mount unit address is displayed in the upper right corner on the Status screen on the TEC-EYE display (see Figure 36 on page 37).

To change the unit address:

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 ENTER key to scroll to **Controller Address (**see Figure 37).
5) Press UP or DOWN keys to change the address to a value between 1 and 14.

FIGURE 37
Changing Unit Setup Values



NOTE: *Each unit must have a unique address for the communication to work properly. Bard also recommends labeling each unit for ease in identification.*

In addition to setting up the address, the user may also want to set the unit of measure (UOM), zone and economizer control type. Unit addresses can only be used once per LC6000 regardless of number of zones.

To change these settings:

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 ENTER key to scroll to **UOM (**see Figure 37).
5) If desired, press UP or DOWN keys to change the value from **USA** to **SI**, **NC**, **LON**, **CAN** or **UK**. Units are preconfigured for each selection.
6) Press ENTER key to scroll to **Zone**.
7) If desired, press UP or DOWN keys to change value.
8) Press ENTER key to save.

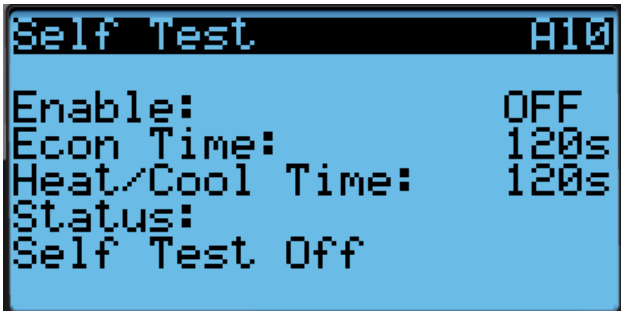
Basic wall unit parameter settings are now set and the unit is ready to communicate with the LC.

2. Execute a Self Test on Each Unit

Execute a self test on each unit to verify the equipment is functioning correctly. Some unit parameters are adjustable.

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 key to scroll to **Self Test A10** screen.
5) Press ENTER key to scroll to **Enable** (see Figure 38).
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 38
Executing Self Test



Self Test Parameter Description

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.

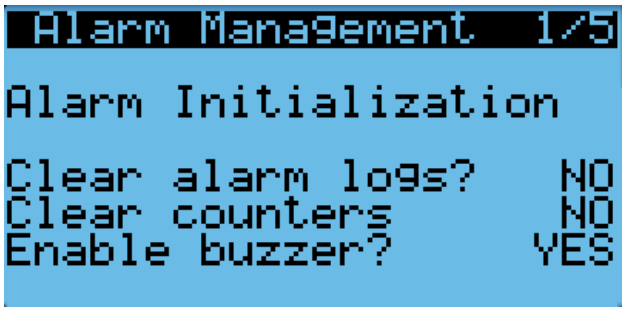
3. Clear Unit Alarm Logs on Each Unit

Units may have alarms logged due to testing. Unit alarm logs must be cleared at time of installation.

To clear the wall-mount unit alarm logs:

1) Press MENU key to go to the Main Menu screen.
2) Use UP or DOWN keys and ENTER key to enter TECHNICIAN 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 ENTER key to scroll to **Clear alarm logs?** (see Figure 39).
6) Press UP or DOWN key to value to **YES**; press ENTER key.
7) Press ESCAPE key several times to return to Main Menu screen.

FIGURE 39
Clearing Unit Alarm Logs



After each of the wall-mount units have been addressed, had a self test performed and had the alarm logs cleared, the rest of the system set up can proceed.

Setting Up LC6000 for Operation

The LC6000 controller will be used for the remaining steps in the set up process.

LC6000 Status Screen

The Status screen is the default start-up screen and also the return screen after 5 minutes of no activity on the LC6000. The screen can be accessed any time by pressing the ESCAPE key repeatedly.

The Status screen on the LC6000 displays the current date, time, unit displayed, zones and system status (see Figure 40).

4. Set LC Controller Date and Time

1) Press MENU key to access the Main Menu screen.
2) Use UP or DOWN keys and ENTER key to enter USER password 2000.
3) Press the UP or DOWN keys to scroll to the **Settings** menu; press ENTER key.
4) Press UP or DOWN keys to scroll to **Date/Time** menu; press ENTER key.
5) Press UP or DOWN keys to scroll to **Date/Time change**.

FIGURE 40
LC6000 Controller Display and Interface (Status Screen Shown)

LC6000 interface key functions are the same as those shown for the TEC-EYE in Figure 36 on page 37.

6) Press ENTER key to scroll to the desired value to be changed (see Figure 41).

7) Press UP or DOWN keys to change the value.

8) Press ENTER key to save and to scroll to top of screen.

9) Press UP or DOWN keys to scroll to **Timezone** (if applicable). Follow steps 6-8 to change timezone.

10) Press ESCAPE key several times to return to Main Menu screen.

NOTE: *The LC6000 will sync the time and date configured to each of the wall-mount units once communication is established.*

FIGURE 41
Setting Controller Date and Time

5. Configure Sensors

The system will need to be configured for the number of temperature and humidity sensors installed. The system is shipped with one combination temperature and humidity sensor. Additional combination sensors may be purchased or alternatively, temperature-only sensors may be purchased instead. The LC is capable of utilizing five temperature sensors and four humidity sensors. The system will need to be configured for the various configurations.

If necessary, the sensors could be calibrated at this time too. For information on calibrating the sensors (adjusting the offset), see page 45.

To enable/disable **Zone 1 Indoor Humidity**:

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 **IO Config**; press ENTER key.

4) Press UP or DOWN keys to scroll to **Z1 Indoor Hum C4**.

5) Press ENTER key to scroll to **Enable** (see Figure 42).

6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

FIGURE 42
Enable/Disable Zone 1 Indoor Humidity Sensor

To enable/disable **Zone 2 Indoor Humidity**:

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 **IO Config**; press ENTER key.

4) Press UP or DOWN keys to scroll to **Z2 Indoor Hum C5**.

5) Press ENTER key to scroll to **Enable** (see Figure 43).

6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

FIGURE 43
Enable/Disable Zone 2 Indoor Humidity Sensor

To enable/disable **Zone 3 Indoor Humidity:**

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 **IO Config**; press ENTER key.

4) Press UP or DOWN keys to scroll to **Z3 Indoor Hum C6**.

5) Press ENTER key to scroll to **Enable** (see Figure 44).

6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

FIGURE 44
Enable/Disable Zone 3 Indoor Humidity Sensor

To enable/disable **Zone 1 Indoor Temperature**:

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.

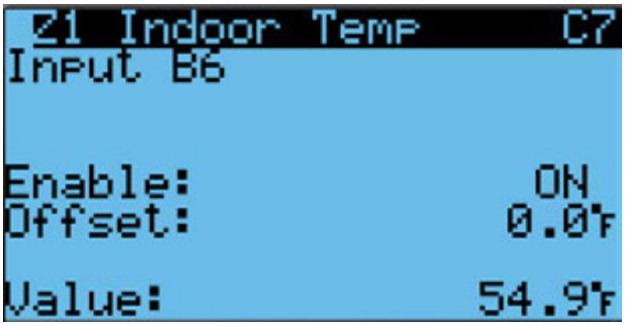
3) Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.

4) Press UP or DOWN keys to scroll to **Z1 Indoor Temp C7**.

5) Press ENTER key to scroll to **Enable** (see Figure 45).

6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

FIGURE 45
Enable/Disable Zone 1 Indoor Temperature Sensor



To enable/disable **Zone 1 Remote Temperature**:

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.

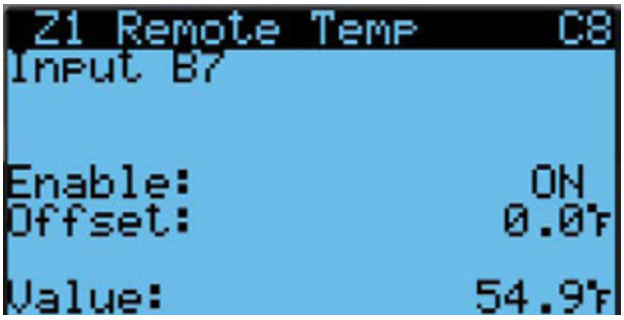
3) Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.

4) Press UP or DOWN keys to scroll to **Z1 Remote Temp C8**.

5) Press ENTER key to scroll to **Enable** (see Figure 46).

6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

FIGURE 46
Enable/Disable Zone 1 Remote Temperature Sensor



To enable/disable **Zone 2 Remote Temperature**:

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.

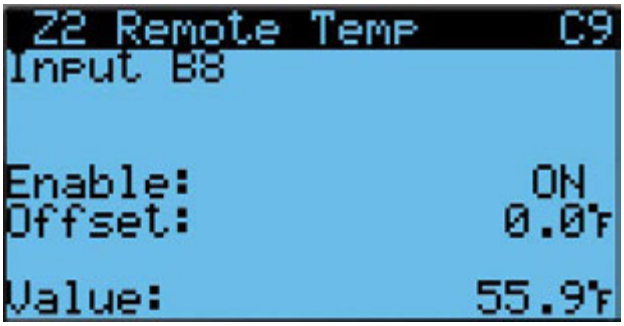
3) Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.

4) Press UP or DOWN keys to scroll to **Z2 Remote Temp C9**.

5) Press ENTER key to scroll to **Enable** (see Figure 47).

6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

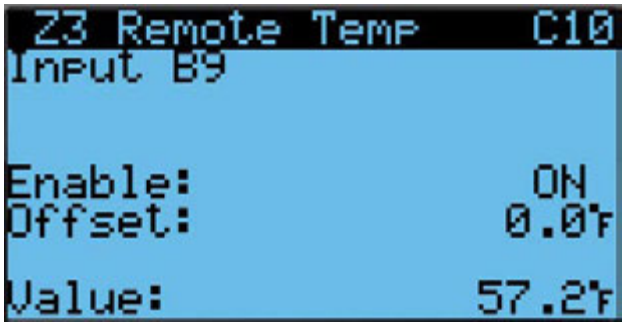
FIGURE 47
Enable/Disable Zone 2 Remote Temperature Sensor



To enable/disable **Zone 3 Remote Temperature**:

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 **IO Config**; press ENTER key.
4) Press UP or DOWN keys to scroll to **Z3 Remote Temp C10**.
5) Press ENTER key to scroll to **Enable** (see Figure 48).
6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

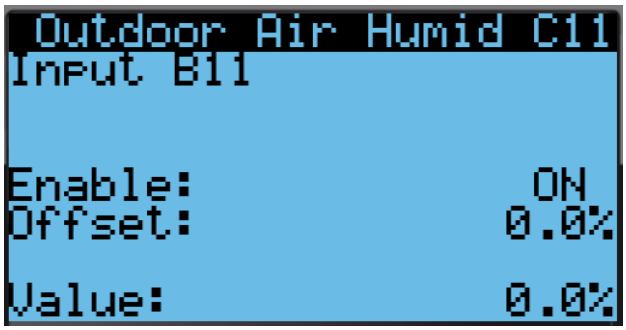
FIGURE 48
Enable/Disable Zone 3 Remote Temperature Sensor



To enable/disable **Outdoor Air Humidity**:

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 **IO Config**; press ENTER key.
4) Press UP or DOWN keys to scroll to **Outdoor Air Humid C11**.
5) Press ENTER key to scroll to **Enable** (see Figure 49).
6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

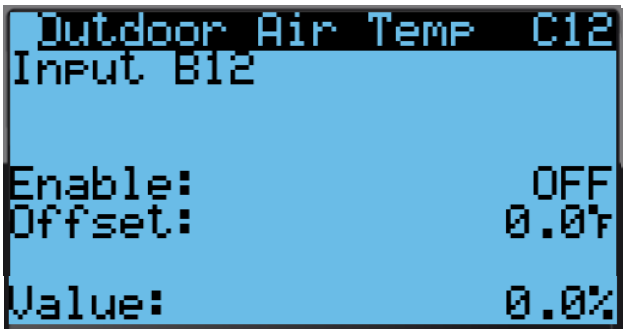
FIGURE 49
Enable/Disable Outdoor Air Humidity Sensor



To enable/disable **Outdoor Air Temperature**:

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 **IO Config**; press ENTER key.
4) Press UP or DOWN keys to scroll to **Outdoor Air Temp C12**.
5) Press ENTER key to scroll to **Enable** (see Figure 50).
6) Press UP or DOWN key to change value to ON to enable sensor (or change value to OFF to disable sensor).

