

**\*Q8SF / PPH3SF SERIES**

**16SEER/12EER/8.2HSPF**

## **INSTALLATION INSTRUCTIONS**

**SINGLE PHASE, CONVERTIBLE PACKAGE HEAT PUMP - TWO-STAGE - R410A**



## **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.**

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## IMPORTANT SAFETY INFORMATION

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:**

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. Unless otherwise noted in these instructions, only factory authorized kits or accessories may be used with this product.

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### **CAUTION:**

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

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### **WARNING:**

Shut off all electrical power to the unit before performing any maintenance or service on the system. Failure to comply may result in personal injury or death.

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### **WARNING:**

This unit is fully charged with R-410A refrigerant and ready for installation. When a system is installed according to these instructions, no refrigerant charging is required. If repairs make it necessary for evacuation and charging, it should only be attempted by qualified, trained personnel thoroughly familiar with this equipment. Some local codes require licensed installation service personnel to service this type of equipment. Under no circumstances should the homeowner attempt to install and/or service this equipment. Failure to comply with this warning could result in equipment damage, personal injury, or death.

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### **WARNING:**

**Do not place combustible material on or against the unit cabinet. Do not place combustible materials, including gasoline and any other flammable vapors and liquids, in the vicinity of the unit.**

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### **WARNING:**

The safety information listed below must be followed during the installation, service, and operation of this unit. Unqualified individuals should not attempt to interpret these instructions or install this equipment. Failure to follow safety recommendations could result in possible damage to the equipment, serious personal injury or death.

- 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.
- This equipment contains liquid and gaseous refrigerant under high pressure. Installation or servicing should only be performed by qualified trained personnel thoroughly familiar with this type equipment.
- 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.
- Installer must comply with safety codes and wear appropriate safety equipment (safety glasses, work gloves, fire extinguisher, etc.) when performing brazing operations.
- Install this unit only in a location and position as specified on [page 4](#). This unit is designed only for outdoor installations and should be located with consideration of minimizing the length of the supply and return ducts. Consideration should also be given to the accessibility of fuel, electric power, service access, noise, and shade.
- 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.

## GENERAL INFORMATION

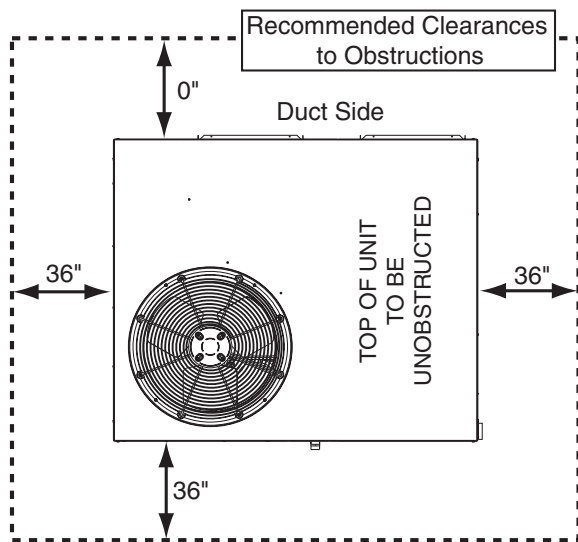
The Q8SF / PPH3SF series heat pump is designed only for outdoor rooftop or ground level installations. This unit has been tested for capacity and efficiency in accordance with AHRI Standards and will provide many years of safe and dependable comfort, providing it is properly installed and maintained. Abuse, improper use, and/or improper maintenance can shorten the life of the appliance and create unsafe hazards.

### Before you install this unit

- ✓ 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. If there is any question concerning the power supply, contact the local power company.
- ✓ 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. 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.
- Choose an appropriate location that minimizes the length of the supply and return air ducts.
- Overhead obstructions, poorly ventilated areas, and areas subject to accumulation of debris should be avoided.
- 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.



**NOTE:** Provide adequate clearance to the top (72") and sides (36") of the unit to provide servcability, prevent recirculation of air and poor performance.

Figure 1. Clearance Requirements

### Field Connections for Electrical Power Supply

- All wiring must comply with current provisions of the National Electrical Code (ANSI/NFPA 70) and with applicable local codes having jurisdiction.
- The minimum size of electrical conductors and circuit protection must be in compliance with information listed on the outdoor unit data label.
- Electrical power supplied to the unit must be adequate for proper operation of the equipment. The system must be wired and provided with circuit protection in accordance with local building codes.

### Air Ducts

This unit is designed only for use with supply and return ducts. Air ducts must be installed in accordance with the standards of the National Fire Protection Association Standard for Installation of Air Conditioning Systems (NFPA 90A), Standard for Installation of Residence Type Warm Air Heating and Air Conditioning Systems (NFPA 90B), and all applicable local codes. NFPA publications are available by writing to: National Fire Protection Association, Batterymarch Park, Quincy, ME 02269 or visit [www.NFPA.org](http://www.NFPA.org) on the web.

- Design the duct work according to methods described by the Air Conditioning Contractors of America (ACCA).
- The ducts must be properly sized not to exceed .2" W.C. total pressure drop at 400 scfm per nominal ton of cooling capacity.
- Duct work should be attached directly to the unit flanges for horizontal applications.
- If roof curb is installed, the ducts must be attached to the curb hangers, not the unit.

### Unconditioned Spaces

All duct work passing through unconditioned space must be properly insulated to minimize duct losses and prevent condensation. Use insulation with an outer vapor barrier. Refer to local codes for insulation material requirements.

### Acoustical Duct Work

Certain installations may require the use of acoustical lining inside the supply duct work.

- Acoustical insulation must be in accordance with the current revision of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) application standard for duct liners.
- Duct lining must be UL classified batts or blankets with a fire hazard classification of FHC-25/50 or less.
- Fiber duct work may be used in place of internal duct liners if the fiber duct work is in accordance with the current revision of the SMACNA construction standard on fibrous glass ducts. Fibrous duct work and internal acoustical lining must be NFPA Class 1 air ducts when tested per UL Standard 181 for Class 1 ducts.

