

# INSTALLATION INSTRUCTIONS

**\*SH1BE4M1SP - 24K, 30K, 36K, 42K, & 48K (2, 2.5, 3, 3.5, & 4 TON) SERIES**  
**SINGLE PHASE MODELS FOR MANUFACTURED HOUSING**

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## IMPORTANT

### ATTENTION INSTALLERS:

It is your responsibility to know this product better than your customer. This includes being able to install the product according to strict safety guidelines and instructing the customer on how to operate and maintain the equipment for the life of the product. Safety should always be the deciding factor when installing this product and using common sense plays an important role as well. Pay attention to all safety warnings and any other special notes highlighted in the manual. Improper installation of the furnace or failure to follow safety warnings could result in serious injury, death, or property damage.

These instructions are primarily intended to assist qualified individuals experienced in the proper installation of this appliance. Some local codes require licensed installation/service personnel for this type of equipment. Please read all instructions carefully before starting the installation. Return these instructions to the customer's package for future reference.

**DO NOT DESTROY. PLEASE READ CAREFULLY & KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.**

## IMPORTANT SAFETY INFORMATION

INSTALLER: Please read all instructions before servicing this equipment. Pay attention to all safety warnings and any other special notes highlighted in the manual. Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored. **WARNING** indicates a potentially hazardous situation that if not avoided, could result in personal injury or death. **CAUTION** indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.

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### **WARNING:**

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#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

**Failure to follow safety warnings exactly could result in serious injury or property damage.**

**Improper servicing could result in dangerous operation, serious injury, death or property damage.**

- **Before servicing, disconnect all electrical power to the unit.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

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### **WARNING:**

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**This split system heat pumps is shipped charged with R410A refrigerant and ready for installation. If repairs make it necessary for evacuation and charging, it should only be attempted by qualified trained personnel thoroughly familiar with this equipment. Under no circumstances should the owner attempt to install and/or service this equipment. Failure to comply with this warning could result in property damage, personal injury, or death.**

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### **CAUTION:**

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**This unit uses R-410A refrigerant. DO NOT use any other refrigerant in this unit. Use of another refrigerant will damage the unit.**

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### **WARNING:**

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**Unless noted otherwise in these instructions, only factory authorized parts or accessory kits may be used with this product. Improper installation, service, adjustment, or maintenance may cause explosion, fire, electrical shock or other hazardous conditions which may result in personal injury or property damage.**

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- Installation of equipment may require brazing operations. Installer must comply with safety codes and wear appropriate safety equipment (safety glasses, work gloves, fire extinguisher, etc.) when performing brazing operations.
- Follow all precautions in the literature, on tags, and on labels provided with the equipment. Read and thoroughly understand the instructions provided with the equipment prior to performing the installation and operational checkout of the equipment.
- Use caution when handling this appliance or removing components. Personal injury can occur from sharp metal edges present in all sheet metal constructed equipment.

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### **WARNING:**

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**The information listed below and the next page must be followed during the installation, service, and operation of this furnace. Failure to follow safety recommendations could result in possible damage to the equipment, serious personal injury or death.**

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- The installer must comply with all local codes and regulations which govern the installation of this type of equipment. Local codes and regulations take precedence over any recommendations contained in these instructions. Consult local building codes and the National Electrical Code (ANSI C1) for special installation requirements.
- All electrical wiring must be completed in accordance with local, state and national codes and regulations and with the National Electric Code (ANSI/NFPA 70) or in Canada the Canadian Electric Code Part 1 CSA C.22.1.
- This equipment contains liquid and gaseous refrigerant under high pressure. **DO NOT USE ANY PORTION OF THE CHARGE FOR PURGING OR LEAK TESTING.** Installation or servicing should only be performed by qualified trained personnel thoroughly familiar with this type equipment.
- Fully annealed, refrigerant grade copper tubing should be used when installing the system. Refrigerant suction line tubing should be fully insulated.
- This unit is designed for outdoor installations only and should be positioned as shown on [page 3](#).

## HEAT PUMP INSTALLATION

### General Information

\*SH1BE4M1SP split system heat pumps are designed only for outdoor rooftop or ground level installations. This unit has been tested for capacity and efficiency in accordance with AHRI Standards and will provide many years of safe and dependable comfort, providing it is properly installed and maintained. Abuse, improper use, and/or improper maintenance can shorten the life of the appliance and create unsafe hazards.

To achieve optimum performance and minimize equipment failure, it is recommended that periodic maintenance be performed on this unit. The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools.

Refer to the Quick Reference Data sheet for additional electrical, charging and unit information.

### Before You Install the Heat Pump

- ✓ The cooling load of the area to be conditioned must be calculated and a system of the proper capacity selected. It is recommended that the area to be conditioned be completely insulated and vapor sealed.
- ✓ Check the electrical supply and verify the power supply is adequate for unit operation. The system must be wired and provided with circuit protection in accordance with local building codes. If there is any question concerning the power supply, contact the local power company.
- ✓ The indoor section (air handler, furnace, etc) should be installed before routing the refrigerant tubing. Refer to the indoor unit's installation instructions for installation details.
- ✓ All units are securely packed at the time of shipment and upon arrival should be carefully inspected for damage prior to installing the equipment at the job site. Verify coil fins are straight. If necessary, comb fins to remove flattened or bent fins. Claims for damage (apparent or concealed) should be filed immediately with the carrier.
- ✓ Please consult your dealer for maintenance information and availability of maintenance contracts. Please read all instructions before installing the unit.

### Locating the Heat Pump

- Survey the job site to determine the best location for mounting the outdoor unit.
- Overhead obstructions, poorly ventilated areas, and areas subject to accumulation of debris should be avoided. See [Figure 1](#).
- Sufficient clearance for unobstructed airflow through the outdoor coil must be maintained in order to achieve rated performance. See [Figure 1](#) for minimum clearances to obstructions.
- Consideration should be given to availability of electric power, service access, noise, and shade.

### Packaging Removal

To prevent damage to the tubing connections, carefully remove the carton and user's manual from the equipment. Discard the shipping carton.

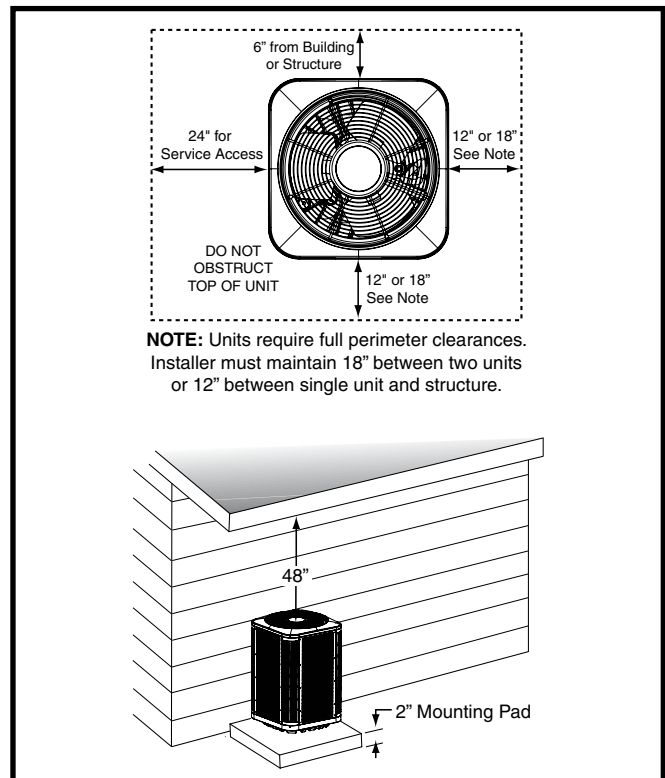
### Ground Level

Ground level installations must be located according to local building codes or ordinances and these requirements:

- Clearances must be in accordance with those shown in [Figure 1](#).
- A suitable mounting pad must be provided and be separate from the building foundation. The pad must be level and strong enough to support the unit's weight. The slab height must be a minimum of 2" (5 cm) above grade and with adequate drainage. See [Figure 1](#).

### Rooftop

- The method of mounting should be designed so that it does not overload roof structures or transmit noise to the interior of the structure. The roof must be structurally capable of handling the weight of the unit.
- Full perimeter support is required under the unit. Support must be made of weather resistant materials and installed prior to unit installation.
- The support must be built to raise the unit 6" above the roof.



**Figure 1. Clearance Requirements**

## Connecting Refrigerant Tubing Between the Indoor & Outdoor Unit

### CAUTION:

When servicing, cover or seal openings to minimize the exposure of the refrigerant system to air to prevent accumulation of moisture and other contaminants.