FIGURE 50
Enable/Disable Outdoor Air Temperature



6. Enter Total Number of Units

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 **Sys Config**; press ENTER key.
4) Press UP or DOWN keys to scroll to **General**; press enter key.

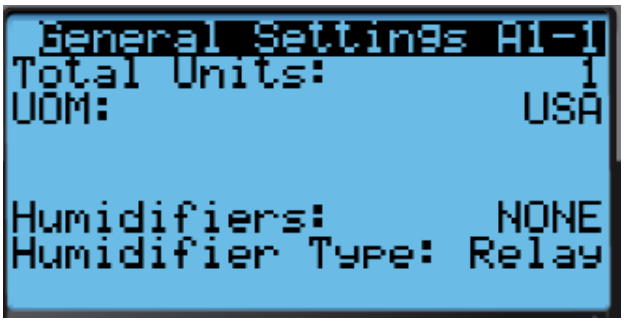
5) Press ENTER key to scroll to **Total Units** (see Figure 51).

6) Press UP or DOWN keys to adjust value to correct number of units.

7) Press ENTER key to save value.

8) Press the ESCAPE key several times to return to Main Menu screen.

FIGURE 51
Total Units Displayed



7. Verify Units Are Online

Once a unit is uniquely addressed, communication can be verified at the LC controller.

With the correct number of units set at the LC controller, each unit can be remotely viewed from the controller information screen.

To view these screens:

1) Press ESCAPE key to view the Status screen. (May need to be pressed more than once.)

2) Press UP or DOWN key until the Quick Menu in the lower right corner of the screen displays the Information icon ( ); press ENTER key.

3) Press UP or DOWN keys to scroll through the Information screens until the desired unit Information screen appears.

In addition to being able to remotely view the units, an alarm will be generated on the LC controller for units not communicating.

8. Select Economizer Type for Each Zone

Each zone can be configured to operate the economizers with different considerations. For more information on the different economizer choices, reference the most recent version of FUSION-TEC WR Series Service Instructions 2100-695.

The type of consideration can be set to none, dry bulb, temperature and humidity or enthalpy. These settings will be communicated to the wall units while connected to the LC6000 to ensure all units operate the same.

To select economizer type for each zone:

1) Press MENU key to go to the Main Menu screen.

2) Use UP or DOWN keys and ENTER key to enter 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 **Zone 1**, **Zone 2** or **Zone 3**; press ENTER key.

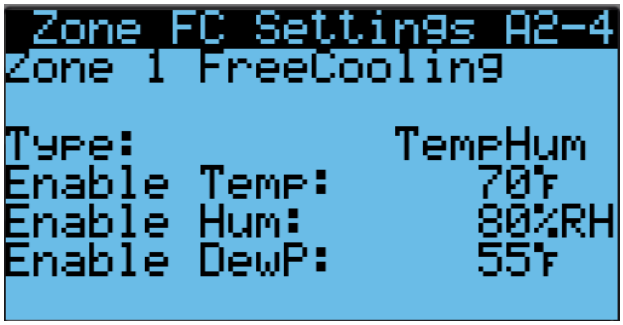
5) Press UP or DOWN keys to scroll to **Zone FC Settings A2-4** (Zone 1), **Zone FC Settings A3-4** (Zone 2) or **Zone FC Settings A4-4** (Zone 3).

6) Press ENTER key to scroll to **Type** (see Figure 52).

7) Press UP or DOWN keys to change economizer type to **None**, **Drybulb**, **TempHum** or **Enthalpy**.

8) Press ENTER key to save.

FIGURE 52
Selecting Economizer Type



9. Clear Controller Alarm Logs

The LC6000 controller may have alarms logged due to bench testing. Controller alarm logs must be cleared at time of installation.

To clear the LC controller alarm logs:

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.

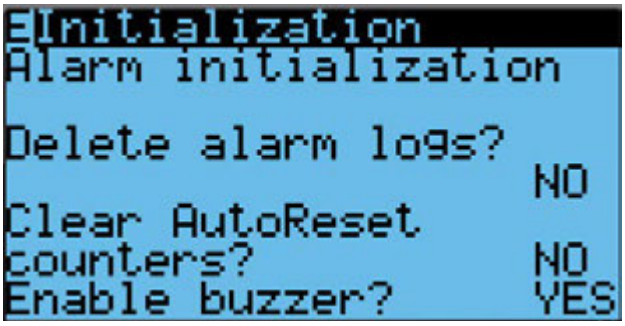
4) Press UP or DOWN keys to scroll to **Initialization**; press ENTER key.

5) Press ENTER key to scroll to **Delete alarm logs?** (see Figure 53 on page 44).

6) Press UP or DOWN key to value to **YES**; press ENTER key.

7) Press ESCAPE key several times to return to Main Menu screen.

FIGURE 53
Clearing LC6000 Alarm Logs



10. Complete Installation

Once all the installation steps have been completed, all alarms and alarm logs have been cleared and system verification and self test results were satisfactory, the installation can now be considered “complete".

Additional programming information can be found in the most recent versions of FUSION-TEC WR Series Service Instructions 2100-695 and LC6000 Service Instructions 2100-669.

Menu Screens and Password Levels

WR Series Unit

System Config: A1-A10 User (2000)
Adv. System Config: B1-B8 Technician (1313)
I/O Config: C1-C15 Technician (1313)
On/Off: User (2000)
Alarm Logs: User (2000)
Settings
- Date/Time: Technician (1313)
- Language: User (2000)
- Import/Export
  - Unit Parameters: Engineer (9254)
  - Alarm Log Export: User (2000)
  - 7 Day Log Export: User (2000)
- Initialization
  - Alarm Management: User (2000)
  - System Default: Engineer (9254)
- Change Passwords

Logout: Used to log out of the current password level. Entering back into the menu requires password.

LC1000 Controller

System Config
- General: User (2000)
- Zone 1: User (2000)
- Zone 2: User (2000)
- Zone 3: User (2000)

Adv. System Config: B1-B13 Technician (1313)
I/O Configuration: C1-C10 Technician (1313)
On/Off: User (2000)
Alarm Log: User (2000)
Settings
- Date/Time: Technician (1313)
- Language: User (2000)
- Network Config: Technician (1313)
- Initialization
  - Clear Logs: User (2000)
  - System Default: Engineer (9254)
  - Restart: User (2000)
  - Parameter Config: Engineer (9254)
  - Alarm Export: User (2000)

Logout: Used to log out of the current password level. Entering back into the menu requires password.

TABLE 5
LC6000/TEC-EYE Passwords (Defaults)

User	2000
Technician	1313
Engineer	9254
Use UP or DOWN keys and ENTER key to enter password	

Setpoints

The *LC6000* setpoints will determine the cooling and heating setpoints when *communicating with the wall-mount units*. The *unit* cooling and heating setpoints will determine the cooling and heating setpoints when *in orphan mode*.

If at any time the unit(s) loses communication with the LC6000 controller, the unit(s) will go into orphan mode.

Calibrating Sensors

1. Press MENU key on LC controller interface 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 **I/O Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to sensor to be adjusted.
5. Press ENTER key to scroll to **Offset** (see Figure 54).
6. Press UP or DOWN keys to add or subtract to the sensor offset value.
7. Press ENTER key to save.

FIGURE 54
Adjusting Sensor Offset Value

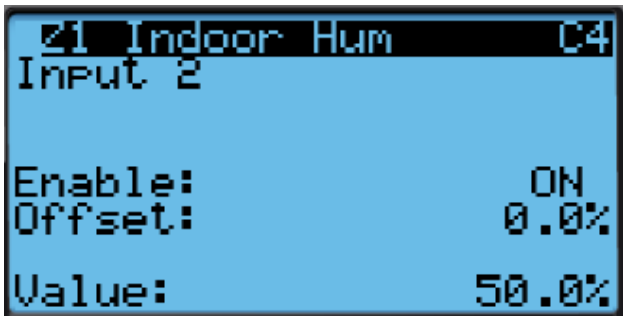


TABLE 6
WR Series Wall-Mount Unit Status Messages

Message	Description
Waiting...	PLC is on and has not started running the application yet.
Orphan Mode	Unit is on and in orphan mode with no calls for heating or cooling.
LC Online	Unit is on and communicating with the LC6000 with no heating or cooling calls.
Cont. Blower	Unit is operating with continuous blower when no heating or cooling calls are present.
Power Loss	Unit has experienced a loss of main utility power. Alarm only available with inverter units.
Freecooling	Unit is actively economizing.
Optimized Cool	Unit is mechanical cooling while actively economizing.
Cooling	Unit is actively mechanical cooling.
Heating	Unit is actively heating.
Passive Dehum	Unit is taking measures to decrease humidity without using extra energy.
Active Dehum	Unit is taking active measures to decrease humidity.
Self Test	Unit is performing a self test.
Off by Alarm	Unit has major fault preventing operation.
Off by DI	Unit is disabled by the local unit disable input.
Off by LC	Unit has been turned off by the supervisory controller.
Off by Keyboard	Unit has been turned off by the local user.
Override Active	There is an active override on the system.
Emergency Vent	Unit is in Emergency Ventilation. LC6000 has an active hydrogen alarm.
Emergency Cool	Unit is in Emergency Cooling. Indoor temperatures have exceeded high temp alarms.
Emergency Off	Unit is in Emergency Off. LC6000 Emergency Off input indicates an alarm.

TABLE 7
LC6000 Status Messages

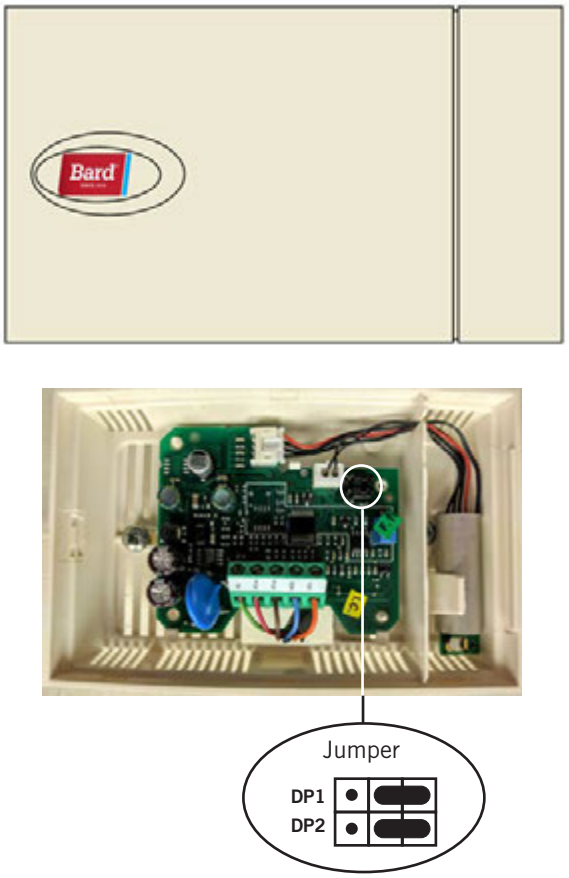
Message	Description
On	The LC6000 is ready and functioning properly.
Off by BMS	The LC6000 is being turned off by the Building Management System through Modbus TCP/IP.
Off by Keyboard	The LC6000 is turned off using the (D. On/Off) Menu on the PGD. All communicating units will be inactive.
Comfort Mode	The LC6000 is set to Comfort Mode. This mode is used to temporarily override heating/cooling setpoints and maintain a default temperature of 72°F for 60 minutes.
Emergency Cooling	A high temperature has been sensed in one or more zones. All available units in that zone are sent a command for emergency cooling. (Refer to unit manual for emergency cooling sequence.)
Emergency Vent	Input signal from an external device at terminal DI2 (e.g., hydrogen detector). Units that are equipped with a ventilation option and configured will open the dampers at 100% with the blower at full speed.