### Air Filter Requirements

## WARNING:

**Never operate the unit without a filter in place. Dust and lint could accumulate on internal parts, resulting in loss of efficiency, equipment damage and possible fire. Replace disposable filters with the same type and size.**



- Air filter(s) are not supplied and must be installed in the return air system by the installer.
- All return air must pass through the filters before entering the unit. **NOTE:** It is important that all filters be kept clean and/or replaced frequently to ensure proper operation of unit. Dirty or clogged filters will reduce the efficiency of the unit and result in unit shutdowns.
- Air filter pressure drop must not exceed 0.08 inches WC. When replacing the air filters, a suitable air filter must be installed upstream of the evaporator coil of the return air system.
- Internal return air filter kits are available. Contact your distributor for more information.

## HEAT PUMP INSTALLATION

### Packaging Removal

Remove the shipping carton and User's Manual from the equipment. For rooftop installations, remove and discard the two supports attached beneath the unit.

### Rigging & Hoisting

#### **WARNING:**

**To avoid the risk of property damage, personal injury, or death, it is the rigger's responsibility to ensure that whatever means are used to hoist the unit are safe and adequate:**

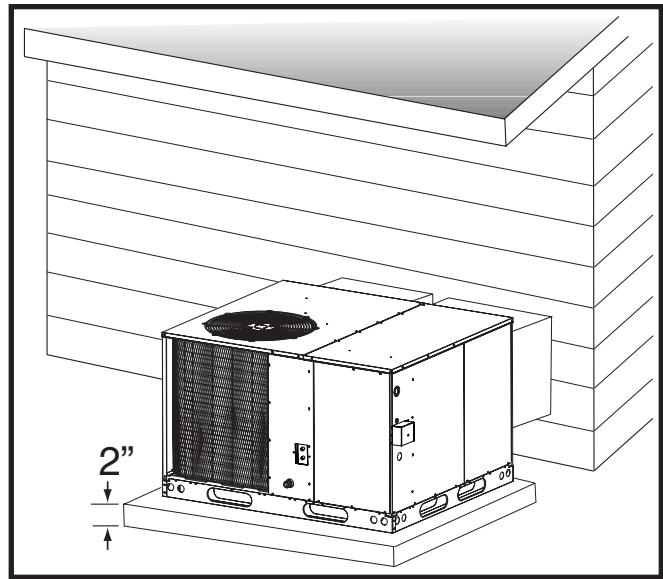
- **The lifting equipment must be adequate for the load. Refer to Table 5 (page 13) for unit weights.**
- **The unit must be lifted from the holes in the base rails using cables or chains.**
- **Spreader bars are required to protect the unit and ensure even loading.**
- **Keep the unit in an upright position at all times. The rigging must be located outside the unit's center of gravity. Refer to Figure 10 (page 13) for locating the center of gravity.**
- **All panels must be securely in place during rigging and hoisting.**

### Minimum Clearances

Q8SF / PPH3SF units are certified as combination heating and cooling equipment for outdoor installation only. Figure 1 (page 4) displays the minimum clearances to obstructions for both downflow and horizontal discharge.

Units may be installed on Class A, B, or C roof covering material when used with bottom supply and return air ducts as long as the following requirements are met:

- If using horizontal supply and return air ducts, the horizontal roof curb kit and return air kit must be installed prior to unit installation. Horizontal roof curb is required.
- If using bottom discharge with return air ducts a roof curb must be installed prior to unit installation. See Rigging and Hoisting section for setting of the unit.



**Figure 2. Typical Ground Level Installation**

### 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 (page 4). Also consider clearances for access to the internal filter; if configured for internal
- A suitable mounting pad must be provided and separate from the building foundation. The pad must be level to ensure proper condensate disposal and strong enough to support the unit's weight. The slab height must be a minimum of 2" (5cm) above grade and with adequate drainage. See Figure 2.
- Ductwork should be attached directly to flanges on panels.

### Rooftop

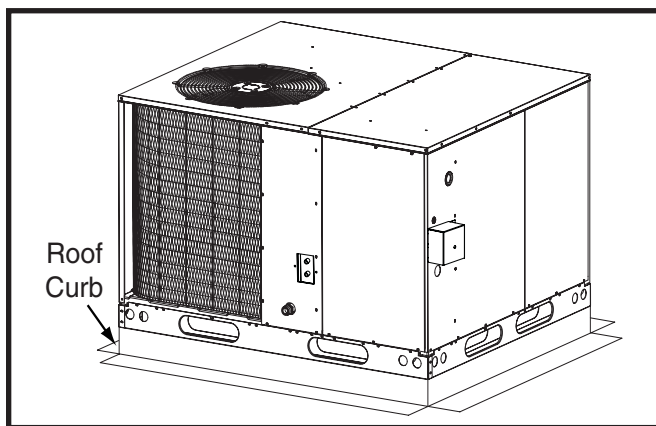
Rooftop installations must be located according to local building codes or ordinances and these requirements:

- The roof must be capable of handling the weight of the unit. For unit weights, see Table 5 (page 13). Reinforce the roof or transition curb if necessary.
- The appropriate accessory roof curb (Figure 3 (page 6)) should be installed prior to unit installation. The roof curb must be square and level to ensure proper condensate drainage. **Please follow all instructions provided with the kit.**
- Secure roof curb or frame to roof using acceptable mechanical methods per local codes. Extreme wind kits are also available for windy regions. **NOTE:** Make sure the two supports beneath the unit have been removed.

### Horizontal to Downflow Conversion

The unit is shipped ready for horizontal duct connections. If down flow ducts are required, the unit must be converted following the steps below for the supply and return ducts.

1. Locate the duct cap inside the duct openings and remove the screw holding it in place.
2. Lift the cap out of the unit. (**Hint:** The cap can be pushed up from the bottom by reaching through the fork slot).
3. Cover the horizontal duct opening with the horizontal duct cap. The insulation will be on the indoor side.
4. Fasten the cover with screws (field supplied) and apply appropriate sealant to seal any gaps.