After outdoor and indoor unit placement has been determined, route refrigerant tubing between the equipment in accordance with sound installation practices.

- When connecting refrigerant linesets together, it is recommended that dry nitrogen be flowing through the joints during brazing. This will prevent internal oxidation and scaling from occurring.
- Refrigerant tubing should be routed in a manner that minimizes the length of tubing and the number of bends in the tubing.
- Refrigerant tubing should be supported in a manner that the tubing will not vibrate or abrade during system operation.
- Tubing should be kept clean of foreign debris during installation.
- Every effort should be made by the installer to ensure that the field installed refrigerant containing components of the system have been installed in accordance with these instructions and sound installation practices to insure reliable system operation and longevity.
- The maximum recommended interconnecting refrigerant line length is 75 feet, and the vertical elevation difference between the indoor and outdoor sections should not exceed 20 feet.
- If precise forming of refrigerant lines is required, a copper tubing bender is recommended. Avoid sharp bends and contact of the refrigerant lines with metal surfaces.
- A filter dryer is provided with the unit and must be installed in the liquid line of the system. If the installation replaces a system with a filter dryer already present in the liquid line, the filter dryer must be replaced with the one supplied with the unit. The filter dryer must be installed in strict accordance with the manufacturer's installation instructions.
- Optional equipment such as liquid line solenoid valves, low ambient, etc., should be installed in strict accordance with the manufacturer's installation instructions.

### Outdoor Orifice Removal & Installation

The orifice installed in the outdoor unit has been sized for use with the most popularly matched indoor units. Depending on the indoor coil that the unit is being matched with, the outdoor restrictor may need to be changed. Please refer to the Quick Reference Data sheet that is supplied with the outdoor unit for more information.

If the outdoor unit has the liquid valve shown in [Figure 2](#), then the restrictor is located inside the swivel nut connection of the liquid valve and not inside the outdoor

unit's distributor. Perform steps 1 - 5 if the outdoor restrictor needs to be changed.

### CAUTION:

When servicing, cover or seal openings to minimize the exposure of the refrigerant system to air to prevent accumulation of moisture and other contaminants.

### CAUTION:

To prevent damage to the unit or internal components, it is recommended that two wrenches be used when loosening or tightening nuts. Do not over tighten!

1. Using two wrenches loosen the nut and liquid valve. Turn the assembly nut counter-clockwise until the orifice body halves are separated.
2. Insert a light-gauge wire hook between the valve body and the restrictor orifice while being careful not to scratch either part. Carefully remove the restrictor orifice from the valve body. See [Figure 3](#) (page 4).

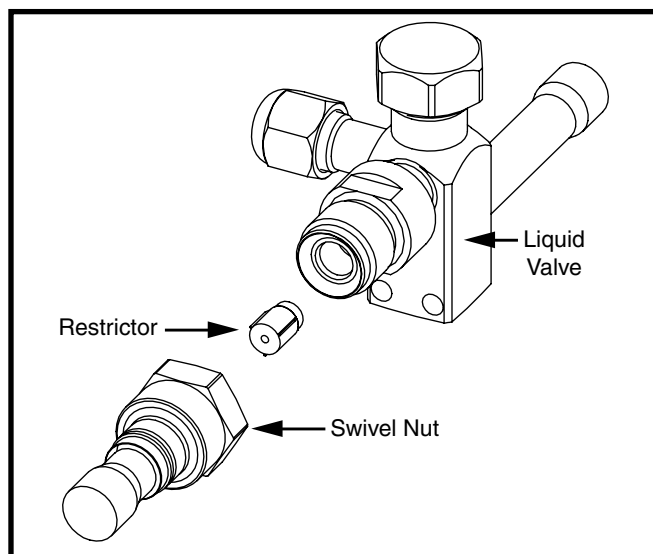


Figure 2. Liquid Valve, Restrictor, & Swivel Nut Adapter

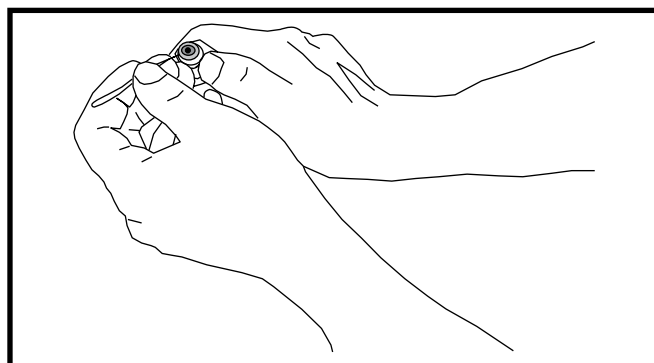


Figure 3. Removal of Orifice

3. Check the actual size of the new orifice. **NOTE:** The size is stamped on its side. Do not use pin gauges to measure the orifice diameter.
4. Insert the new orifice into the valve body, with the rounded end facing into the valve. See [Figure 2 \(page 4\)](#).

### **CAUTION:**

**To prevent damage to the unit or internal components, it is recommended that two wrenches be used when loosening or tightening nuts. Do not over tighten!**

5. Realign the assembly nut on the valve body and hand tighten both components. Mark a line on both bodies and then tighten an additional ¼ turn using two wrenches. The movement of the two lines will show how much the nut is tightened.

## **ELECTRICAL WIRING**

### **WARNING:**

**To avoid risk of electrical shock, personal injury, or death, disconnect all electrical power to the unit before performing any maintenance or service. The unit may have more than one electrical supply.**

**Label all wires prior to disconnection when servicing the unit. Wiring errors can cause improper and dangerous operation.**

- All electrical connections must be in compliance with all applicable local codes and ordinances, and with the current revision of the National Electric Code (ANSI/NFPA 70).
- For Canadian installations the electrical connections and grounding shall comply with the current Canadian Electrical Code (CSA C22.1 and/or local codes).

### **Pre-Electrical Checklist**

- ✓ Verify that the voltage, frequency, and phase of the supply source match the specifications on the unit rating plate.
- ✓ Verify that the service provided by the utility is sufficient to handle the additional load imposed by this equipment. Refer to the unit wiring label for proper high and low voltage wiring.
- ✓ Verify factory wiring is in accordance with the unit wiring diagram. Inspect for loose connections. See [Figure 12 \(page 19\)](#).

### **Line Voltage**

- A wiring diagram is located on the inside cover of the electrical box of the outdoor unit. The installer should become familiar with the wiring diagram before making any electrical connections to the outdoor unit.

- **An electrical disconnect must be located within sight of and readily accessible to the unit.** This switch shall be capable of electrically de-energizing the outdoor unit.
- Line voltage to the unit should be supplied from a dedicated branch circuit containing the correct fuse or circuit breaker for the unit. Incoming field wiring and minimum size of electrical conductors and circuit protection must be in compliance with information listed on the outdoor unit data label. Any other wiring methods must be acceptable to authority having jurisdiction.
- The outdoor unit requires both power and control circuit electrical connections. Refer to the wiring diagram ([Figure 12](#)) for identification and location of outdoor unit field wiring interfaces. Make all electrical connections in accordance with all applicable codes and ordinances.
- Overcurrent protection must be provided at the branch circuit distribution panel and sized as shown on the unit rating label and according to applicable local codes. See the unit rating plate for minimum circuit ampacity and maximum overcurrent protection limits.
- Provide power supply for the unit in accordance with the unit wiring diagram, and the unit rating plate. Connect the line-voltage leads to the terminals on the contactor inside the control compartment.
- Use only copper wire for the line voltage power supply to this unit as listed in [Table 1](#). Use proper code agency listed conduit and a conduit connector for connecting the supply wires to the unit. Use of rain tight conduit is recommended.
- 208/230 Volt units are shipped from the factory wired for 230 volt operation. For 208V operation, remove the lead from the transformer terminal marked 240V and connect it to the terminal marked 208V.
- Optional equipment requiring connection to the power or control circuits must be wired in strict accordance of the NEC (ANSI/NFPA 70), applicable local codes, and the instructions provided with the equipment.

COPPER WIRE SIZE — AWG (1% VOLTAGE DROP)				
SUPPLY WIRE LENGTH-FEET				SUPPLY CIRCUIT AMPACITY
200	150	100	50	
6	8	10	14	15
4	6	8	12	20
4	6	8	10	25
4	4	6	10	30
3	4	6	8	35
3	4	6	8	40
2	3	4	6	45
2	3	4	6	50
2	3	4	6	55
1	2	3	4	60

Wire Size based on N.E.C. for 60° type copper conductors.