Remote Indoor Temperature/Humidity Sensor Orientation

Current versions of the remote indoor temperature/humidity sensor need to be installed with the shielded cable wires entering the bottom of the back of the sensor to connect to the sensor terminals (see Figure 55). Earlier versions of this sensor were installed so that the sensor wires entered through the top of the back of the sensor (see Figure 56). **The orientation of the sensor affects the position of the DP1/DP2 jumpers. Depending on how the sensor is installed, be sure to confirm that the jumpers are in the proper position for the 0-1 V setting as shown in the figures below.**

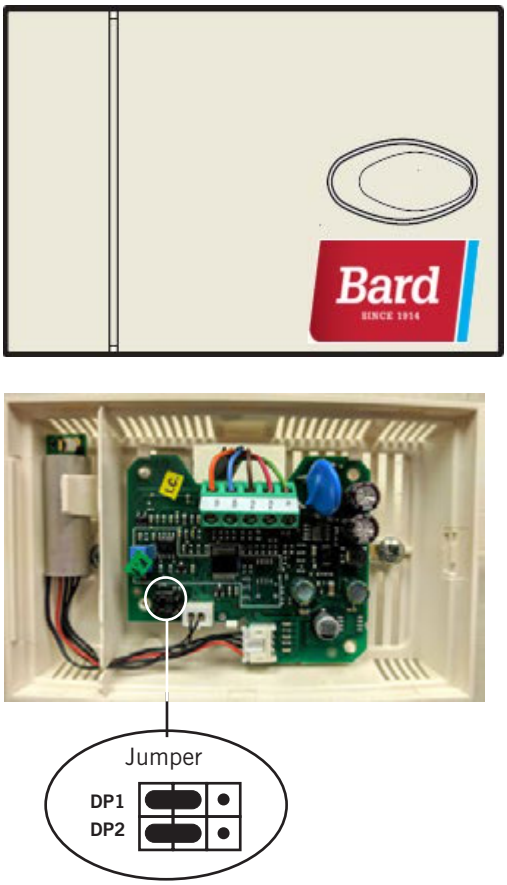
This applies to all indoor temperature/humidity sensors connected to the LC controller. See illustration mounted inside of sensor cover for further detail on jumper position.

FIGURE 55
Current Sensor Orientation
(Shielded Cable Wires Enter from Bottom)



DP1 and DP2 Jumpers
Positioned for 0-1V
(Current Orientation)

FIGURE 56
Earlier Sensor Orientation
(Shielded Cable Wires Enter from Top)



DP1 and DP2 Jumpers
Positioned for 0-1V
(Earlier Orientation)

Quick Start Guide

FUSION-TEC® WR Series/LC6000 Air Conditioning System

This quick start guide is designed to lead an installer through the steps necessary for setting up a Bard air conditioning system composed of FUSION-TEC WR Series wall-mount units paired with an LC6000 controller. See the latest versions of FUSION-TEC WR Series/LC6000 System Installation Instructions 2100-704, FUSION-TEC WR Series Service Instructions 2100-688 and LC6000 Service Instructions 2100-669 for more detailed information on the installation, service and maintenance of this Bard air conditioning system.

The TEC-EYE™ hand-held diagnostic tool and LC6000 controller will both be used in this installation. The TEC-EYE diagnostic tool is shipped inside the controller and a cable is included to connect it to the wall-mount unit control board.

NOTICE

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

SYSTEM SET-UP

Set up and configuration must be done to each FUSION-TEC WR Series wall-mount unit using the TEC-EYE hand-held diagnostic tool. Use the LC6000 controller for the remaining steps.

IMPORTANT: *When working with circuit board components, Bard recommends the use of an anti-static wrist strap to prevent static electricity shorts to electronic controls.*

Address each wall unit and select unit zone and unit of measure (TEC-EYE)

The address of the unit being looked at will be listed in the upper right hand corner on the status screen. The available addresses are 1-14.

1. Remove outer and inner unit control panel doors.
2. Connect TEC-EYE to wall-mount unit control board.
3. Press MENU key to access the Main Menu screen.
4. Press UP/DOWN/ENTER keys to enter password 1313.
5. Press UP/DOWN keys to scroll to **Sys Config**; press ENTER key.
6. Press ENTER key to scroll to **Controller Address**.
7. Press UP/DOWN keys to change address to value between 1 and 14.

NOTE: *Each unit must have a unique address for the communication to work properly. Bard also recommends labeling each unit for ease in identification.*

8. Press ENTER key to scroll to **UOM** (unit of measure**)**.
9. If desired, press UP/DOWN keys to change the value from **USA** to **SI**, **NC**, **LON**, **CAN** or **UK**. Units are preconfigured for each selection.
10. Press ENTER key to scroll to **Zone**.
11. If desired, press UP/DOWN keys to change the value to the desired zone (1, 2 or 3).
12. Press ENTER key to save.

Execute a run test on each unit to verify the equipment is functioning correctly (TEC-EYE)

1. Use UP/DOWN keys to scroll to **Run Test A10**.
2. Press ENTER key to scroll to **Run Test Enable** parameter.
3. Use UP/DOWN key to change value to **ON**. The run test will begin.

See most recent version of Installation Instructions 2100-704 if additional information on run testing units is needed.

Clear unit alarm logs on each unit (TEC-EYE)

Units may have alarms logged due to testing. Unit alarm logs must be cleared at time of installation. To clear the wall-mount unit alarm logs:

1. Press MENU key to go to the Main Menu screen.
2. Use UP/DOWN/ENTER keys to enter password 1313.
3. Press UP/DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP/DOWN keys to scroll to **Initialization**; press ENTER key.
5. Press ENTER key to scroll to **Clear Alarm Logs?**.
6. Press UP/DOWN key to change value to **YES**; press ENTER key.

After first unit has been set up and configured, follow the above steps to set up and configure the remaining units.

The LC6000 controller will be used for the remaining steps in the set-up process.

Set LC Controller Date/Time (LC Controller)

1. Press MENU key to access the Main Menu screen.
2. Use UP/DOWN/ENTER keys to enter password 1313.
3. Press the UP/DOWN keys to scroll to the **Settings** menu; press ENTER key.
4. Press UP/DOWN keys to scroll to **Date/Time** menu; press ENTER key.

5. Press UP/DOWN keys to scroll to **Date/Time change**.
6. Press ENTER key to scroll to the desired value to be changed.
7. Press UP/DOWN keys to change the value.
8. Press ENTER key to save and scroll to top of screen.
9. Press UP/DOWN keys to scroll to **Timezone** (if applicable). Follow steps 6-8 to change timezone.
10. Press the ESCAPE key several times to return to Main Menu screen.

Configure sensors (LC Controller)

One remote temperature/humidity sensor is included with the controller. An additional remote indoor temperature sensor can be installed in Zone 1. Additional remote temperature/humidity sensors or temperature-only sensors (one per zone) can be installed in Zones 2 and 3 (if applicable). One optional outdoor temperature/humidity sensor can also be installed. The controller must be configured to match the installed sensors. The Zone 1 Indoor Humidity and Zone 1 Indoor Temperature sensors are enabled by default. The additional humidity and temperature sensors are disabled by default.

See Installation Instructions 2100-704 for information on configuring (enabling/disabling) sensors. If necessary, the sensors can be calibrated at this time too. For information on calibrating the sensors, see manual 2100-704.

See LC6000 Service Instructions manual 2100-669 for information on setting up emergency off, emergency ventilation and generator relays (if applicable).

Enter total number of units (LC Controller)

1. Press MENU key to go to the Main Menu screen.
2. Use UP/DOWN/ENTER keys to enter password 1313.
3. Press UP/DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP/DOWN keys to scroll to **General**; press ENTER key.
5. Press ENTER key to scroll to **Total Units**.
6. Press UP/DOWN keys to adjust value to correct number of units.
7. Press ENTER key to save.

Verify units are online (LC Controller)

Once a unit is uniquely addressed, communication can be verified at the LC controller.

With the correct number of units set at the LC controller, each unit can be remotely viewed from the LC Information screens.

To view these screens:

1. Press ESCAPE key to view the Status screen. (May need to be pressed more than once.)
2. Press UP/DOWN key until the Quick Menu in the lower right corner of the screen displays the Information icon ( ); press ENTER key.
3. Press UP/DOWN keys to scroll through the Information screens until the desired unit Information screen appears.

In addition to being able to remotely view the units, an alarm will be generated on the LC controller for units not communicating.

Select economizer type for each zone (LC Controller)

Each zone can be configured to operate the economizers with different considerations. For more information on the different economizer choices, reference FUSION-TEC WR Series Service Manual 2100-688.

The type of consideration can be changed to none, dry bulb, temperature and humidity or enthalpy. These settings will be communicated to the wall units while connected to the LC6000 to ensure all units operate the same.

To select free cooling type for each zone:

1. Press MENU key to go to the Main Menu screen.
2. Use UP/DOWN/ENTER keys to enter password 1313.
3. Press UP/DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP/DOWN keys to scroll to **Zone 1**, **Zone 2** or **Zone 3**; press ENTER key.
5. Press UP/DOWN keys to scroll to **Zone FC Settings A2-4** (Zone 1), **Zone FC Settings A3-4** (Zone 2) or **Zone FC Settings A4-4** (Zone 3**)**.
6. Press ENTER key to scroll to **Type**.
7. Press UP/DOWN keys to change economizer type to **None**, **Drybulb**, **TempHum** or **Enthalpy**.
8. Press ENTER key to save.

Clear controller alarm logs (LC Controller)

The LC6000 may have alarms logged due to bench testing. Controller alarm logs must be cleared at time of installation. To clear the LC controller alarm logs:

1. Press MENU key to go to the Main Menu screen.
2. Use UP/DOWN/ENTER keys to enter password 1313.
3. Press UP/DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP/DOWN keys to scroll to **Initialization**; press ENTER key.
5. Press ENTER key to scroll to **Delete alarm logs?**
6. Press UP/DOWN key to change value to **YES**; press ENTER key.
7. Press ESCAPE key several times to return to Main Menu screen.

Once all the installation steps have been completed, all alarms and alarm logs have been cleared and system verification and run test results were satisfactory, the installation can now be considered “complete”.

REPLACEMENT PARTS MANUAL

FUSION-TEC®
Wall-Mount Air Conditioner

Models: WR35BPA WR36BPA WR58BPA
WR35BPB WR36BPB WR58BPB

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.