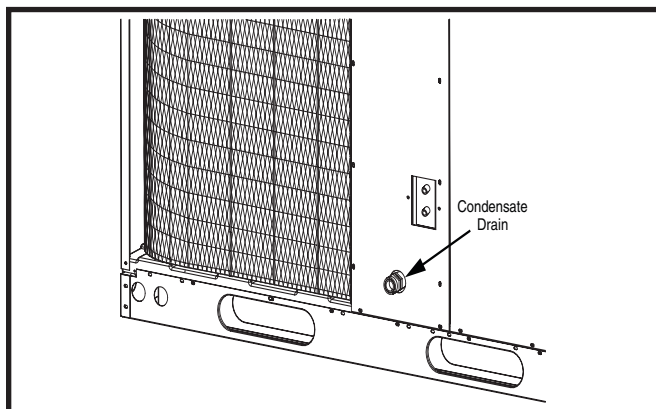


**Figure 3. Roof Top Installation**

### Condensate Drain

Condensate is removed from the unit through the 3/4" female pipe fitting located on the front side of the unit. Install a 2 inch condensate trap (field supplied) at the end of the drain line, of the same size and prime with water. See [Figure 4](#).

When connecting rigid drain line, hold the female fitting with a wrench to prevent twisting. **Do not over tighten!** Refer to local codes and restrictions for proper condensate disposal requirements.



**Figure 4. Condensate Drain Location**

## 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**

- 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. See [Figure 12 \(page 16\)](#). Inspect for and tighten any loose connections.

### Line Voltage

- A wiring diagram is located on the inside cover of the units electrical box. 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 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 unit requires both power and control circuit electrical connections. Refer to [Figure 12 \(page 16\)](#) 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. 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.

Wire Gauge	Recommended Maximum Wire Length (FT) From Unit to Thermostat
22	45
20	70
18	115
16	180

**Table 1. Thermostat Wire Gauge**

- Units are shipped from the factory wired for 240 volt operation. Remove the lead from the transformer terminal marked 240V and connect it to the terminal marked 208V (if needed).
- 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.

## 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.

## Blower Speed

The blower speed is preset (for operation) at the factory for heating and cooling. These factory settings are listed in [Table 6 \(page 14\)](#). For optimum system performance and comfort, it may be necessary to change the factory set speed.

### **CAUTION:**

**To avoid personal injury or property damage, make sure the motor leads do not come into contact with any uninsulated metal components of the unit.**

## Thermostat Connections

- The Q8SF heat pump requires a two-stage cooling/heating heat pump thermostat. If electric heating is installed, a 3-stage HP thermostat is required. If 2-stage electric heat is selected, a 4-stage HP thermostat is required. Refer to the thermostat manufacturer's installation manual for additional instructions.
- The low voltage wires must be properly connected to the unit's low voltage terminal block as shown in [Figure 11 \(page 15\)](#). Recommended wire gauge and lengths for typical thermostat connections are listed in [Table 1](#).
- 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's instruction sheet for mounting and installation information.

STATUS INDICATOR	STATUS TYPE	DIAGNOSTIC DESCRIPTION
C1	Operating Status	Cooling, 1st Stage
C2	Operating Status	Cooling, 2nd Stage
H1	Operating Status	Heating, 1st Stage
H2	Operating Status	Heating, 2nd Stage
SC	Operating Status	Anti Short Cycle Timer
DF	Operating Status	Defrost
--	Operating Status	Power on, no call for operation
D1	Fault	Pressure switch, low
D2	Fault	Pressure switch, high
D3	Fault	Temperature Sensor, Ambient
D4	Fault	Temperature Sensor, Coil
D5	Fault	Board
DF (FLASHING)	Input Error	Forced defrost - test short applied longer than 11 minutes

**Table 2. Defrost Control Board Status Indicators**

## 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.
- To determine operating status or fault conditions, refer to [Table 2](#) for diagnostic description.

## Clearing Defrost Board Fault Codes

- Fault codes can be removed from memory through the use of the test pins. This is accomplished by shorting the two test pins momentarily (more than 1 second) while there is no Y1 IN input present.
- Without resetting using the test pins, the fault codes will stay in the board's memory continuously (even through loss of power) for 7 days.

## Ambient Sensor Mounting

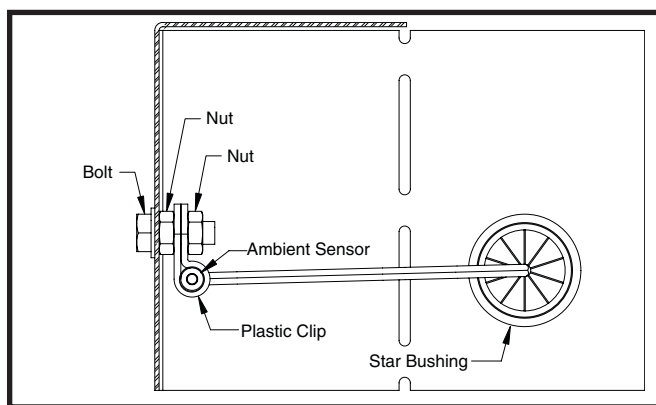
For optimum performance of the heat pump system, the ambient sensor must be mounted on the outside of the unit. See [Figure 5 \(page 8\)](#).

- Remove the mounting bracket wire tied to the control bracket and all hardware included in the packet.
- Remove star bushing from 7/8" hole in corner panel of the unit. See [Figure 7 \(page 14\)](#).
- Route the ambient sensor through the 7/8" hole in the corner panel of the unit, and then through the 7/8" hole in the mounting bracket.
- Route the sensor through the star bushing. Use the star bushing to secure the mounting bracket to the unit.
- Secure the ambient sensor inside the plastic clip and secure it to the mounting bracket with the screw and nut provided.
- Install one spacer nut between the plastic clip and mounting bracket.
- Bend the mounting bracket into position and screw the mounting bracket to the corner panel.

## Electric Heat Package (optional)

This heat pump is shipped without an auxiliary electric heat kit installed. If electric heat is desired, an accessory heater kit must be field installed. Refer to [Table 6 \(page 14\)](#) for blower speeds.

- Select the correct size heat package for the installation. See specifications sheet for available kits and application.



**Figure 5. Ambient Sensor Mounting**

Install the heater kit according to the to the installation instructions provided with the kit.

- Installation is most easily accomplished before making duct or electrical connections.