**Table 1. Copper Wire Size**



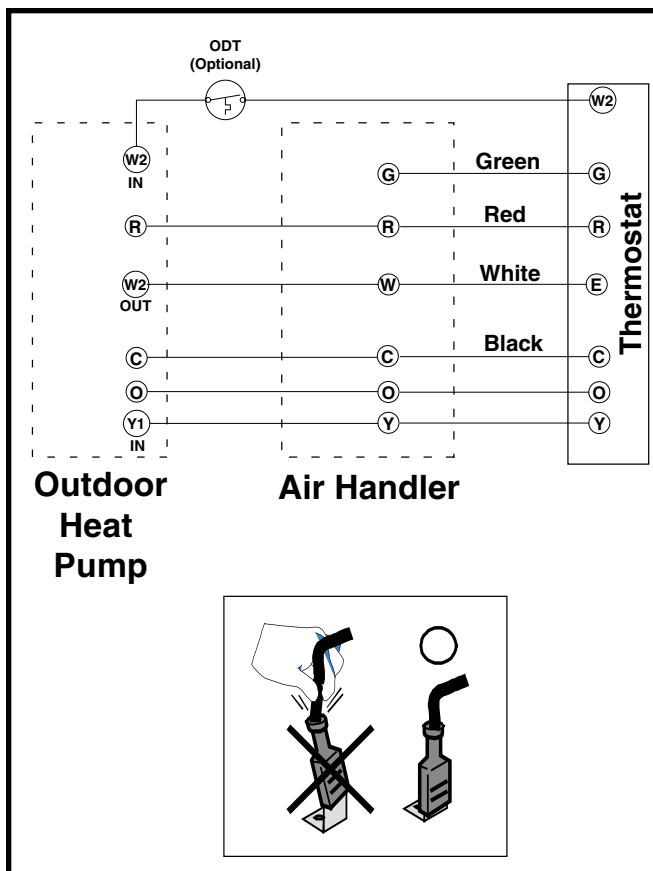


Figure 4. Typical Thermostat Connections

THERMOSTAT WIRE GAUGE	MAXIMUM RECOMMENDED THERMOSTAT WIRE LENGTH (FT)
24	25
22	45
20	70
18	110

Table 2. Thermostat Wire

## Grounding

### **WARNING:**

**The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. Do not use gas piping as an electrical ground!**

This unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code (ANSI/NFPA 70) or the CSA C22.1 Electrical Code. Use the grounding lug provided in the control box for grounding the unit.

### Thermostat / Low Voltage Connections

- Thermostat connections should be made in accordance with the instructions supplied with the thermostat and the indoor equipment. A typical installation with a heat pump thermostat and air handler is shown in [Figure 4](#).
- The outdoor unit is designed to operate from a 24 VAC Class II control circuit. The control circuit wiring must comply with the current provisions of the NEC (ANSI/NFPA 70) and with applicable local codes having jurisdiction.
- The low voltage wires must be properly connected to the unit's low voltage terminal block. Recommended wire gauge and wire lengths for typical thermostat connections are listed in [Table 2](#).
- The thermostat should be mounted about 5 feet above the floor on an inside wall. DO NOT install the thermostat on an outside wall or any other location where its operation may be adversely affected by radiant heat from fireplaces, sunlight, or lighting fixtures, and convective heat from warm air registers or electrical appliances. Refer to the thermostat manufacturer's instruction sheet for detailed mounting and installation information.

## START UP & ADJUSTMENTS

### Pre-Start Check List

- ✓ Verify the unit is level and has sufficient clearances for unobstructed airflow.
- ✓ Verify the outdoor coil and top of the unit are free from obstructions and debris, and all equipment access/control panels are in place.
- ✓ Verify that the line voltage power leads are securely connected and the unit is properly grounded.
- ✓ Verify that the low voltage wires are securely connected to the correct leads on the low voltage terminal strip.
- ✓ Verify that the power supply branch circuit overcurrent protection is sized properly.
- ✓ Verify that the thermostat is wired correctly.

### Start-Up Procedures

#### **WARNING:**

**This unit is equipped with a crankcase heater. Allow 24 hours prior to continuing the start up procedures to allow for heating of the refrigerant compressor crankcase. Failure to comply may result in damage and could cause premature failure of the system. This warning should be followed at initial start up and any time the power has been removed for 12 hours or longer.**

### Operating Temperatures

This equipment has been designed to operate within the temperatures specified in [Table 3](#). Running the equipment in heating at higher than 70°F may require the use of a Heat Pump Mild Weather Control Kit or changing over to emergency or auxiliary heating.

COOLING		HEATING	
MIN (°F)	MAX (°F)	MIN (°F)	MAX (°F)
60	115	-10	70

**Table 3. Heat Pump Operating Temperatures**

### Air Circulation - Indoor Blower

1. Set the thermostat system mode on OFF and the fan mode to ON.
2. Verify the blower runs continuously. Check the air delivery at the supply registers and adjust register openings for balanced air distribution. If insufficient air is detected, examine ductwork for leaks or obstructions.
3. Set the thermostat fan mode to AUTO and verify the blower stops running.

### Short Cycle Protection

1. Set the thermostat system mode to COOL. Observe the temperature setting of the thermostat and gradually raise the set-point temperature until the unit de-energizes.
2. Immediately lower the set point temperature of the thermostat to its original setting and verify that the indoor blower is energized and outdoor unit remains de-energized.

3. After approximately 5 minutes, verify the outdoor unit energizes and the temperature of the discharge air is cooler than the room temperature.

### System Cooling












1. Set the thermostat's system mode to COOL and the fan mode to AUTO. Gradually lower the thermostat temperature setpoint below room temperature and verify the outdoor unit and indoor blower energize.
2. Verify blower wheel is spinning in direction indicated by arrow. Feel the air being circulated by the indoor blower and verify that it is cooler than ambient temperature. Listen for any unusual noises. If unusual sounds occur, determine the source of the noise and correct as necessary.
3. Verify HI and LO refrigerant pressures.
4. Allow the system to operate for several minutes and then set the temperature selector above room temperature. Verify the fan and compressor cycle off with the thermostat. **NOTE:** The blower should also stop unless fan switch is set to the ON position.

### System Heating

1. Set the thermostat's system mode to HEAT and the temperature mode to below room temperature.
2. Verify the outdoor unit and indoor fan stop running. After 5 minutes, increase the temperature on the thermostat to it's maximum setting.
3. Verify the outdoor unit and indoor blower energize. Feel the air being circulated by the indoor blower and verify that it is warmer than ambient temperature. Listen for any unusual noises. If unusual sounds occur, determine the source of the noise and correct as necessary.

### Defrost Control Board Test Pins

- Placing a jumper between the test pins for less than 1 second will bypass the Anti-Short Cycle Timer.
- Placing a jumper between the test pins for more than 1 second will force the unit into a defrost cycle. As soon as the jumper is removed, the defrost cycle will end as determined by the typical criteria.
- Verify the Status Indicator (on the control board) against the codes listed in [Table 4](#) to determine proper diagnostic description.

STATUS INDICATOR	STATUS TYPE	DIAGNOSTIC DESCRIPTION
	Operating Status	Cooling, 1st Stage
	Operating Status	Heating, 1st Stage
	Operating Status	Anti Short Cycle Timer
	Operating Status	Defrost
	Operating Status	Power on, no call for operation
	Fault	Pressure switch, low
	Fault	Pressure switch, high
	Fault	Temperature Sensor, Ambient
	Fault	Temperature Sensor, Coil
	Fault	Board
	Input Error	Forced defrost - test short applied longer than 11 minutes

**Table 4. Defrost Control Board Status Indicators**

## HEAT PUMP MAINTENANCE

### **WARNING:**

To prevent electrical shock, personal injury, or death, disconnect all electrical power to the unit before performing any maintenance or service. The unit may have more than one electrical supply.

Proper maintenance is important to achieve optimum performance from the heat pump. The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you do not possess these skills, contact your dealer for maintenance. Consult your local dealer about the availability of maintenance contracts. Routine maintenance should include the following:

- Inspect and clean or replace air filters at the beginning of each heating and cooling season, or more frequently if required.
- Inspect the outdoor coil at the beginning of each cooling season. Remove any debris. Clean the outdoor coil and louvers as necessary using a mild detergent and water. Rinse thoroughly with water.
- Inspect the electrical connections for tightness at the beginning of each heating and cooling season. Service as necessary.

### **CAUTION:**

The unit should never be operated without a filter in the return air system. Replace disposable filters with the same type and size.