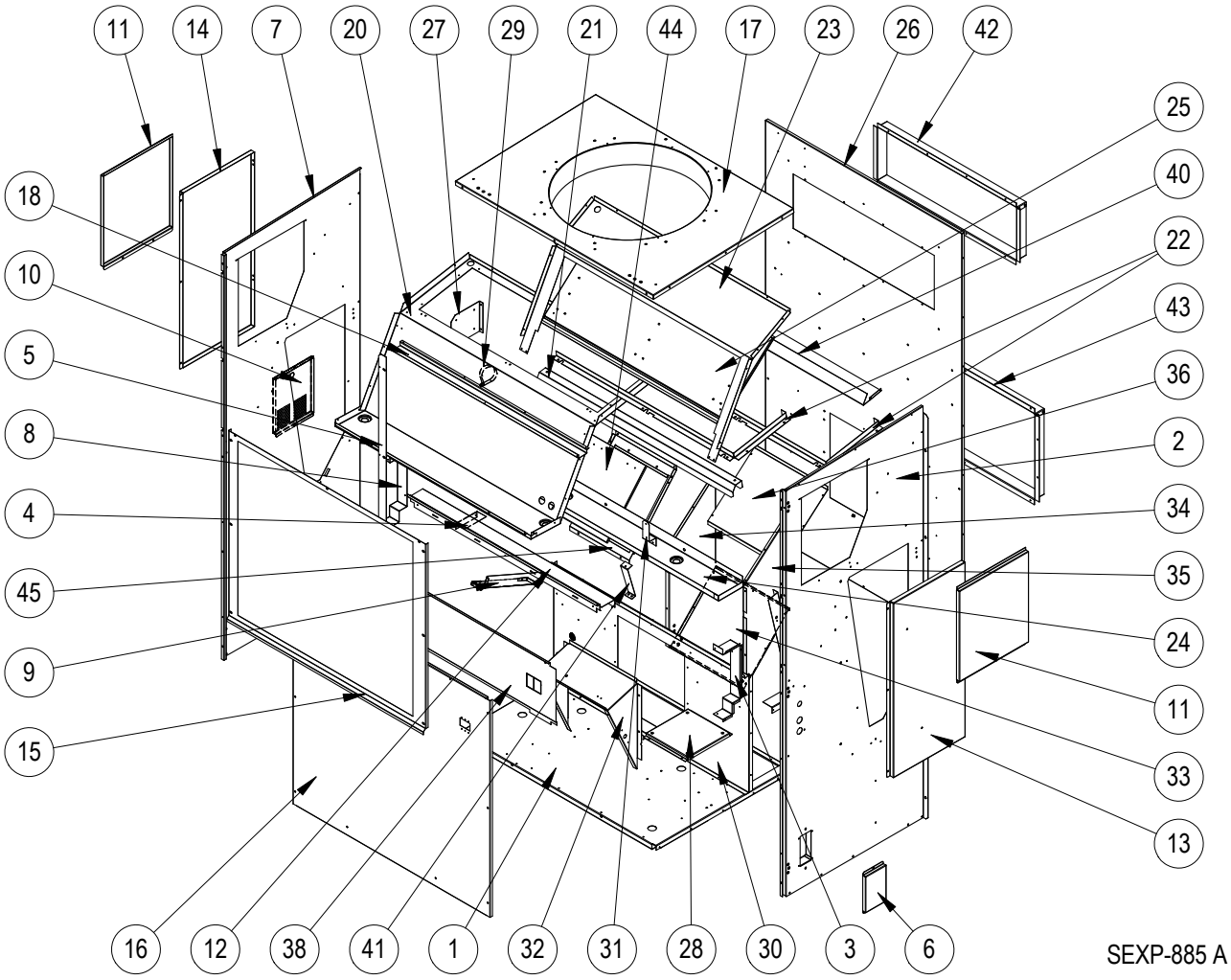
Bard® SINCE 1914
Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

www.bardhvac.com

Manual: 2110-1547O
Supersedes: 2110-1547N
Date: 1-2-24

CABINET COMPONENTS



NOTE: *When replacing parts in the upper condenser area, note any use of caulk as a sealant. Be sure to replace caulk seals using 100% silicone outdoor-rated caulk.*

This drawing is referenced in tables on pages 3 and 4

Dwg No.	Part Number	Description	WR35BPA	WR35BPB
1	527-545	Unit Base	X	X
2	S501-1015-* ①	Right Side	X	X
3	105X1434	Right Control Panel Angle	X	X
4	105-1416	Drain Pan Angle	X	X
5	105-1447	Condenser Coil Fill	X	X
6	S543-212-* ①	Coremax Box Cover	X	X
7	501-1016-* ①	Left Side Assembly	X	X
8	105Y1434	Left Control Panel Angle	X	X
9	113-696	Wire Bracket	X	X
10	S553-704-* ①	Sensor Access Door	X	X
11	S143-217-* ①	Condenser Access Panel	2	2
12	S135-893-* ①	Coil Riser	X	X
13	S543-215-* ①	Right Filter Panel	X	X
14	S543-218-* ①	Left Filter Panel	X	X
15	118-120-* ①	Condenser Grille	X	X
16	S533-293-* ①	Control Panel Cover	X	X
17	S107-384-* ①	Unit Top	X	X
18	137-892	Upper Condenser Fill	X	X
20	521-560-* ①	Lower Condenser Partition w/ Damper Frame	X	X
21	131-167	Upper Filter Angle	X	X
22	111-295	Outdoor Air Frame	X	X
23	521-564-* ①	Upper Condenser Partition	X	X
24	S123-155	Drain Pan	X	X
25	921-0055	Exhaust Damper Blade Assembly	X	X
26	S509-397	Back Assembly	X	X
27	113-677	Motor Control Bracket	X	X
28	127-555	Compressor Isolation Plate	X	X
29	8550-011	2-1/2" Single Hole Strap	X	X
30	521-565	Evaporator Partition	X	X
31	113-718	Filter Switch Hose Bracket	X	X
32	105-1435	Left Blower Mounting Angle	X	X
32	105-1443	Right Blower Mounting Angle	X	X
33	539-372	Supply Duct Bottom	X	X
34	539-373	Supply Duct Left	X	X
35	539-374	Supply Duct Right	X	X
36	539-375	Supply Duct Top	X	X
38	S133-294	Inner Control Panel Cover	X	
38	S133-311	Inner Control Panel Cover		X
40	143-216	Evaporator Coil Cover	X	X
42	111-296	Return Air Frame	X	X
43	111-297	Supply Air Frame	X	X
44	S139-376	Outdoor Damper Blade	2	2
45	105-1432	Outdoor Damper Frame	2	2
NS	113-740	Rain Flashing	X	X
NS	113-704	Motor Cradle	X	X
NS	S518-121	Lower Intake Grille Assembly	X	X
NS	5252-033	Bard Nameplate	X	X

① Standard unit exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, please reference the following codes: Beige -X, White -1, Buckeye Gray -4, Desert Brown -5, Dark Bronze -8

NS – Not Shown

CABINET COMPONENTS

Dwg No.	Part Number	Description	WR36BPA	WR36BPB	WR58BPA	WR58BPB
1	527-573	Unit Base	X	X	X	X
2	S501-1001-* ①	Right Side – Standard Unit	X	X	X	X
3	105X1413	Right Control Panel Angle	X	X	X	X
4	105-1416	Drain Pan Angle	2	2	2	2
5	105-1425	Condenser Coil Angle	X	X	X	X
6	S543-212-* ①	Coremax Box Cover	X	X	X	X
7	S501-1002-* ①	Left Side Assembly – Standard Unit	X	X	X	X
8	105Y1413	Left Control Panel Angle	X	X	X	X
9	113-681	Wire Bracket	X	X	X	X
10	S553-704-* ①	Sensor Access Door	X	X	X	X
11	S143-210-* ①	Condenser Access Panel	2	2	2	2
12	S135-383-* ①	Rain Channel/Coil Riser	X	X	X	X
13	S543-211-* ①	Right Filter Panel	X	X	X	X
14	S543-213-* ①	Left Filter Panel	X	X	X	X
15	118-117-* ①	Condenser Grille	X	X	X	X
16	S533-288-* ①	Control Panel Cover	X	X	X	X
17	S107-381-* ①	Unit Top	X	X	X	X
18	137-880	Upper Condenser Fill	X	X	X	X
20	521-558-* ①	Lower Condenser Partition w/ Damper Frame	X	X	X	X
21	131-166	Upper Filter Angle	X	X	X	X
22	111-273	Outdoor Air Frame	X	X	X	X
23	521-554-* ①	Upper Condenser Partition	X	X	X	X
24	S123-154	Drain Pan	X	X	X	X
25	921-0035	Exhaust Damper Blade Assembly	X	X	X	X
26	S509-392	Back Assembly	X	X	X	X
27	113-677	Motor Control Bracket	X	X	X	X
28	127-555	Compressor Isolation Plate	X	X	X	X
29	8550-011	2-1/2" Single Hole Strap	X	X	X	X
30	521-555	Evaporator Partition	X	X	X	X
31	113-678	Filter Switch Hose Bracket	X	X	X	X
32	111-332	Blower Mounting Duct Flange Top	X	X	X	X
32	111X333	Blower Mounting Duct Flange Right	X	X	X	X
32	111Y333	Blower Mounting Duct Flange Left	X	X	X	X
33	539-363	Supply Duct Bottom	X	X	X	X
34	539-364	Supply Duct Left	X	X	X	X
35	539-365	Supply Duct Right	X	X	X	X
36	539-366	Supply Duct Top	X	X	X	X
38	S133-290	Inner Control Panel Cover	X		X	
38	S133-295	Inner Control Panel Cover		X		X
40	143-214	Evaporator Coil Cover	X	X	X	X
41	113-682	EEV Bracket	X	X	X	X
42	111-115	Return Air Frame	X	X	X	X
43	111-270	Supply Air Frame	X	X	X	X
44	S139-367	Outdoor Damper Blade	2	2	2	2
45	S105-1414	Outdoor Damper Frame	2	2	2	2
NS	113-150-* ①	Rain Flashing	X	X	X	X
NS	113-704	Motor Cradle Mount	X	X	X	X
NS	S518-119	Lower Intake Grille Assembly	X	X	X	X
NS	5252-033	Bard Nameplate	X	X	X	X

① Standard unit exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, please reference the following codes: Beige -X, White -1, Buckeye Gray -4, Desert Brown -5, Dark Bronze -8

NS – Not Shown

This table references drawing on page 2

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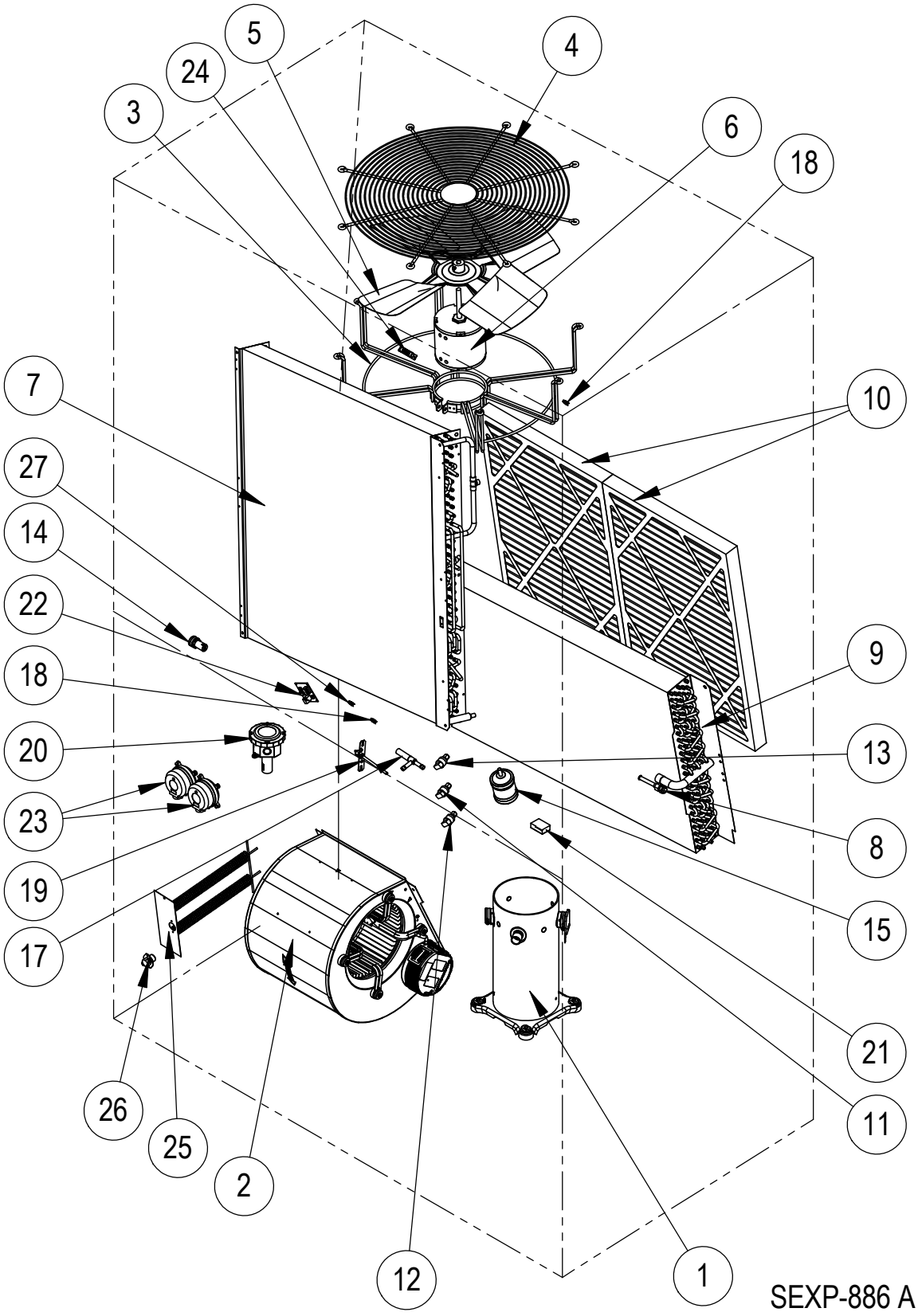
FUNCTIONAL COMPONENTS