### Humidifier

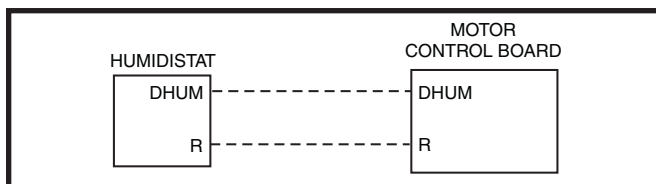
The unit has an output to power a humidifier when the blower is running. This output is rated to 1.0 amp at 208/240V.

### Dehumidification Options

The motor control board has a **DHUM** or **D** connection that allows the system to increase the amount of humidity that is removed from the circulating air. See [Figure 6 \(page 8\)](#). This is accomplished by reducing the CFM and allowing the cooling coil to become colder. This will only occur when there is a call for cooling. There are many ways that this can be electrically wired.

1. If the room thermostat incorporates a humidity sensor and **DHUM** output, connect the **DHUM** on the thermostat to the **D** terminal on the motor control board. See [Figure 6](#).
2. If using a separate humidistat, connect the **DHUM** & **R** terminals on the humidistat to the **D** & **R** terminals on the motor control board of the air handler. In this option, the **DHUM** output of the humidistat must be set so it is only closed when there is a call for dehumidification.
3. If a humidistat is not available, it is an acceptable option to connect the **R** & **D** terminals on the motor control board together with a field supplied wire. This option causes the blower to run at a reduced CFM for 10 minutes after a call for cooling.

**NOTE:** If the **DHUM** terminal is energized when there is a call for cooling, then the motor control board shall run the blower motor at 60% of torque setting for 10 minutes. After 10 minutes, the torque shall be 100% of the torque setting.



**Figure 6. DHUM Wiring Configuration**

### Electronic Air Cleaner (EAC)

The unit has an output to power an electronic air cleaner when the blower is running. This output is rated to 1.0 amp at 208/240V.

### Optional Outdoor Thermostat

An outdoor thermostat can be installed in the field with 2-stage electric heat by removing the orange wire from the **E** terminal on the terminal block and connecting to the outdoor thermostat. Connect the other side of the outdoor thermostat to **W2** from the thermostat.

### Optional Electric Heater Kits

Optional electric heater kits are available in 5 kw through 15 kw heating capacities. Single package heat pumps are designed to allow optional electric heat to be field installed as required by the building's particular heating load. The options available for each unit are shown in the heater kit installation instructions. A 2-stage heat pump thermostat should be used when an electric heater kit is installed.

**NOTE:** A 2-stage heating thermostat is required if installing a 2-stage heater kit. Blower motor will only operate in high speed in emergency heat mode. Install the heater kits as directed by the instructions supplied with the heater kit. Follow all cautions and warnings as directed.

## START UP & ADJUSTMENTS

### Pre-Start Check List

- ✓ Verify the unit is level and allows condensate to drain.
- ✓ 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 duct work is sealed to prevent air leakage.
- ✓ 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 outdoor fan turns freely.
- ✓ Verify that the power supply branch circuit overcurrent protection is sized properly.
- ✓ Verify that the thermostat is wired correctly. The thermostat system mode should be set to OFF and the thermostat fan mode should be set to AUTO.

### Start-Up Procedure

Close all electrical disconnects to energize the system.

## CAUTION:

**If the 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.**

### Air Circulation

Leave the thermostat system mode on OFF, and set the fan mode to ON. Blower should run continuously. Check the air delivery at the supply registers and adjust register openings for balanced air distribution. Examine ductwork for leaks or



obstruction if insufficient air is detected. Set the thermostat fan mode to AUTO. The blower should stop running.

### 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 compressor, fan, and blower energize.
2. Feel the air being circulated by the indoor blower and verify that it is cooler than return temperature. Listen for any unusual noises. If unusual sounds occur, determine the source of the noise and correct as necessary.
3. Allow the cooling 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 mode is set to ON.

### System Heating

If the unit has been equipped with optional electric heater kits, set the thermostat's system mode to HEAT and the fan mode to AUTO. Verify the compressor, outdoor fan, blower, and heaters 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.

### Short Cycle Protection

The control circuit is equipped with a time-delay feature for protection against short cycling. With the system operating in the cooling mode, gradually raise the thermostat temperature setting until the system de-energizes. Immediately lower the thermostat temperature to the original setting and verify that the indoor blower is energized. After approximately 5 minutes, the compressor and the outdoor fan will energize.

### Emergency Heat

1. Set the thermostat's system mode to EM HT and the fan mode to AUTO (intermittent air) or ON (continuous air).
2. Set the thermostat's temperature selector above the existing room temperature and check the following:
  - The thermostat auxiliary heat light (RED) is on.
  - The compressor and the fan should not run; low voltage circuit remains energized.
  - The blower runs according to the thermostat's fan mode setting.
  - Strip heat energizes.

### **Forced Defrost Mode (Field Test)**

- When the **TEST** terminals are shorted for more than 3 seconds, with the **Y1** input active and pressure switches closed, the ACST will be eliminated and the compressor contactor output energizes. The control will be placed into a forced defrost mode.

**NOTE:** The coil temperature sensor does not need to be cold when the unit is forced into defrost.

- If the short across the **TEST** pins exist, the unit will stay in DEFROST as long as the short remains or until the **TERMINATE TIME** is reached (11 minutes). This will happen regardless of coil temperature.

### **Anti Short Cycle Timer Test**

The 5 minute time delay feature can be bypassed by shorting the **TEST** pins together.

### Heating Mode

When the **TEST** pins are shorted together for more than 1 second, the control will switch between defrost mode and heating mode as described in the Forced Defrost Mode procedure section.

### Cooling Mode

When the **TEST** pins are shorted together for more than 1 second, the Anti Short Cycle Timer will be bypassed.

### **Blower Configurations**

#### Basic Cooling / Heat Pump Airflow for Fixed Speed

The basic cooling/heat-pump airflow is controlled by setting switches 5 - 8 on the motor control board (mounted on the blower). FAN ONLY would deliver 70% of the selected cooling airflow. [Table 6 \(page 14\)](#) lists the CFM airflow values recommended for each nominal system capacity. To determine dip switch settings, refer to [Table 6](#).