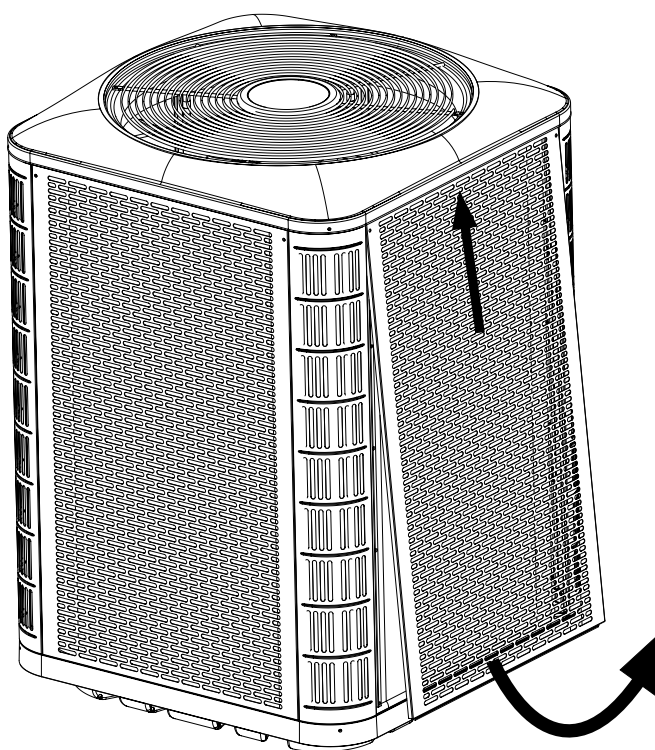
- Do not add additional oil to motors unequipped with oil tubes. The compressor is hermetically sealed at the factory and does not require lubrication.
- To access the internal components of the unit, refer to [Figure 5](#) for panel removal and [Figure 6](#) for panel installation.

#### **Panel Removal**

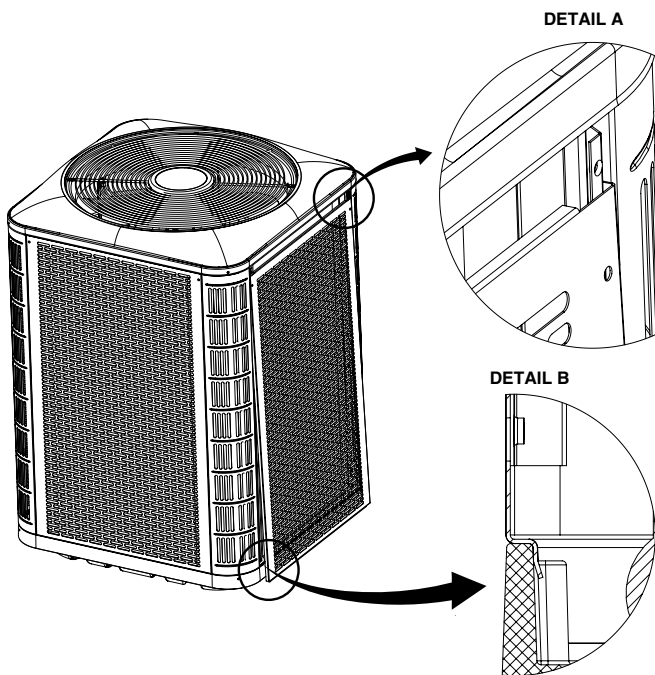
1. Remove screws securing the panel.
2. Slide the panel up towards the top pan in order to clear the bottom flange from the base pan. See [Figure 5](#).
3. Swing the bottom of the panel out and pull the panel down to remove it from the unit.

#### **Panel Installation**

1. Insert the top corners of side panel flanges into the corner post channels as shown in Detail A in [Figure 6](#).
2. Slide the panel up into the top pan. (You may need to push on the center of the panel at the top in order to clear the top pan edge).
3. Swing the panel in and push down until the panel is resting on the top edge of the base pan wall as shown in Detail B.
4. Insert screws into the panel to secure it to the unit.



**Figure 5. Panel Removal**



**Figure 6. Panel Installation**



## REFRIGERANT CHARGING

### **WARNING:**

**This split system heat pump is shipped charged with R410A refrigerant and ready for installation. If repairs make it necessary for evacuation and charging, it should only be attempted by qualified trained personnel thoroughly familiar with this equipment. Under no circumstances should the owner attempt to install and/or service this equipment. Failure to comply with this warning could result in property damage, personal injury, or death.**

After refrigerant line connections are completed, it is required that you leak check and evacuate the indoor section and all line connections (using proper methods) before finalizing the full system refrigerant charge.

- To achieve rated capacity and efficiency, the compressor must be exposed to refrigerant for at least 24 hours prior to running and then the compressor must be run for a minimum of 12 hours.
- Cooling mode charging charts and tables are applicable only to matched assemblies of this equipment and listed airflows for the indoor coil. Refer to the Quick Reference Data sheet for additional charging information. Outdoor units with non-AHRI listed indoor coils are not recommended and deviations from rated airflows or non-listed combinations may require modification to the expansion device and refrigerant charging procedures for proper and efficient system operation. For correct system charging, refer to [Figure 7 \(page 10\)](#), [Figure 8 \(page 11\)](#), [Figure 9 \(page 11\)](#), [Figure 10 \(page 12\)](#), [Figure 11 \(page 12\)](#) and [Table 5 \(page 13\)](#), [Table 6 \(page 13\)](#), [Table 7 \(page 14\)](#), [Table 8 \(page 14\)](#), & [Table 9 \(page 15\)](#).
- The refrigerant charge can be checked and adjusted through the service ports provided external to the outdoor unit. Use only gage line sets which have a "Schrader" depression device present to actuate the valve. A common suction port for heating mode charging is included and located on the compressor

access panel above the outdoor unit service valves.

- Heat Mode Verification Tables are provided for quick reference when the unit is in heating mode and for the inspection of the liquid line pressures and temperatures. See [Table 10 \(page 17\)](#), [Table 11 \(page 17\)](#), [Table 12 \(page 17\)](#), [Table 13 \(page 18\)](#), & [Table 14 \(page 18\)](#).
- A high-pressure switch is factory-installed and located in the compressor discharge line internal to the outdoor unit. The switch is designed to de-energize the system when very high pressures occur during abnormal conditions. Under normal conditions, the switch is closed. If the discharge pressure rises above 575 psig, then the switch will open and de-energize the outdoor unit. The switch will close again once the liquid pressure decreases to 460 psig. Please note that the switch interrupts the thermostat inputs to the unit. When the switch opens and then closes, there will be a 5 minute short cycling delay before the outdoor unit will energize.