This drawing is referenced in tables on pages 7 and 8

Dwg No.	Part Number	Description	WR35BPA	WR35BPB	WR36BPA	WR36BPB
1	8000-440	Compressor	X			
1	8000-442	Compressor		X		
1	8000-379	Compressor			X	
1	8000-380	Compressor				X
2	900-362-0154BX	Blower Assembly	X	X		
2	5154-002-0146BX	Blower Assembly			X	X
3	8200-054	Condenser Motor Mount	X	X		
3	8200-055	Condenser Motor Mount			X	X
4	7051-094	Condenser Discharge Grille	2	2		
4	7051-091	Condenser Discharge Grille			2	2
5	5151-064	Fan Blade	X	X		
5	5151-062	Fan Blade			X	X
6	8106-061-0167	Condenser Fan Motor	X	X		
6	S8105-070-0145	Condenser Fan Motor			X	X
7	5051-218	Condenser Coil	X	X		
7	5054-218	Condenser Coil – Coated	X	X		
7	5051-217	Condenser Coil			X	X
7	5054-217	Condenser Coil – Coated			X	X
8	800-0417	Distributor Assembly	X	X		
8	800-0460	Distributor Assembly			X	X
9	917-0349	Evaporator Coil	X	X		
9	917-0350	Evaporator Coil – Coated	X	X		
9	917-0343	Evaporator Coil			X	X
9	917-0344	Evaporator Coil – Coated			X	X
10	7004-068	Air Filter MERV 8 (18"x22"x2")	2	2	2	2
10	7004-027	Air Filter MERV 8 (20"x30"x2")	2	2	2	2
11	8406-157	Liquid Line Pressure Transducer	X	X	X	X
12	8406-158	Suction Pressure Transducer	X	X	X	X
13	8406-142	High Pressure Switch	X	X	X	X
14	8611-199	Filter Service LED	X	X	X	X
15	5201-021	Filter Drier	X	X		
15	5201-022	Filter Drier			X	X
17	5651S244	Electronic Expansion Valve (less cable and stator – see NS below)	X	X	X	X
18	8408-044	Return Air Sensor	X	X	X	X
18	8408-054	Suction Temp Sensor	X	X	X	X
19	8301-066	Supply Air Temp Sensor	X	X	X	X
20	8301-067	Outdoor Temp and Humidity Sensor	X	X	X	X
21	8301-073	Dust (Particulate) Sensor	X	X	X	X
22	8612-061	Dust (Particulate) Sensor Board	X	X	X	X
23	8301-057	Filter Switch w/Adjustment	X	X	X	X
23	8301-057	Blower Fail Switch w/Adjustment	X	X	X	X
24	8406-150	Damper Blade Switch	X	X	X	X
25	--	Reference pages 17 and 18	X	X	X	X
26	--	Reference pages 17 and 18	X	X	X	X
27	8408-045	Liquid Line Temp Sensor	X	X	X	X
NS	6301-009	Coremax Valve Core	2	2	2	2
NS	8605-019	Compressor Crankcase Heater ①	X	X	X	X
NS	8602-040	Damper Hinge	7	7	7	7
NS	8602-095	22" Rod	2	2		
NS	8602-084	37-1/4" Rod			2	2
NS	5651-246	Electronic Expansion Valve Cable and Stator	X	X	X	X
NS	8615-092	Circuit Breaker Boot	X	X	X	X

① – Optional on these models NS – Not Shown

FUNCTIONAL COMPONENTS

Dwg No.	Part Number	Description	WR58BPA	WR58BPB
1	8000-385	Compressor	X	
1	8000-386	Compressor		X
2	S5154-007-0142	Blower Assembly	X	X
3	8200-055	Condenser Motor Mount	X	X
4	7051-091	Condenser Discharge Grille	2	2
5	5151-062	Fan Blade	X	X
6	S8106-061-0132	Condenser Fan Motor	X	X
7	5051-216	Condenser Coil	X	X
7	5054-216	Condenser Coil – Coated	X	X
8	800-0417	Distributor Assembly	X	X
9	917-0339	Evaporator Coil	X	X
9	917-0340	Evaporator Coil – Coated	X	X
10	7004-027	Air Filter MERV 8 (20"x30"x2")	2	2
11	8406-157	Liquid Line Pressure Transducer	X	X
12	8406-158	Suction Pressure Transducer	X	X
13	8406-142	High Pressure Switch	X	X
14	8611-199	Filter Service LED	X	X
15	5201-022	Filter Drier	X	X
17	5651S245	Electronic Expansion Valve (less cable and stator – see NS below)	X	X
18	8408-044	Return Air Sensor	X	X
18	8408-054	Suction Temp Sensor	X	X
19	8301-066	Supply Air Temp Sensor	X	X
20	8301-067	Outdoor Temp and Humidity Sensor	X	X
21	8301-073	Dust (Particulate) Sensor	X	X
22	8612-061	Dust (Particulate) Sensor Board	X	X
23	8301-057	Filter Switch w/Adjustment	X	X
23	8301-057	Blower Fail Switch w/Adjustment	X	X
24	8406-150	Damper Blade Switch	X	X
25	--	Reference page 18	X	X
26	--	Reference page 18	X	X
27	8408-045	Liquid Line Temp Sensor	X	X
NS	6301-009	Coremax Valve Core	2	2
NS	8605-017	Compressor Crankcase Heater ①	X	X
NS	8602-040	Damper Hinge	7	7
NS	8602-084	37-1/4" Rod	2	2
NS	5651-246	Electronic Expansion Valve Cable and Stator	X	X
NS	8615-092	Circuit Breaker Boot	X	X

① – Optional on these models NS – Not Shown

This table references drawing on page 6

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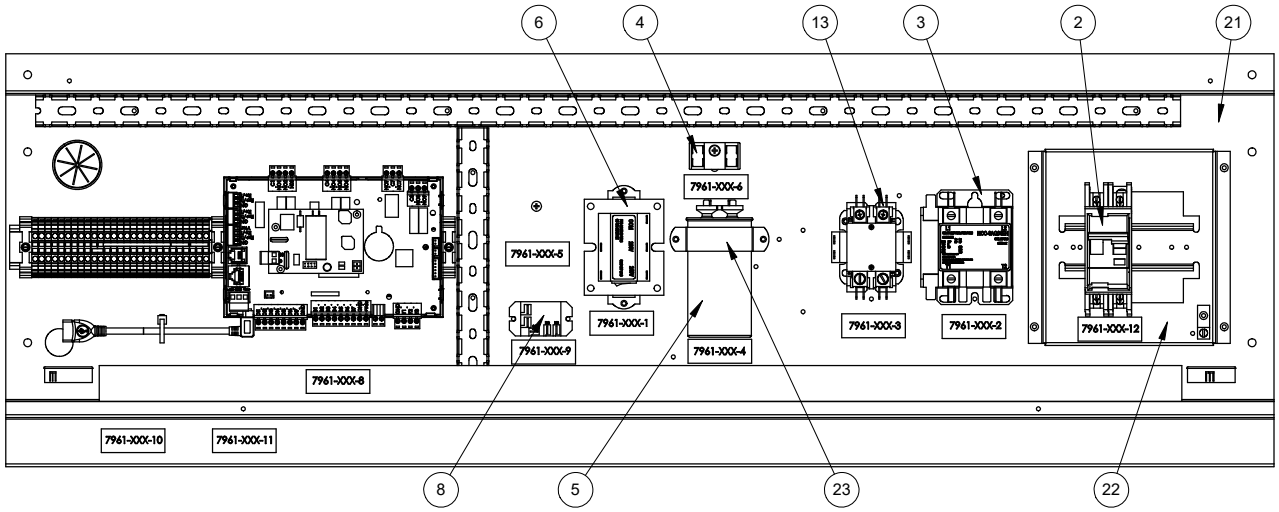
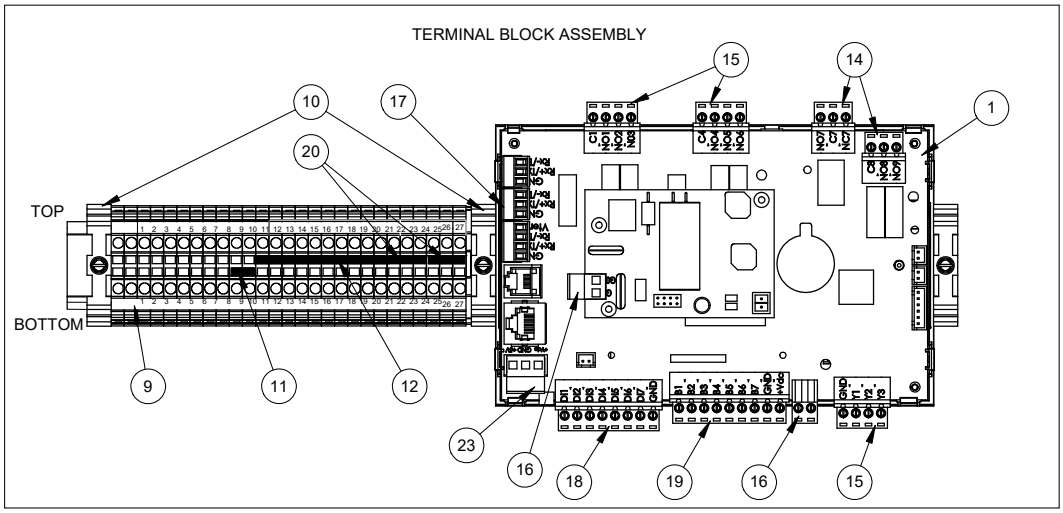
CONTROL PANEL – 1 PHASE