- When operating in the heat pump mode, a higher basic airflow setting will increase the energy efficiency and capacity but will also decrease the supply air temperature.
- For maximum capacity and energy efficiency, select an airflow at or near the top of the range for that nominal capacity. See [Table 6](#).
- For maximum dehumidification, select an airflow near the middle or bottom of the range for that nominal capacity. Additional information on humidity control can be found in the Dehumidification Options section on page 8.
- For thermostats with a dehumidifier output, use a field supplied wire to connect the thermostat's dehumidifier output to the terminal marked **DHUM**. The thermostat should be set so that the **DHUM** output should be high (energized) when dehumidification is needed. See also Dehumidification Options section.

**IMPORTANT!** If indoor coil icing is observed (in cooling mode), the basic cooling / heat-pump airflow selected may be too low. Verify the setting selected is within the range shown in [Table 6](#). Please refer to the instructions supplied with the unit. If icing continues to occur, raise the selected airflow one or two steps and check for restricted refrigeration circuit.

## **HEAT PUMP MAINTENANCE**

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### **WARNING:**

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

---

### **CAUTION:**

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**Use care when servicing the heat pump or removing components. Personal injury can result from sharp edges present in equipment constructed with sheet metal**

---

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 condensate drain and outdoor coil at the beginning of each season. Remove any debris. Clean the outdoor coil 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.
- Blower Compartment - Dirt and lint can create excessive loads on the motor resulting in higher than normal operating temperatures and shortened service life. It is recommended that the blower compartment be cleaned of dirt or lint that may have accumulated in the compartment or on the blower and motor as part of the annual inspection.

## ⚠ CAUTION:

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

- The motors for the circulating air blower and the outdoor fan are pre-lubricated at the factory. No further oiling is required for the life of this product.

## TROUBLESHOOTING

If the unit fails to operate, check the following:

- Is the electric turned on?
- Is the thermostat operating properly?
- Is the blower compartment door(s) in place?
- Is the units disconnect closed?
- Has the circuit breaker tripped or the control board fuse burned open?
- Is the filter dirty or plugged?
- Is the LED on both control boards constantly ON? If not, refer to [Table 3](#) or [Table 4](#) to determine fault condition.

RED LED (AN2)	DIAGNOSTIC
OFF	Control Fault (No Power)
Flash	Blower Fault
ON	Normal Operation

**Table 3. Heat Pump Control Board Fault Conditions**

DIAGNOSTIC FAULT CONDITIONS	GREEN LED	RED LED
Control Fault (No Power)	Off	Off
Normal Operation	On	On
Motor Fault	On	Flash
Communications Fault	Flash	Flash

**Table 4. Motor Control Board Display Codes**

## REFRIGERANT CHARGING

## ⚠ WARNING:

**Single Packaged Heat Pumps are shipped fully charged with R-410A refrigerant and ready for installation. When a system is installed according to these instructions, no refrigerant charging is required. If repairs make it necessary for evacuation and charging, it should only be done by qualified, trained personnel thoroughly familiar with this equipment. Some local codes require licensed installation/service personnel to service this type of 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.**

The system refrigerant charge can be checked and adjusted through the service ports provided at the front panel. Use only gauge lines which have a Schrader depression device present to actuate the valve. Draw a vacuum on gauge lines to remove air before attaching them to the service ports on the unit.

### IMPORTANT NOTES:

- To achieve rated capacity and efficiency the compressor must be exposed to refrigerant for at least 24 hours prior to running and then must be run for a minimum of 12 hours.
- The refrigerant charging charts are applicable at listed airflows and minimum indoor and outdoor air temps. See [Figure 7 \(page 11\)](#), [Figure 8 \(page 12\)](#), & [Figure 9 \(page 12\)](#).

### Charging an R-410A Unit in AC Mode (With Outdoor Temperatures Above 65° F)

1. With the system operating at steady-state in 2nd stage, measure the liquid refrigerant pressure in psig at the service valve.
2. Measure the liquid refrigerant temperature in Fahrenheit at the filter drier.
3. For the temperature measured, determine the required liquid refrigerant pressure from the appropriate charging charts in [Figure 7 \(page 11\)](#), [Figure 8 \(page 12\)](#), & [Figure 9 \(page 12\)](#).
4. If the pressure measured in step 1 is greater than the required liquid refrigerant pressure determined in step 4, then there is too much charge in the system. Remove refrigerant and repeat steps 1 through 3 until the system is correctly charged.
5. If the pressure measured in step 1 is less than the required liquid refrigerant pressure determined in step 4, then there is too little charge in the system. Add refrigerant and repeat steps 1 through 3 until the system is correctly charged.

### Charging an R-410A Unit in Heating Mode

Use the steps below for proper charging of unit in heat mode:

1. Evacuate the refrigerant system.
2. Weigh in the proper charge as shown on the unit rating plate (during heating mode operation).

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

- **IMPORTANT NOTE:** 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, the ideal system sub-cooling can vary over the range of operation. Reference the charts (Figure 7 (page 11), Figure 8 (page 12), & Figure 9 (page 12)) 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.
- Inspect the unit for the proper voltage and phase balance and the refrigeration system for leaks.
- Units that are operating at less than 95% of the nominal voltage may see a more significant deviation than the amount stated above.