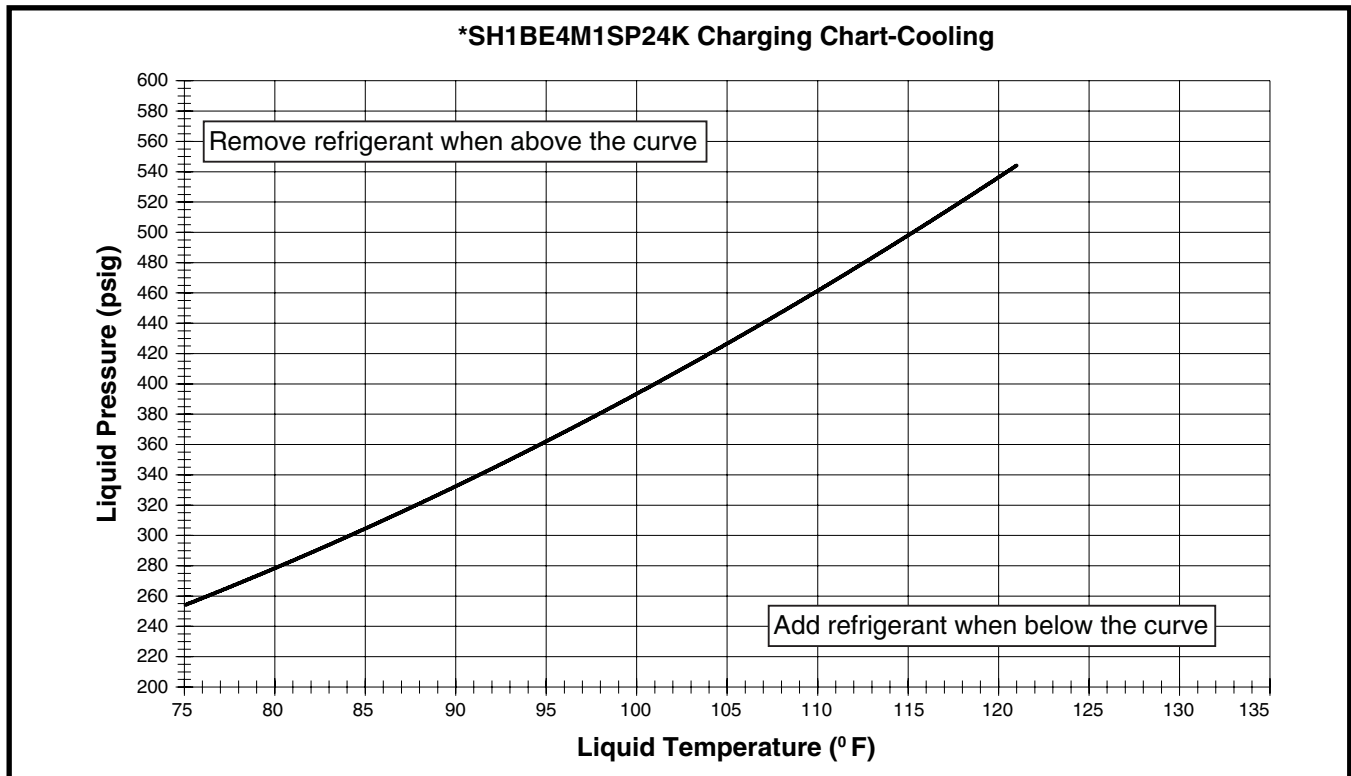
### **Charging the Unit in AC Mode**

*(With Outdoor Temperatures Above 65° F)*

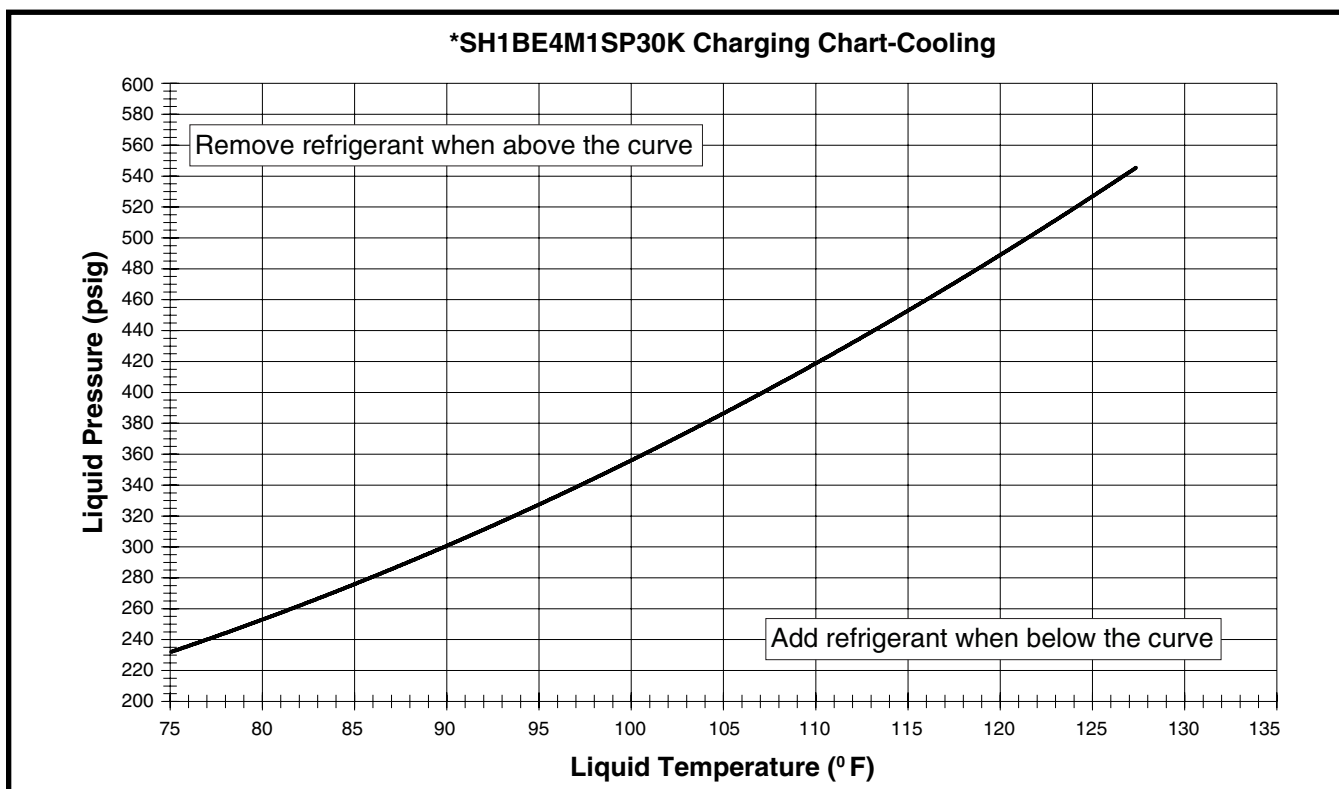
1. With the system operating at steady-state, measure the liquid refrigerant pressure (in psig) at the outdoor unit service valve.
2. Measure the liquid refrigerant temperature (in Fahrenheit) at the service valve.
3. Determine the required liquid refrigerant pressure from [Figure 7 \(page 10\)](#), [Figure 8 \(page 11\)](#), [Figure 9 \(page 11\)](#), [Figure 10 \(page 12\)](#), & [Figure 11 \(page 12\)](#).
  - If the pressure measured in Step 1 is greater than the required liquid refrigerant pressure determined in Step 3, then there is too much charge in the system. Remove refrigerant and repeat Steps 1 through 3 until the system is correctly charged.
  - If the pressure measured in Step 1 is less than the required liquid refrigerant pressure determined in Step 3, there is too little charge in the system. Add refrigerant and repeat Steps 1 through 3 until the system is correctly charged.

## Application Notes & Charging Charts (Cooling Mode Only)

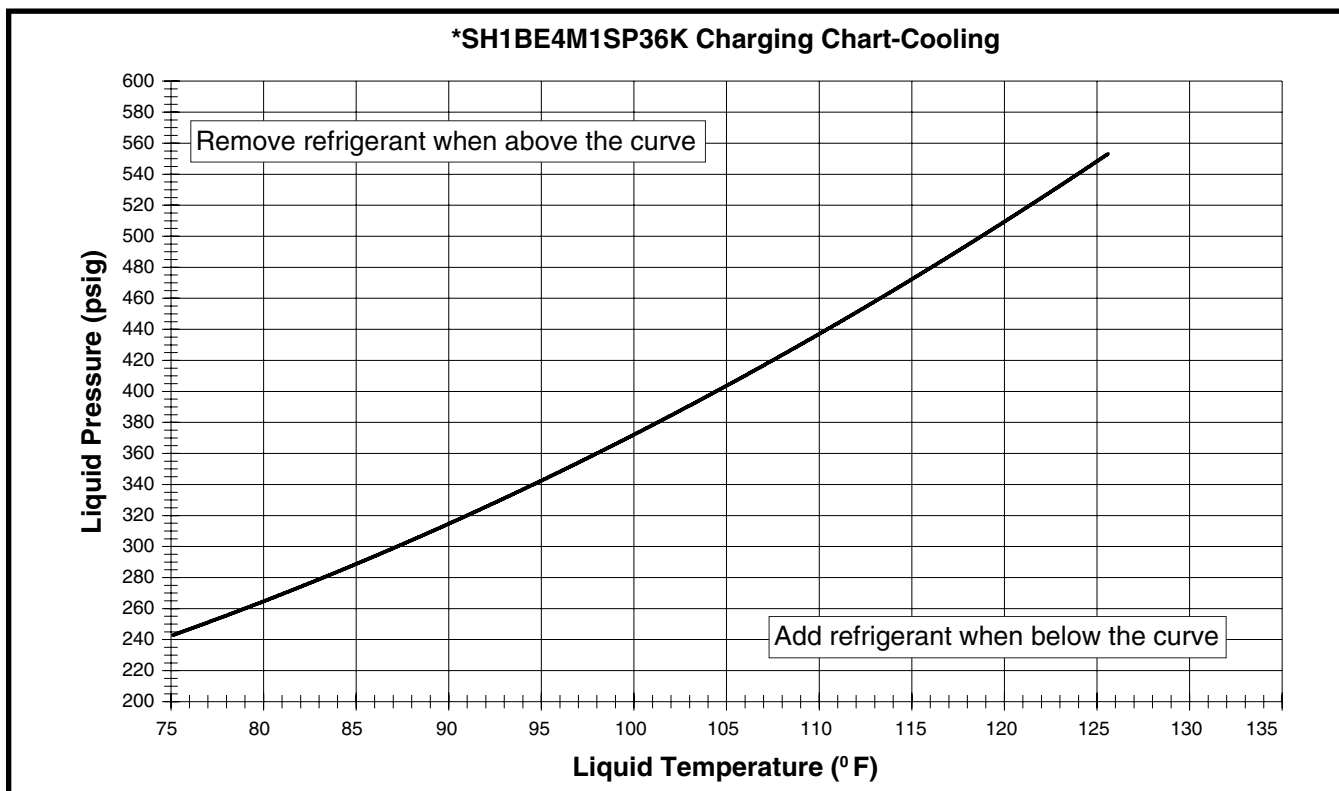
- This equipment's cooling system contains refrigerant under high pressure. Always use safe and environmentally sound methods when handling refrigerant handling or servicing the unit. Review the factory literature and safety warnings prior to servicing.
- When repairing system leaks, always use a nitrogen (inert) gas to protect the refrigerant system and pressure check the repair before re-charging. Always replace the filter-dryers when performing any repair to the refrigeration system with one capable of acid removal. After completing the repairs, evacuate the system to 350 - 500 microns and weigh in the refrigerant to the amount specified on the unit rating label.
- Charging charts are valid for a variety of indoor, return air conditions and are most influenced by the outdoor ambient temperature, outdoor fan operation and the unit operating voltage. Before using these charts, make sure the unit is in a stable operating mode. As shown in the charging charts: [Figure 7 \(page 10\)](#), [Figure 8 \(page 11\)](#), [Figure 9 \(page 11\)](#), [Figure 10 \(page 12\)](#), & [Figure 11 \(page 12\)](#), the ideal system sub-cooling can vary over the range of operation. Reference the charts to determine the ideal amount of sub-cooling for a given liquid pressure. Units charged to other values will not perform at the rated unit efficiency (EER) or rated Coefficient of Performance (COP) in heating mode.
- To inspect a systems operation using quality instruments, match the measured liquid temperature to the units chart. The measured liquid pressure reading should be within 3% of the charts value for most installations.
- For systems that are operating with more than a 5% deviation, inspect the unit for the proper voltage and phase balance and the refrigeration system for leaks.
- Units that are operating at less then 95% of the nominal voltage or with a 2% phase imbalance may see a more significant deviation than the amount stated above.
- **DO NOT** use the charts in systems that have a fan cycling under low-ambient control. Refer to the low-ambient kit instructions for more information (If applicable).