SEXP-887 C

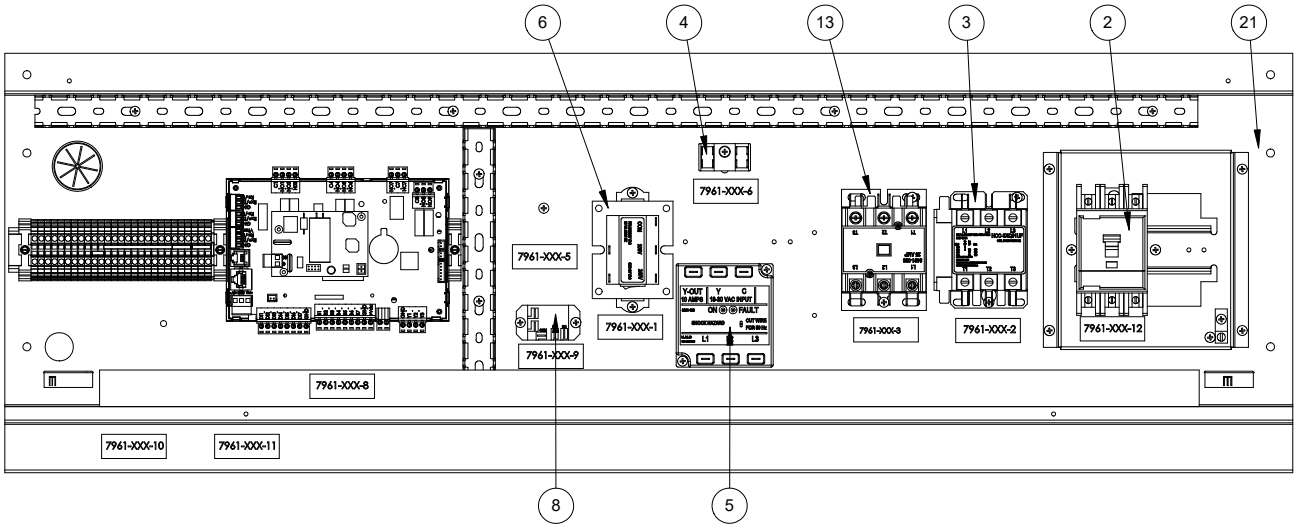
Dwg No.	Part Number	Description	WR35BPA	WR36BPA	WR58BPA
1	8301-096-004*	UPC3-C2 FUSION-TEC WR	X	X	X
2	8615-097	Circuit Breaker 35A 2-Pole	X	X	
2	8615-098	Circuit Breaker 60A 2-Pole			X
3	8401-038	Contactor 2-Pole 40 Amp (Compressor)	X	X	X
4	8607-017	Terminal Block 240V 2 Terminal	X	X	X
5	8552-043 ①	Capacitor 45MFD 370V 2.5" R	X		
5	8552-035 ①	Capacitor 40MFD 370V 1.5" R		X	
5	8552-096	Capacitor 40MFD 440V 2" R			X
6	8407-065	Transformer 208/240-24 75VA	X	X	X
7	8201-171BX	Compressor Control Module	X	X	X
8	8201-130	Relay Pilot Duty	X	X	X
9	8611-150	DIN Rail Terminal Block	X	X	X
10	8611-144	DIN Rail End Clamp	X	X	X
11	8611-194	2 Position Jumper	X	X	X
12	8611-203	10 Position Jumper	X	X	X
13	8401-034	Contactor 2-Pole 40 Amp (Heat)	X	X	X
14	8611-147	3-Pin Circuit Board Connector	3	3	3
15	8611-148	4-Pin Circuit Board Connector	3	3	3
16	8611-183	2-Pin Circuit Board Connector	2	2	2
17	8611-192	3-Pin Circuit Board Connector	1	1	1
18	8611-185	8-Pin Circuit Board Connector	1	1	1
19	8611-149	9-Pin Circuit Board Connector	1	1	1
20	8611-208	3 Position Jumper	2	2	2
21	517-401	Control Panel	X		
21	517-400	Control Panel		X	X
22	127-556	Circuit Breaker Base	X	X	X
23	8550-008	Capacitor Bracket 2.5"	X		
23	8550-007	Capacitor Bracket 2.0"			X
23	8550-006	Capacitor Bracket 1.5"		X	
NS	8301-088	USB A to Micro B 90° Cable	X	X	X

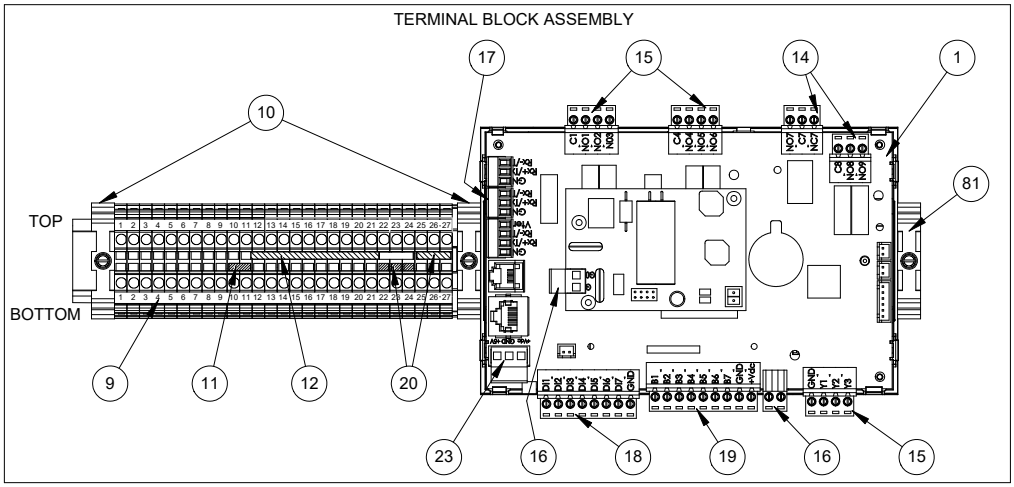
* Replacement part will have a letter attached to the end of the part number to designate software version (Example: 8301-096-004**A**). A software upgrade of all PLCs onsite (units and controllers) should accompany any PLC replacement. Latest revisions of software, change log and instructions are available on the Bard website at http://www.bardhvac.com/software-download/

① Capacitor mounted to WR35/36BPA control panel

Wiring diagram reference listed under **HEATER PACKAGES** on pages 17 and 18

CONTROL PANEL – 3 PHASE





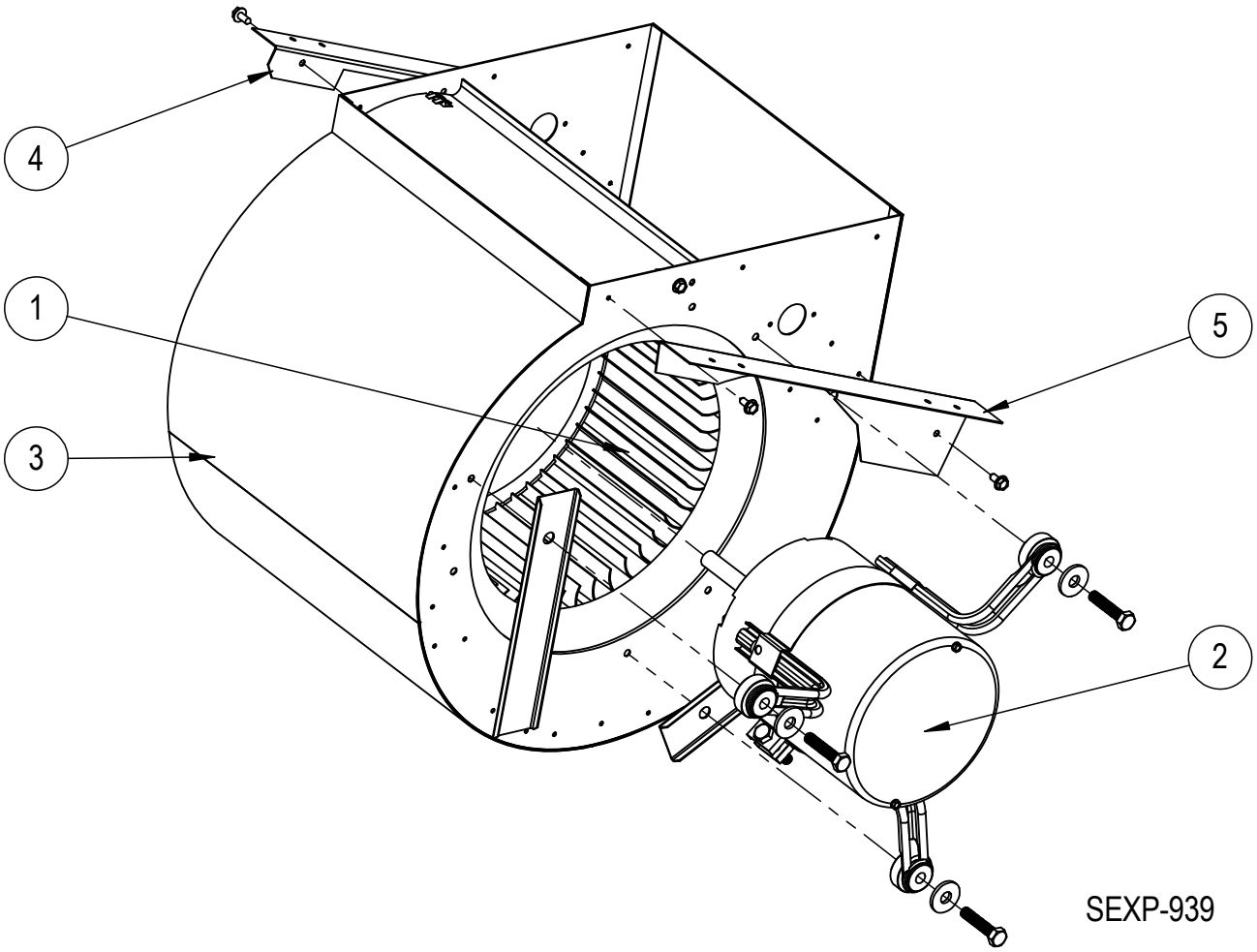
SEXP-891 B

Dwg No.	Part Number	Description	WR35BPB	WR36BPB	WR58BPB
1	8301-096-004*	UPC3-C2 FUSION-TEC WR	X	X	X
2	8615-099	Circuit Breaker 45A 3-Pole			X
2	8615-100	Circuit Breaker 30A 3-Pole	X	X	
3	8401-037	Contactor 3-Pole 30 Amp (Compressor)	X	X	X
4	8607-017	Terminal Block 240V 2 Terminal	X	X	X
5	8201-174BX	3 Phase Line Monitor 50/60 HZ	X	X	X
6	8407-065	Transformer 208/240-24 75VA	X	X	X
7	8201-171BX	Compressor Control Module	X	X	X
8	8201-130	Relay Pilot Duty	X	X	X
9	8611-150	DIN Rail Terminal Block	X	X	X
10	8611-144	DIN Rail End Clamp	X	X	X
11	8611-194	2 Position Jumper	X	X	X
12	8611-203	10 Position Jumper	X	X	X
13	8401-035	Contactor 3-Pole 25 Amp (Heat)	X	X	X
14	8611-147	3-Pin Circuit Board Connector	3	3	3
15	8611-148	4-Pin Circuit Board Connector	3	3	3
16	8611-183	2-Pin Circuit Board Connector	2	2	2
17	8611-192	3-Pin Circuit Board Connector	1	1	1
18	8611-185	8-Pin Circuit Board Connector	1	1	1
19	8611-149	9-Pin Circuit Board Connector	1	1	1
20	8611-208	3 Position Jumper	2	2	2
21	517-400	Control Panel		X	X
21	517-401	Control Panel	X		
22	127-556	Circuit Breaker Base	X	X	X
NS	8301-088	USB A to Micro B 90° Cable	X	X	X