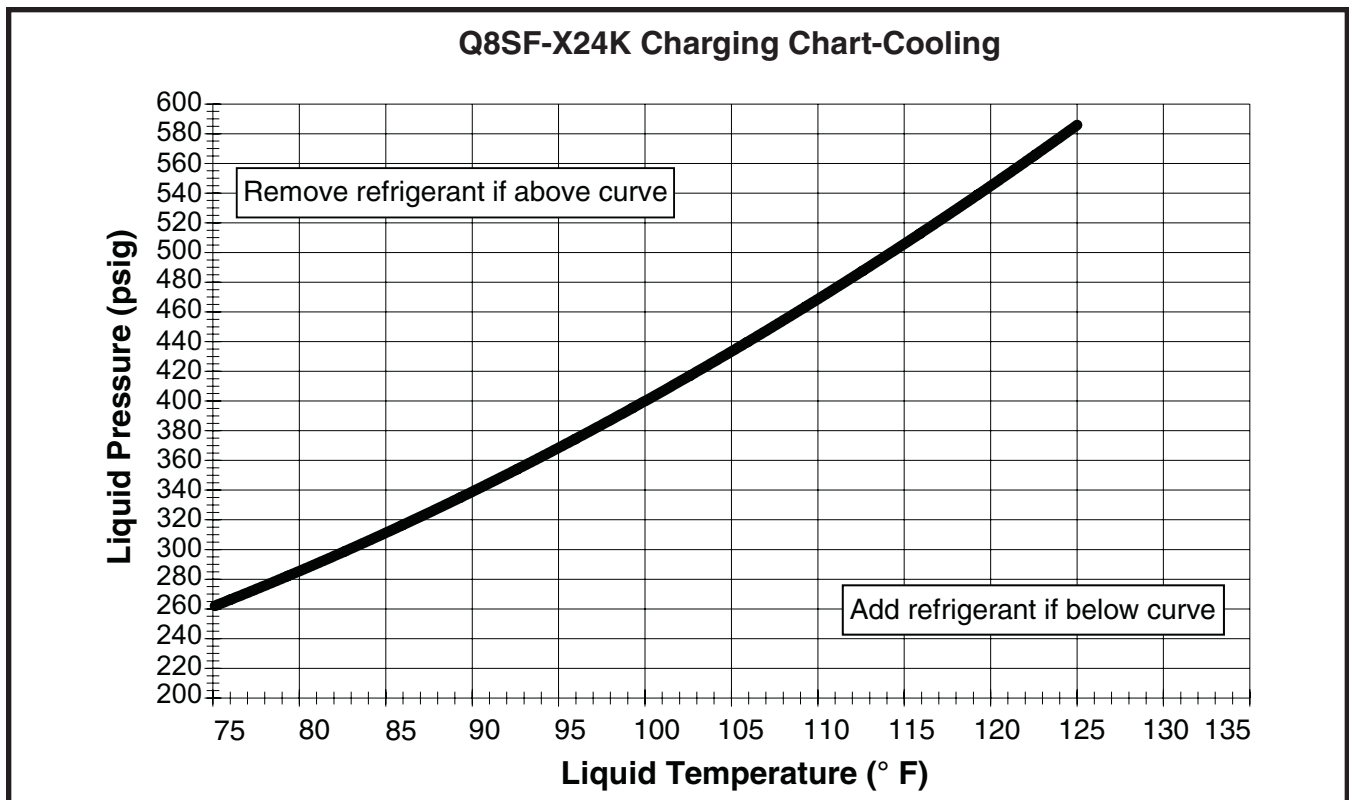


Figure 7. Charging Chart for 2 Ton Units

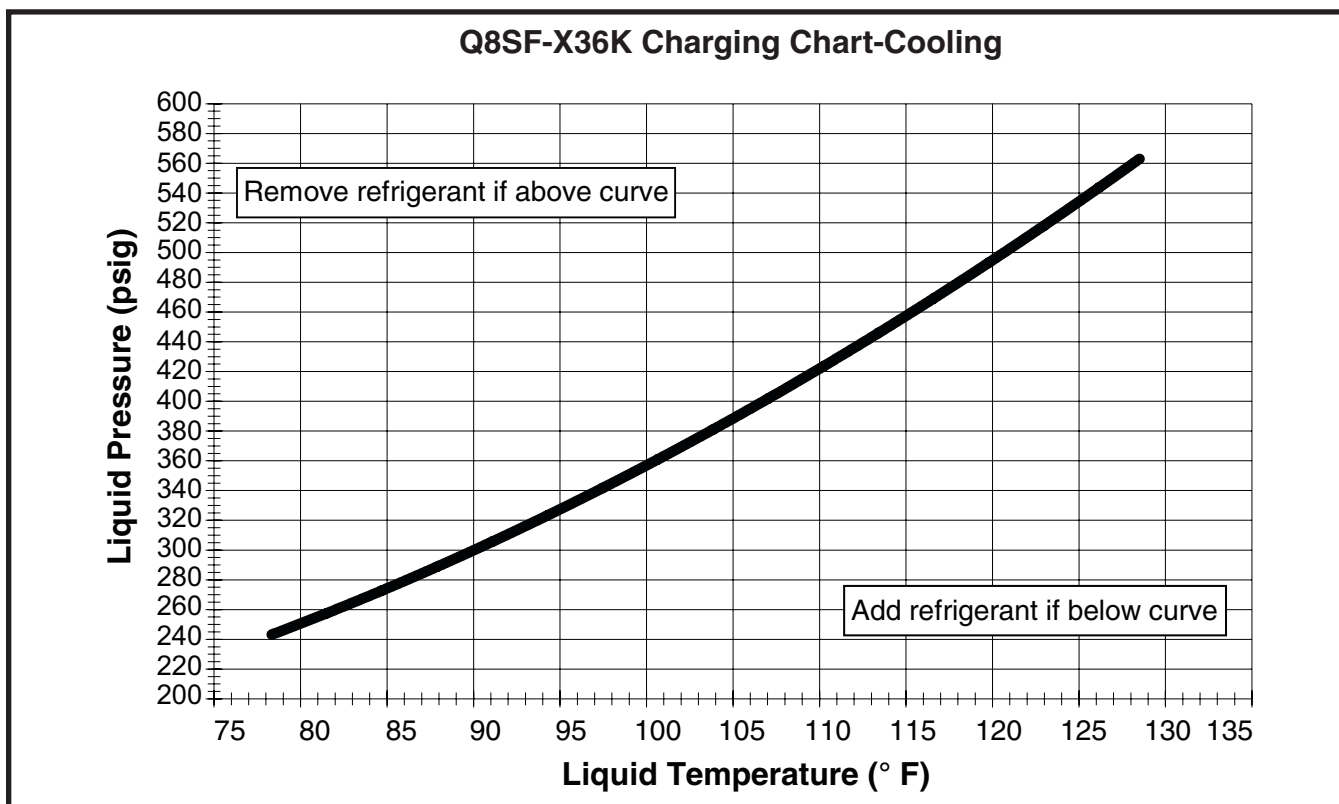


Figure 8. Charging Chart for 3 Ton Units

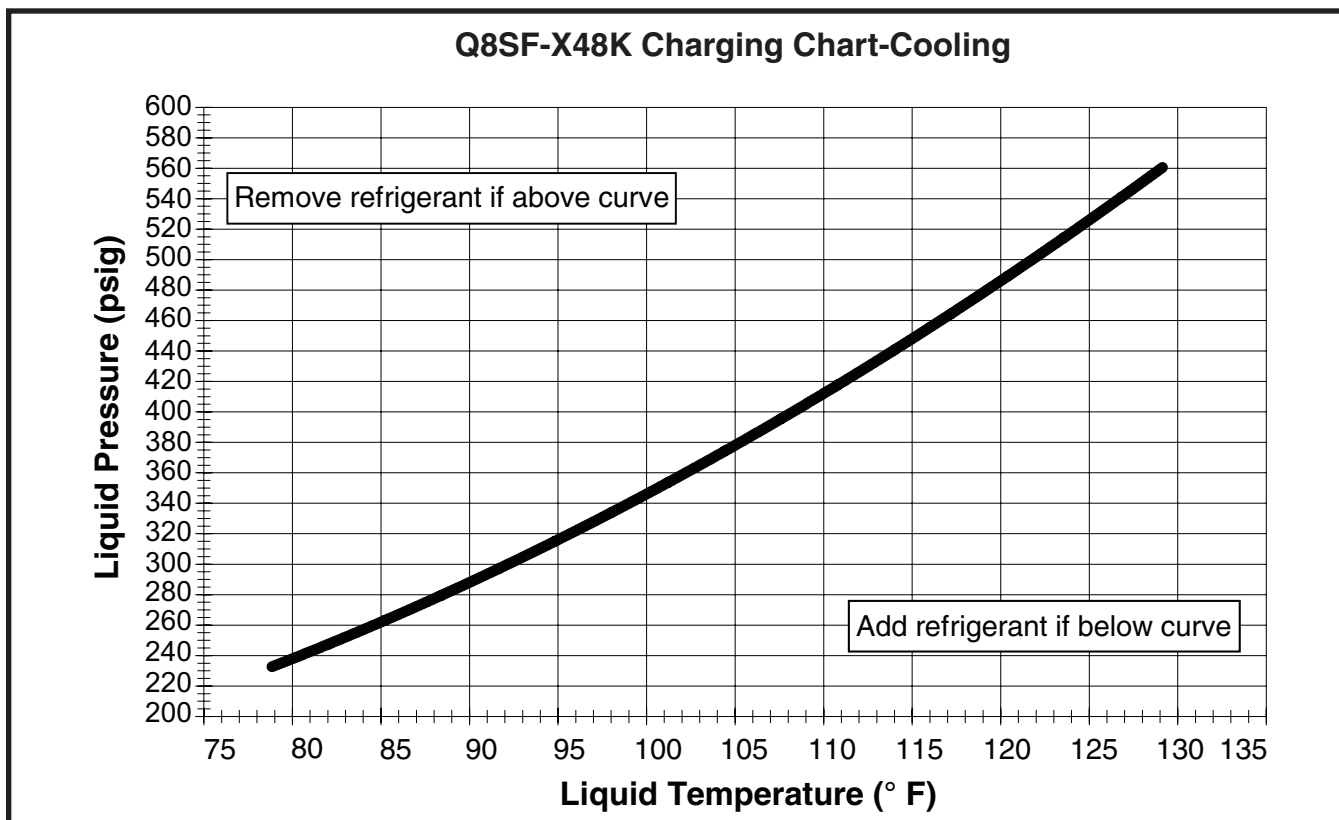


Figure 9. Charging Chart for 4 Ton Units



## FIGURES & TABLES

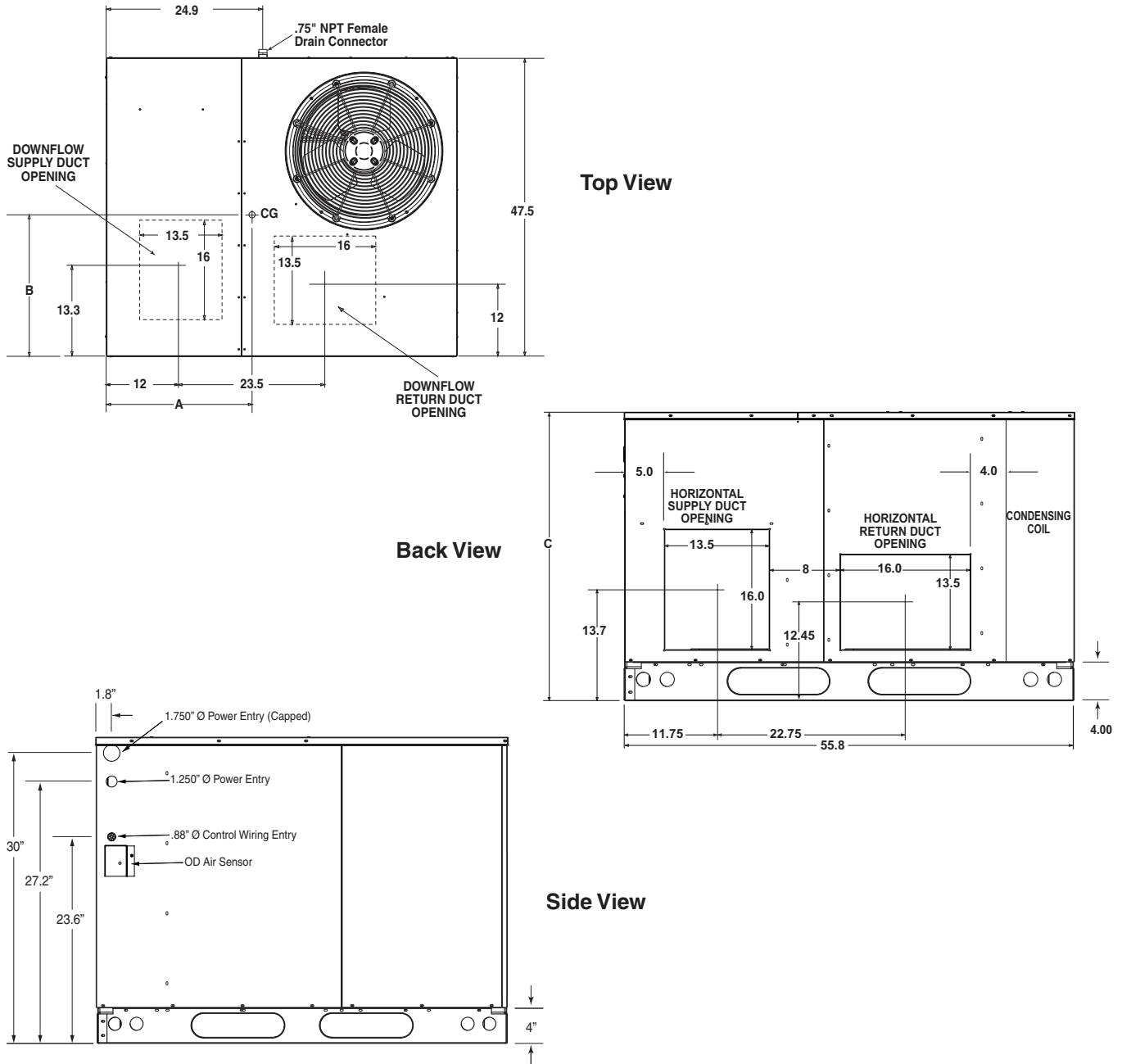


Figure 10. Q8SF Heat pump Dimensions

MODEL NUMBER Q8SF-	NET WEIGHT	SHIPPING WEIGHT	CENTER OF GRAVITY		HEIGHT -C- (IN INCHES)	
			-A-	-B-	WITH BASE RAILS	WITHOUT BASE RAILS
X24	397	419	28.0	25.5	39.0	35.3
X36	420	442	29.5	26.0	43.0	39.3
X48	534	556	29.5	26.0	43.0	39.3

Table 5. Center of Gravity & Unit Shipping Weights

## Airflow Data

MODEL	SWITCH SETTINGS 0 = OFF, 1 = ON				COOLING OR HEATING AIRFLOW (CFM)															
					0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
	1/5	2/6	3/7	4/8	CFM	TEMP RISE	CFM	TEMP RISE	CFM	TEMP RISE	CFM	TEMP RISE	CFM	TEMP RISE	CFM	TEMP RISE	CFM	TEMP RISE	CFM	TEMP RISE
X24K	0	0	0	0	840	38	745	42	655	48	590	54	520	61	430	73	345	92	320	99
	1	0	0	0	920	34	850	37	780	41	695	45	615	51	540	59	465	68	420	75
	*0	1	0	0	1025	31	960	33	890	35	800	39	710	44	645	49	575	55	535	59