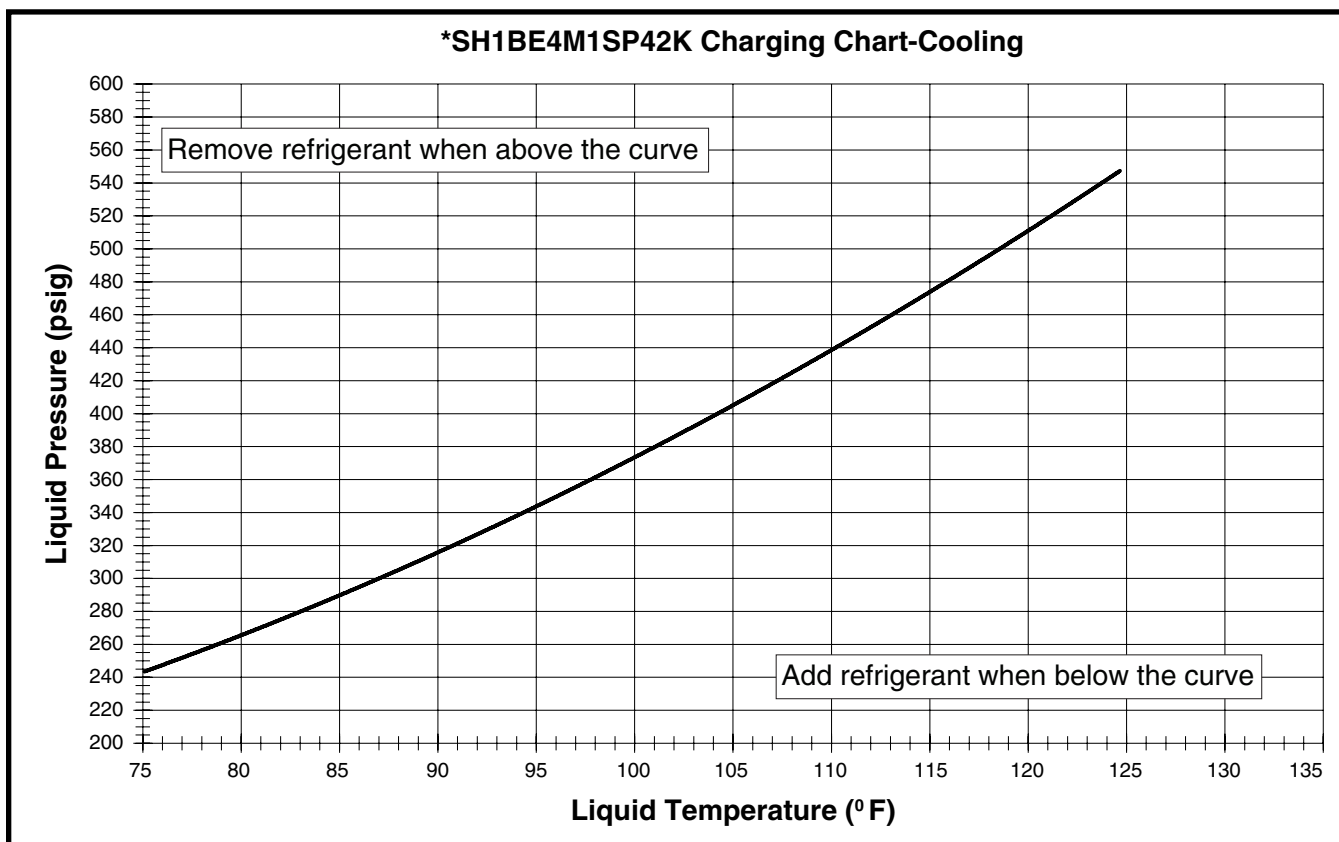
**Figure 7. Charging Chart for 2 Ton Models  
(TXV Matches)**



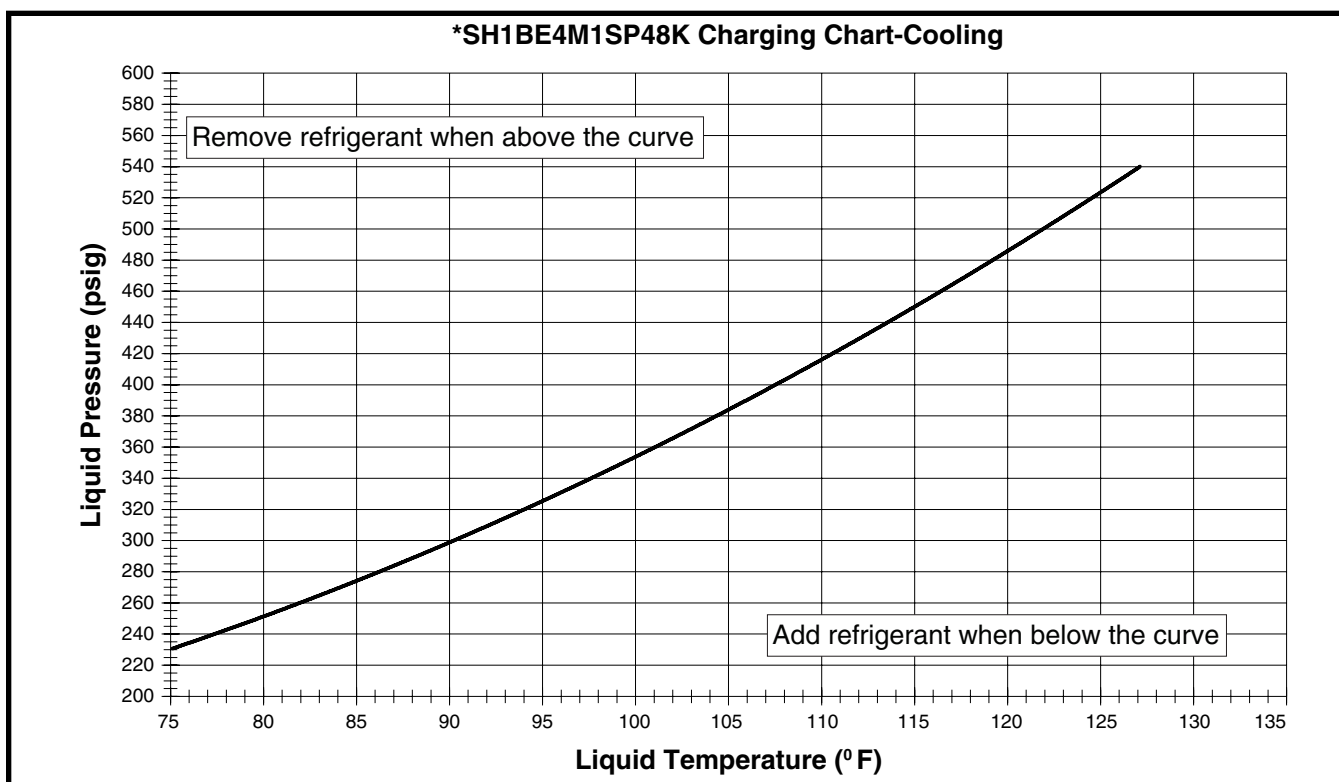
**Figure 8. Charging Chart for 2.5 Ton Models  
(TXV Matches)**



**Figure 9. Charging Chart for 3 Ton Models  
(TXV Matches)**



**Figure 10. Charging Chart for 3.5 Ton Models  
(TXV Matches)**




**Figure 11. Charging Chart for 4 Ton Models  
(TXV Matches)**



## Refrigerant Charging Tables (Cooling Mode Only)

 Shaded boxes indicate flooded conditions.