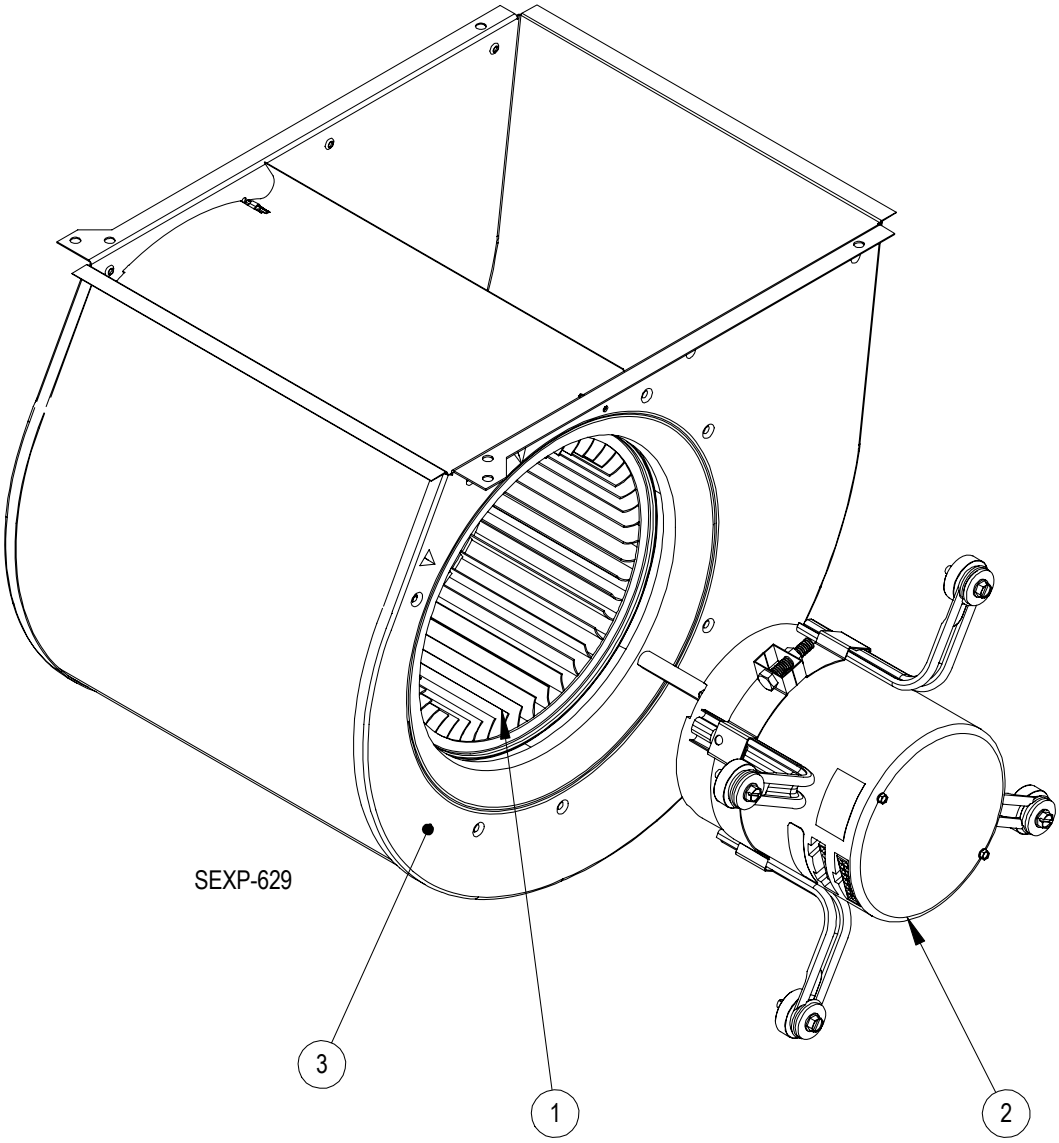
* Replacement part will have a letter attached to the end of the part number to designate software version (Example: 8301-096-004**A**). A software upgrade of all PLCs onsite (units and controllers) should accompany any PLC replacement. Latest revisions of software, change log and instructions are available on the Bard website at http://www.bardhvac.com/software-download/

Wiring diagram reference listed under **HEATER PACKAGES** on page 18

BLOWER ASSEMBLY COMPONENTS – WR35BP*



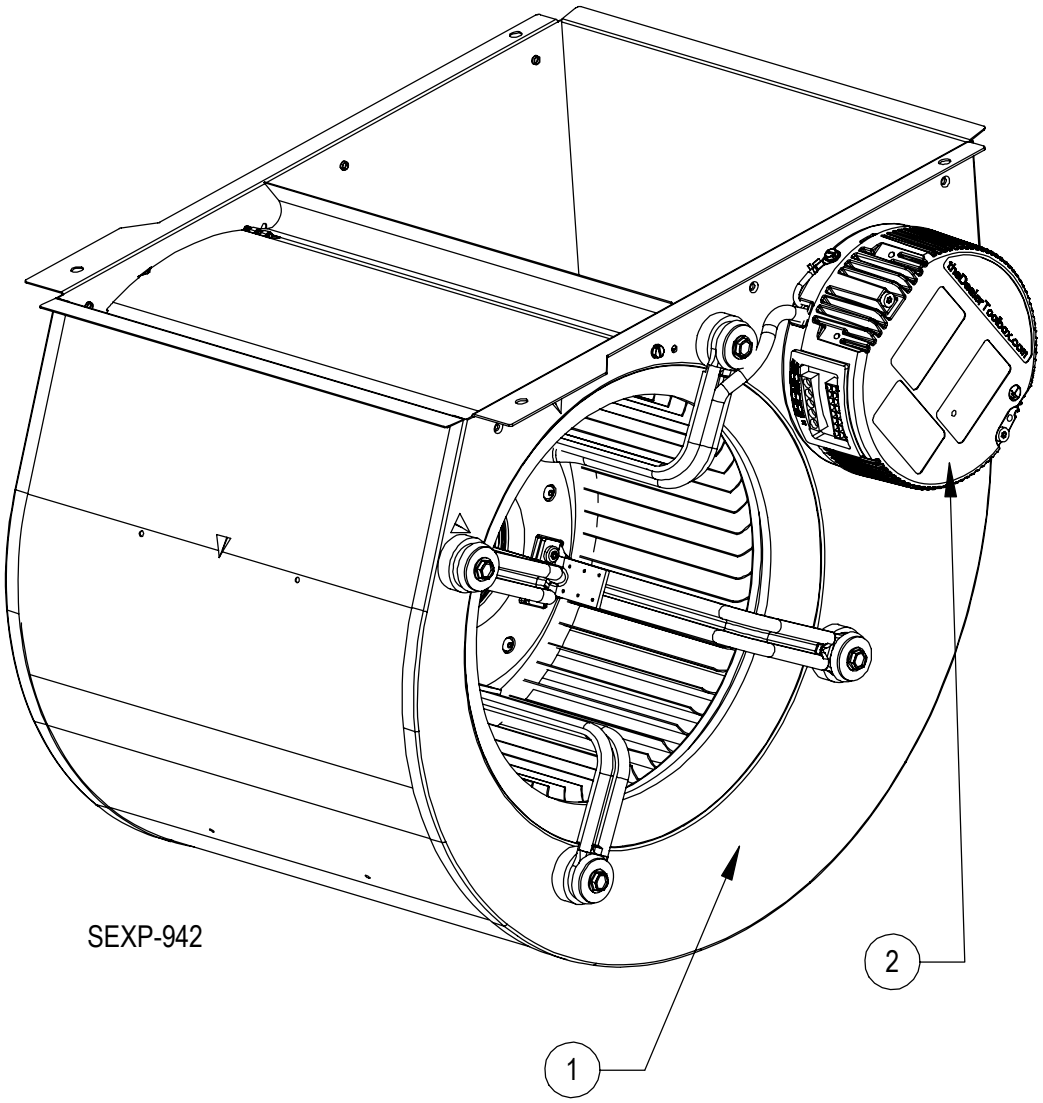
Drawing No.	Part Number	Description	900-362-0154BX
1	5152-014	Blower Wheel	X
2	8106-072-0154BX	1/3 HP Programmed Motor	X
3	151-126	Housing	X
4	105-1435	Left Mounting Angle	X
5	105-1443	Right Mounting Angle	X
NS	3000-1145	Power Harness	X
NS	3000-1578	0-10VDC Adapter Wire	X



5154-002-0146

Drawing No.	Part Number	Description	
1	5152-049	Blower Wheel	X
2	8105-076-0146BX	1/3 HP Programmed Motor	X
3	151-122	Housing	X
NS	3000-1145	Power Harness	X
NS	3000-1578	0-10VDC Adapter Wire	X

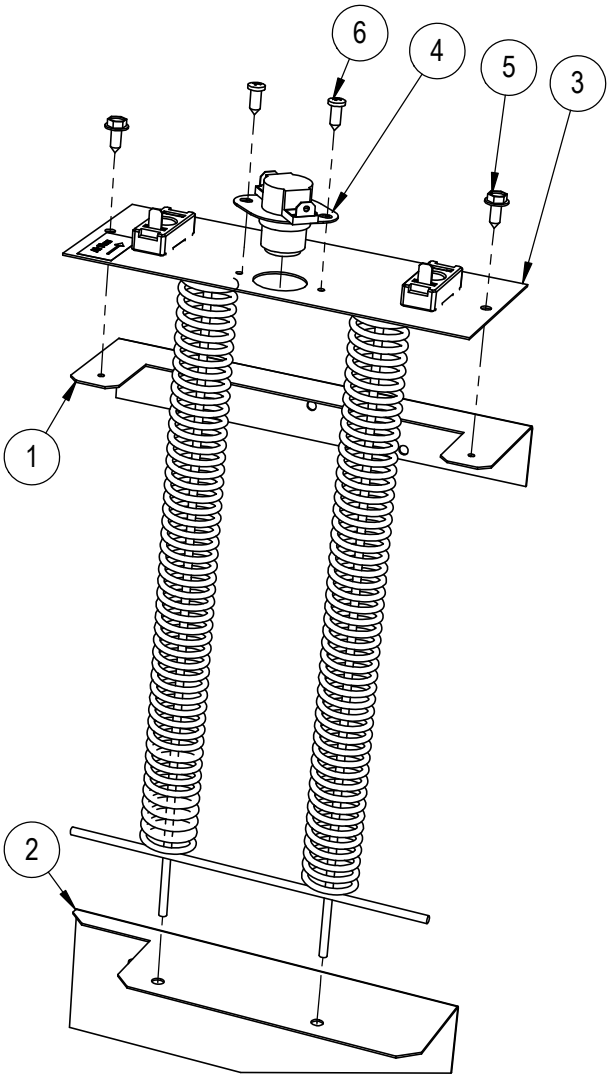
BLOWER ASSEMBLY COMPONENTS – WR58BP*



5154-007-0142

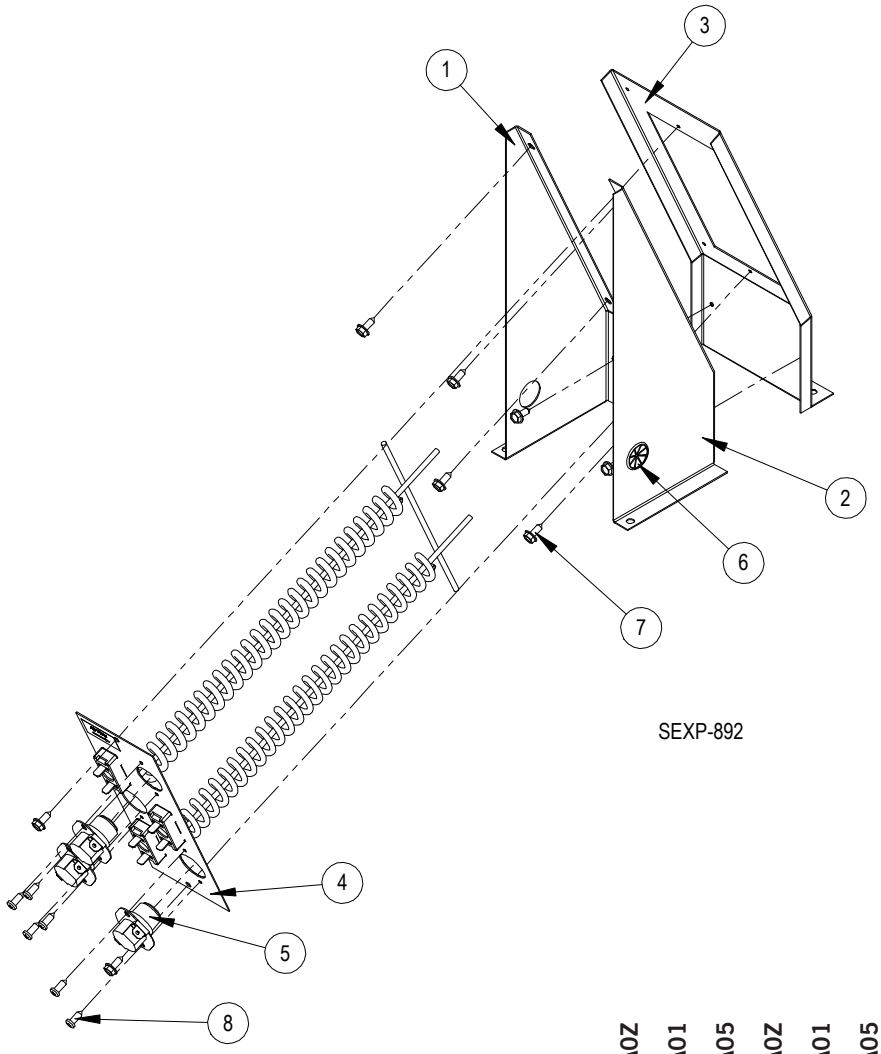
Drawing No.	Part Number	Description	
1	5154-007-0142	Complete Blower Wheel	X
NS	3000-1145	Power Harness	X
NS	3000-1578	0-10VDC Adapter Wire	X