	1	1	0	0	1110	28	1050	30	990	32	900	35	805	39	745	42	685	46	610	52
	0	0	1	0	1165	27	1120	28	1070	30	975	32	875	36	815	39	750	42	715	44
	1	0	1	0	1235	26	1190	27	1140	28	1070	30	995	32	905	35	820	39	800	39
	**0	1	1	0	1335	24	1285	25	1235	26	1170	27	1110	28	1010	31	910	35	850	37
	1	1	1	0	1400	23	1355	23	1310	24	1250	25	1185	27	1090	29	990	32	925	34
	0	0	0	1	1455	22	1410	22	1360	23	1295	24	1235	26	1140	28	1045	30	985	32
	1	0	0	1	1515	21	1465	22	1420	22	1355	23	1290	24	1215	26	1145	28	1055	30
	0	1	0	1	1590	20	1540	21	1490	21	1440	22	1390	23	1325	24	1260	25	1160	27
	1	1	0	1	1640	19	1593	20	1545	20	1500	21	1450	22	1385	23	1320	24	1220	26
	0	0	1	1	1690	19	1645	19	1600	20	1550	20	1500	21	1440	22	1375	23	1280	25
	1	0	1	1	1740	18	1695	19	1645	19	1600	20	1555	20	1495	21	1435	22	1360	23
	0	1	1	1	1805	18	1760	18	1710	18	1665	19	1615	20	1555	20	1500	21	1440	22
	1	1	1	1	1850	17	1800	18	1755	18	1705	19	1660	19	1610	20	1555	20	1495	21
X36K	0	0	0	0	700	45	625	51	545	58	475	67	400	79	370	85	343	92	-	-
	1	0	0	0	824	38	760	42	695	45	620	51	550	57	500	63	450	70	395	80
	0	1	0	0	1005	31	935	34	860	37	790	40	720	44	660	48	605	52	510	62
	1	1	0	0	1130	28	1055	30	975	32	905	35	835	38	775	41	710	44	605	52