 Rated design values. The suction pressure will vary from design value if indoor air flow, entering dry bulb, or entering wet bulb temperatures are lower than design.

1. All pressures are listed in psig and all temperatures in ° F
2. Discharge temperatures greater than charted values indicate an undercharged system.
3. In Cooling Mode, suction pressure will be lower than design value if indoor air flow, entering dry bulb, or entering wet bulb temperatures are lower than design.
4. In Heating Mode, charge should be weighed in. It is strongly recommended to verify charge in cooling mode at ambient above 70°F.


*SH1BE4M1SP24K SERIES																
SUCT. PRESS.	OUTDOOR TEMPERATURE (°F)															
	70		75		80		85		90		95		100		105	
	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.
133	234	114														
135	236	115	255	120												
137	238	115	257	120	276	125										
139	240	116	259	121	278	126	297	131								
141	242	116	261	121	280	126	299	131	318	136						
143			263	122	282	127	301	132	320	137	339	142				
145					285	128	304	132	323	137	341	143	360	148		
147							306	133	325	138	344	143	363	148	381	153
149							308	134	327	138	346	143	365	148	384	154
151									330	139	349	144	368	149	387	154
153											351	144	370	149	389	154
155													373	150	392	155
157															395	155
159																

**Table 5. Charging Table for 2 Ton Models  
(Restrictor Matches)**

*SH1BE4M1SP30K SERIES																
SUCT. PRESS.	OUTDOOR TEMPERATURE (°F)															
	70		75		80		85		90		95		100		105	
	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.
135	242	131														
137	243	132	265	135												
139	244	132	266	135	287	138										
141	245	132	266	135	288	138	310	141								
143	246	132	267	135	289	138	310	141	332	144						
145			268	135	290	138	311	141	333	144	354	148				
147					290	138	312	141	334	144	355	147	377	151		
149							313	141	335	144	356	147	378	151	399	154
151							314	141	335	144	357	147	379	150	400	154
153									336	144	358	147	379	150	401	153
155											359	147	380	150	402	153
157													381	150	403	153
159															404	153
161																

**Table 6. Charging Table for 2.5 Ton Models  
(Restrictor Matches)**

 Shaded boxes indicate flooded conditions.

 Rated design values. The suction pressure will vary from design value if indoor air flow, entering dry bulb, or entering wet bulb temperatures are lower than design.

1. All pressures are listed in psig and all temperatures in ° F
2. Discharge temperatures greater than charted values indicate an undercharged system.
3. In Cooling Mode, suction pressure will be lower than design value if indoor air flow, entering dry bulb, or entering wet bulb temperatures are lower than design.
4. In Heating Mode, charge should be weighed in. It is strongly recommended to verify charge in cooling mode at ambient above 70°F.

*SH1BE4M1SP36K SERIES																
SUCT. PRESS.	OUTDOOR TEMPERATURE (°F)															
	70		75		80		85		90		95		100		105	
	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.
133	242	128														
135	245	128	265	132												
137	247	129	268	132	288	136										
139	250	129	270	133	290	136	311	140								
141	252	130	272	133	293	137	313	140	334	144						
143			275	134	295	137	315	141	336	144	356	148				
145					297	138	318	141	338	145	358	148	379	152		
147							320	141	340	145	361	149	381	152	402	156
149							323	142	343	145	363	149	383	152	404	156
151									345	146	365	149	386	153	406	156
153											368	149	388	153	408	156
155													390	153	411	157
157															413	157
159																

**Table 7. Charging Table for 3 Ton Models  
(Restrictor Matches)**

*SH1BE4M1SP42K SERIES																
SUCT. PRESS.	OUTDOOR TEMPERATURE (°F)															
	70		75		80		85		90		95		100		105	
	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.
132	226	132														
134	231	133	250	136												
136	235	134	254	137	273	140										
138	240	135	258	138	277	141	297	144								
140	242	135	262	138	281	141	300	145	320	148						
142			265	139	284	142	303	145	323	148	343	152				
144					288	143	307	146	326	149	345	152	365	156		
146							310	146	329	149	348	152	368	156	388	160
148							314	147	333	150	352	153	370	156	390	160
150									337	150	356	153	375	157	392	159
152											360	154	379	157	398	160
154													384	158	402	161
156															407	161
158																

**Table 8. Charging Table for 3.5 Ton Models  
(Restrictor Matches)**



Shaded boxes indicate flooded conditions.



Rated design values. The suction pressure will vary from design value if indoor air flow, entering dry bulb, or entering wet bulb temperatures are lower than design.


1. All pressures are listed in psig and all temperatures in ° F
2. Discharge temperatures greater than charted values indicate an undercharged system.
3. In Cooling Mode, suction pressure will be lower than design value if indoor air flow, entering dry bulb, or entering wet bulb temperatures are lower than design.
4. In Heating Mode, charge should be weighed in. It is strongly recommended to verify charge in cooling mode at ambient above 70°F.

*SH1BE4M1SP48K SERIES																
SUCT. PRESS.	OUTDOOR TEMPERATURE (°F)															
	70		75		80		85		90		95		100		105	
	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.	LIQ. PRESS.	DIS. TEMP.
132	248	128														
134	248	128	269	133												
136	248	128	269	133	290	137										
138	248	128	269	133	290	137	310	141								
140	249	129	269	133	290	137	311	141	331	146						
142			270	133	290	137	311	141	332	146	352	150				
144					291	137	311	141	332	146	353	150	373	155		
146							312	141	332	146	353	150	373	154	394	159
148							312	141	332	145	353	150	374	154	394	159
150									333	145	353	150	374	154	395	158
152											354	150	374	154	395	158
154													375	154	395	158
156															396	158
158																

**Table 9. Charging Table for 4 Ton Models  
(Restrictor Matches)**

## Application Notes & Heat Mode Verification Tables (Heat Mode Only)

 Shaded boxes indicate flooded conditions.

 Rated design values. The suction pressure will vary from design value if outdoor air flow, entering dry bulb, or entering wet bulb temperatures vary.

1. All pressures are listed in psig and all temperatures in ° F

2. Discharge temperatures greater than charted values indicate an undercharged system.

- **Read all notes and warnings for the Cooling-mode charging charts prior to using these Heating-mode charge verification charts. Always use safe and environmentally sound methods when handling refrigerant handling or servicing the unit. Review the factory literature and safety warnings prior to servicing.**
- When repairing system leaks, always use a nitrogen (inert) gas to protect the refrigerant system and pressure check the repair before re-charging. Always replace the filter-dryers when performing any repair to the refrigeration system with one capable of acid removal. After completing the repairs, evacuate the system to 350 - 500 microns and weigh in the refrigerant to the amount specified on the unit rating label.
- Before using the heat mode verification tables, determine the outdoor ambient temperature and the return air temperature to the unit. Locate the appropriate location on the units verification chart based on those measurements to determine the ideal discharge pressure and temperature. See [Table 10 \(page 17\)](#), [Table 11 \(page 17\)](#), [Table 12 \(page 17\)](#), [Table 13 \(page 18\)](#), & [Table 14 \(page 18\)](#). Verify the outdoor fan and compressor are running and the outdoor coil is free from frost accumulation. Also verify the system is not operating in defrost mode before inspecting the system.
- Always use quality instruments that are in good working order to measure the actual operating point of the refrigeration system. The discharge temperature should be within 2 degrees of the ideal value and the pressure should be within 2%.
- The most reliable way of verifying the system is at the correct charge is to evacuate the system and weigh in the charge to the amount shown on the rating label. However, if an inspection with these verification charts does not line up with the values shown and the ambient temperature is above 50° F, then a more accurate way to inspect the system for proper charge is with the cooling mode charging charts. Switch the unit into cooling mode and allow it to operate and stabilize for a few minutes then inspect the unit operation with the cooling mode charts and procedures.