HEATER PACKAGES – WR35BP*



SEXP-940

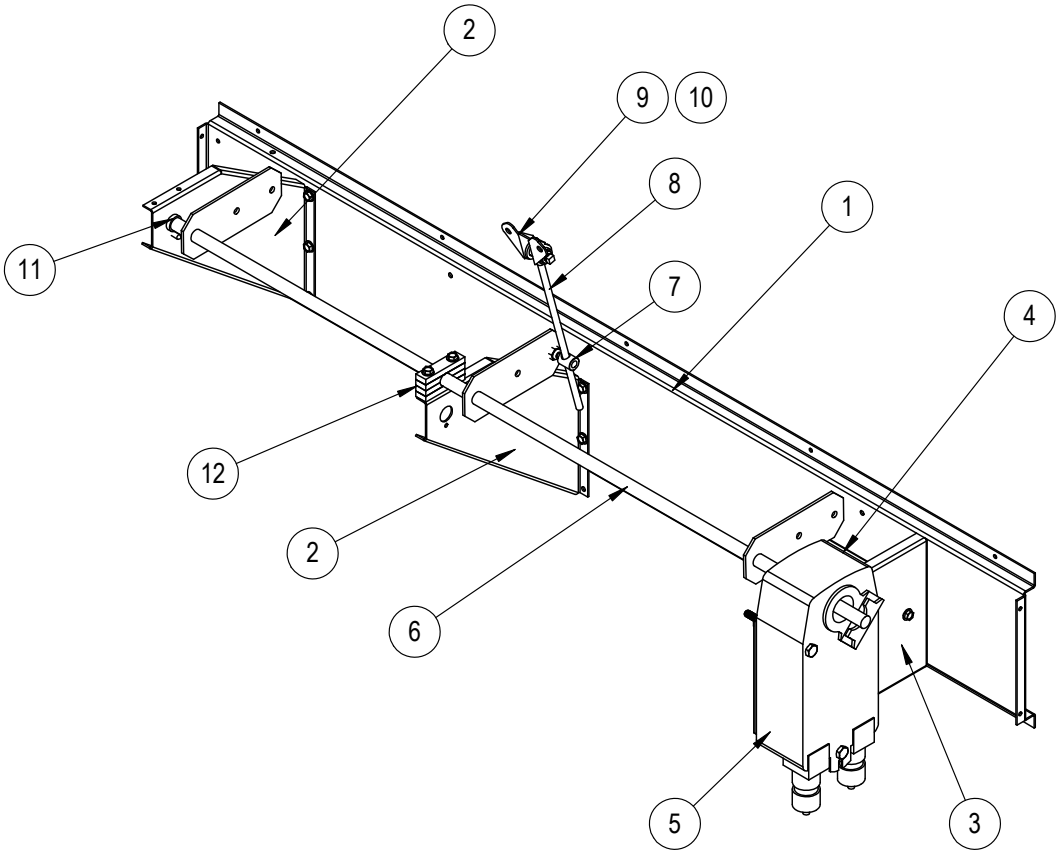
Dwg No.	Part Number	Description	WR35BPA0Z	WR35BPA01	WR35BPA05	WR35BPB0Z	WR35BPB05
1	113-709	Top Heater Support		X	X		X
2	113-710	Lower Heater Support		X	X		X
3	8604-150	Heat Strip 1.5KW 240V 2 Term		X			
3	8604-148	Heat Strip 5.0KW 240V 2 Term			X		
3	8604-149	Heat Strip 6.0KW 240V 3 PH					X
4	8402-190	Limit Control 130P/150BU		1	1		1
5	1012-065	Screw, Type AB PZPNHD #8-18X3/8		6	6		6
6	1012-086	Screw, Type AB HXWHD #10-16X1/2		6	6		6
NS	4208-100	Wiring Diagram	X				
NS	4208-101	Wiring Diagram		X	X		
NS	4208-200	Wiring Diagram				X	
NS	4208-201	Wiring Diagram					X



SEXP-892

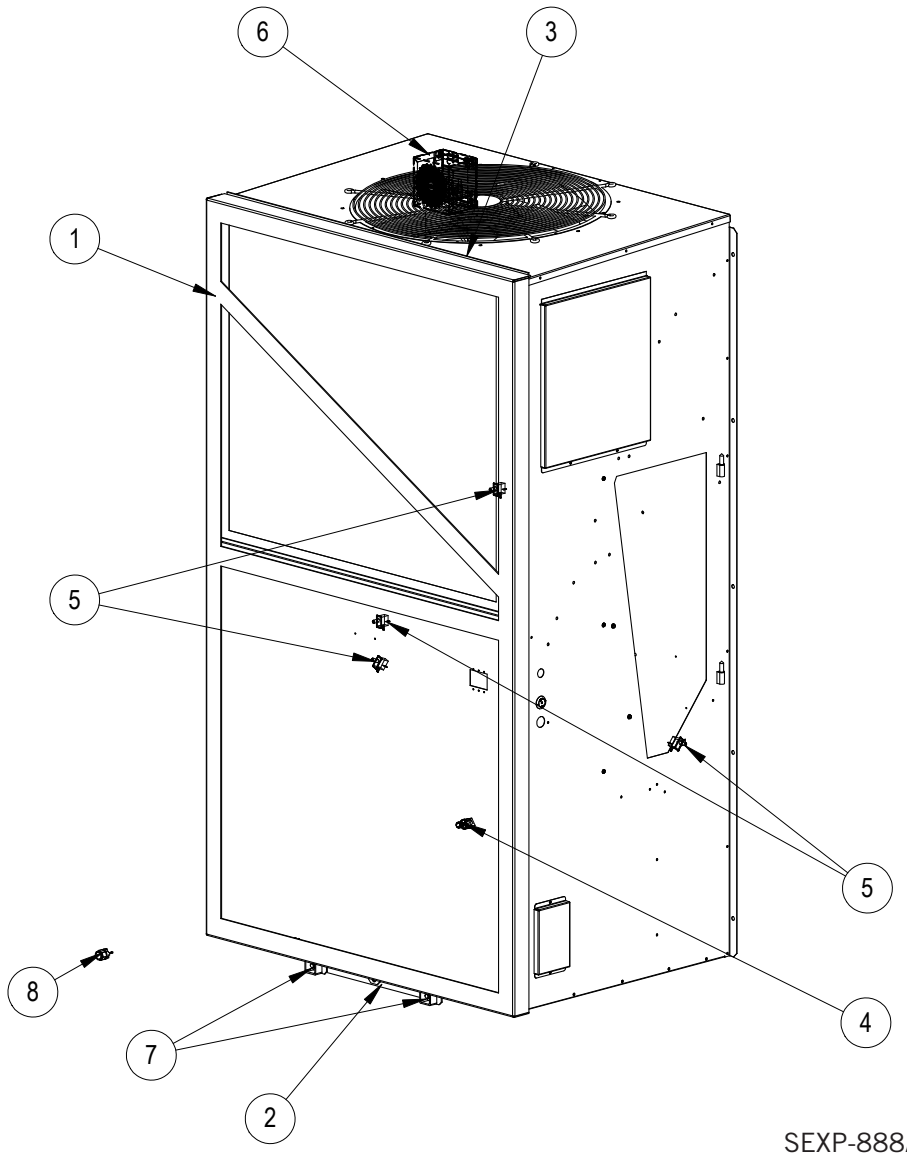
Dwg No.	Part Number	Description	WR36BPA0Z	WR36BPA01	WR36BPA05	WR58BPA0Z	WR58BPA01	WR58BPA05	WR36BPB0Z	WR36BPB05	WR58BPB0Z	WR58BPB05
1	113Y671	Left Heater Support		X	X		X	X		X		X
2	113X671	Right Heater Support		X	X		X	X		X		X
3	113-668	Heater Bracket Front		X	X		X	X		X		X
4	8604-150	Heat Strip 1.5KW 240V 2 Term		X			X					
4	8604-148	Heat Strip 5.0KW 240V 2 Term			X			X				
4	8604-149	Heat Strip 6.0KW 240V 3PH								X		X
5	8402-190	Limit Control 130P/150BU		1	1		1	1		3		3
6	8611-016	Universal Bushing		X	X		X	X		X		X
7	1012-065	Screw, Type AB PZPNHD #8-18X3/8		6	6		6	6		6		6
8	1012-086	Screw, Type AB HXWHD #10-16X1/2		8	8		8	8		8		8
NS	4208-100	Wiring Diagram	X			X						
NS	4208-101	Wiring Diagram		X	X		X	X				
NS	4208-200	Wiring Diagram							X		X	
NS	4208-201	Wiring Diagram								X		X

FREECOOLING DAMPER MOTOR



SEXP-902

Dwg. No.	Part Number	Description	WR35BP	WR36BP	WR58BP
1	103-537	Actuator Support Channel	X		
1	103-538	Actuator Support Channel		X	X
2	113-712	Actuator Rod Support Bracket	2	2	2
3	113-711	Actuator Mounting Bracket	X	X	X
4	141-326	Actuator Gusset	X	X	X
5	8602-093	90 in/lb Actuator	X	X	X
6	8602-101	Actuator Drive Rod Assembly		X	X
6	8602-102	Actuator Drive Rod Assembly	X		
7	8602-008	Ball Joint	2	2	2
8	8602-042	1/4" x 6" Rod	X		
8	8602-091	1/4" x 8-1/2" Rod		X	X
9	8602-040	Pivot Rod Bracket	X	X	X
10	1012-348	1/2" x 3/4" Nylon Flat Washer	2	2	2
11	8602-052	1/2" I.D. Bronze Bushing	X	X	X
12	8602-087	Cradle Bushing	2	2	2



SEXP-888A

Dwg No.	Part Number	Description	WR35BP*	WR36BP*	WR58BP*
1	9050-004	Frame Assembly		X	X
1	9050-008	Frame Assembly	X		
2	9050-005	Base Bracket	X	X	X
3	9050-006	Top Bracket		X	X
3	9050-007	Top Bracket	X		
4	8406-135	Low Pressure Switch	X	X	X
5	8406-156	Panel Switch	4	4	4
6	910-2038	Speaker Assembly	X	X	X
7	1012-346	Tri-Groove Nut	2	2	2
8	2151-022	Tri-Groove Socket – Key	X	X	X