### **Before changing the unit charge, always inspect the following items first:**

1. Inspect the liquid line temperature on the inlet and outlet of the filter dryers. If it is the factory dryer and in good condition there should be no temperature difference. If the temperature difference is larger than 5°, replace the filter dryer with one that is bi-directional and has acid removal capability. Refer to the unit RPL for the recommended part number and size.
2. Inspect the units input voltage. Units operating at less than 95% of the nominal voltage may deviate more from the chart than previously stated.
3. Inspect the input voltage for a phase imbalance. Units with greater than a 2% disparity will not operate at the rated performance.
4. Verify that the unit filters are installed and are clean. The pressure drop across the filters should not exceed 0.08 in-W.C.
5. Inspect the indoor coil, indoor blower and blower motor for cleanliness, clogging, and proper operation.
6. Inspect the system for leaks. If any leaks are detected, repair them immediately. Re-inspect the return air and ambient temperatures and verify that the correct system point on the verification chart was selected.

**DONOT** use the charts in systems that have the fan cycling under a low-ambient control. Low-ambient controls are for cooling operation. In heating mode, the low ambient control should be disabled. Unless the unit is in defrost mode, the outdoor fan should always operate in conjunction with the compressor.

### **IMPORTANT NOTE:**

**If the unit is equipped with a liquid valve with an outdoor restrictor as shown in [Figure 2 \(page 4\)](#), then it is not possible to measure the liquid pressure. To approximate the liquid pressure, subtract 7 psig from the discharge pressure.**



*SH1BE4M1SP24K SERIES																			
OUTDOOR TEMPERATURE (DEG. F)																			
0					10					20					30				
SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	
31	224	225	126		46	241	243	131		62	258	260	137		77	276	277	143	
32	231	232	124		47	247	248	129		63	263	264	135		78	279	280	141	
33	238	239	122		48	253	254	127		64	268	269	133		79	283	284	139	
34	245	246	120		49	259	260	125		65	273	274	131		80	287	288	137	
35	252	253	118		50	265	266	123		66	278	279	129		81	290	291	135	
36	259	260	116		51	271	272	121		67	282	284	127		82	294	295	133	
37	266	267	114		52	277	278	119		68	287	288	125		83	298	299	131	

Table 10. Verification Table for 2 Ton Models

*SH1BE4M1SP30K SERIES																			
OUTDOOR TEMPERATURE (DEG. F)																			
0					10					20					30				
SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	
37	225	229	115		49	240	244	122		61	254	259	129		74	269	273	136	
38	232	236	113		50	246	250	120		62	259	264	127		75	273	277	134	
39	239	243	111		51	252	256	118		63	264	268	125		76	276	281	132	
40	246	250	109		52	257	262	116		64	269	273	123		77	280	284	130	
41	253	257	107		53	263	268	114		65	274	278	121		78	284	288	128	
42	260	264	105		54	269	274	112		66	278	283	119		79	287	292	126	
43	267	271	103		55	275	279	110		67	283	287	117		80	291	295	124	

Table 11. Verification Table for 2.5 Ton Models

*SH1BE4M1SP36K SERIES																			
OUTDOOR TEMPERATURE (DEG. F)																			
0					10					20					30				
SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.		SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	
32	224	233	123		47	238	247	126		61	251	260	130		76	264	273	133	
33	231	240	121		48	244	253	124		62	256	265	128		77	268	277	131	
34	238	247	119		49	249	259	122		63	261	270	126		78	272	281	129	
35	245	254	117		50	255	264	120		64	265	274	124		79	275	284	127	
36	252	261	115		51	261	270	118		65	270	279	122		80	279	288	125	
37	259	268	113		52	267	276	116		66	275	284	120		81	283	292	123	
38	266	275	111		53	273	282	114		67	280	289	118		82	286	295	121	

Table 12. Verification Table for 3 Ton Models

*SH1BE4M1SP42K SERIES																			
OUTDOOR TEMPERATURE (DEG. F)																			
0				10				20				30				40			
SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.
34	224	234	124	48	244	254	127	63	264	273	130	77	283	293	133	93	298	307	143
35	231	241	122	49	250	259	125	64	268	278	128	78	287	297	131	94	305	314	140
36	238	248	120	50	256	265	123	65	273	283	126	79	291	300	129	95	312	321	137
37	245	255	118	51	262	271	121	66	278	288	124	80	294	304	127	96	319	328	134
38	252	262	116	52	268	277	119	67	283	292	122	81	298	308	125	97	326	335	131
39	259	269	114	53	273	283	117	68	288	297	120	82	302	311	123	98	333	342	128
40	266	276	112	54	279	289	115	69	292	302	118	83	305	315	121	99	340	349	126

Table 13. Verification Table for 3.5 Ton Models

*SH1BE4M1SP48K SERIES																			
OUTDOOR TEMPERATURE (DEG. F)																			
0				10				20				30				40			
SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.
29	214	225	107	44	233	244	114	59	252	263	122	74	271	282	129	89	281	292	139
30	221	232	105	45	239	250	112	60	257	268	120	75	275	286	127	90	288	299	136
31	228	239	103	46	245	256	110	61	261	272	118	76	278	289	125	91	295	306	133
32	235	246	101	47	251	261	108	62	266	277	116	77	282	293	123	92	302	313	130
33	242	253	99	48	256	267	106	63	271	282	114	78	286	297	121	93	309	320	127
34	249	260	97	49	262	273	104	64	276	287	112	79	289	300	119	94	316	327	124
35	256	267	95	50	268	279	102	65	281	292	110	80	293	304	117	95	323	334	122

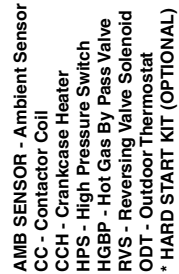
Table 14. Verification Table for 4 Ton Models

### Split System Heat Pump (Outdoor Section)

**NOTES:**

1. Disconnect all power before servicing.
2. For supply connections use copper conductors only.
3. Not suitable on systems that exceed 150 volts to ground.
4. For replacement wires use conductors suitable for 105° C.
5. For ampacities and overcurrent protection, see unit rating plate.
6. Connect to 24 vac/40vac/class 2 circuit. See furnace/air handler installation instructions for control circuit and optional relay/transformer kits.

1. Couper le courant avant de faire le retrait.
2. Employer uniquement des conducteurs en cuivre.
3. Ne convient pas aux installations de plus de 150 volt a la terre.

[illegible]

10214360  
(New)  
03/18

### Figure 12. W.D. for 2 - 4 Ton Models

## INSTALLATION CHECKLIST

<b>INSTALLATION ADDRESS:</b>		
CITY:	STATE:	
UNIT MODEL #		
UNIT SERIAL #		
Unit Installed Minimum clearances per Figure 1 (page 3)?	YES	NO
<b>INSTALLER NAME:</b>		
CITY _____	STATE _____	
Has the owner's information been reviewed with the customer?	YES	NO
Has the Literature Package been left with the unit?	YES	NO

REFRIGERATION SYSTEM		
Was unit given 24 hr warm up period for crankcase heaters?	YES	NO
Stage-1 Liquid Pressure (high side)		
Stage-1 Suction Pressure (low side)		

ELECTRICAL SYSTEM		
Electrical connections tight?	YES	NO
Line voltage polarity correct?	YES	NO
Rated Voltage:..... VOLTS		
Has the thermostat been calibrated?	YES	NO
Is the thermostat level?	YES	NO
Is the heat anticipator setting correct? (If Applicable)	YES	NO

PROPOSITION 65 WARNING:
<b>WARNING:</b> This product contains chemicals known to the state of California to cause cancer.
<b>WARNING:</b> This product contains chemicals known to the state of California to cause birth defects or other reproductive harm.

### REPLACEMENT PARTS

Replacement parts are available through your distributor. Please have the complete model and serial number of the unit when ordering replacement parts.



Capacitors  
Compressors  
Contactors  
Pressure Switches  
Relays

#### ELECTRICAL:

Temperature Limit Switches  
Thermostats  
Time Delay Relays  
Transformers

#### MOTORS:

Blower Motor  
Fan Motor

#### COMPONENTS:

Blower Assembly  
Cabinet Panels  
Expansion Valves

Fan Grille  
Filter/Driers