	**0	0	1	0	1285	25	1230	26	1175	27	1090	29	1000	32	955	33	910	35	755	42
	*1	0	1	0	1420	22	1400	23	1375	23	1335	24	1295	24	1270	25	1250	25	900	35
	0	1	1	0	1540	21	1480	21	1420	22	1370	23	1320	24	1250	25	1180	27	1025	31
	1	1	1	0	1635	19	1585	20	1530	21	1470	21	1410	22	1350	23	1290	24	1130	28
	0	0	0	1	1750	18	1695	19	1640	19	1580	20	1520	21	1460	22	1405	22	1270	25
	1	0	0	1	1855	17	1805	18	1755	18	1700	19	1645	19	1595	20	1540	21	1400	23
	0	1	0	1	1955	16	1910	17	1860	17	1800	18	1745	18	1695	19	1640	19	1515	21
	1	1	0	1	2020	16	1973	16	1925	16	1870	17	1815	17	1770	18	1720	18	1615	20
	0	0	1	1	2100	15	2055	15	2010	16	1960	16	1905	17	1860	17	1810	17	1705	19
	1	0	1	1	2175	15	2125	15	2075	15	2025	16	1975	16	1920	16	1865	17	1760	18
	0	1	1	1	2270	14	2205	14	2140	15	2085	15	2030	16	1985	16	1945	16	1835	17
	1	1	1	1	2320	14	2265	14	2210	14	2160	15	2110	15	2060	15	2015	16	1915	16
X48K	0	0	0	0	900	35	775	41	645	49	520	61	400	79	-	-	-	-	-	-
	1	0	0	0	1010	31	895	35	785	40	670	47	555	57	-	-	-	-	-	-
	0	1	0	0	1135	28	1055	30	975	32	860	37	745	42	675	47	605	52	515	61
	1	1	0	0	1280	25	1184	27	1090	29	1000	32	910	35	830	38	750	42	610	52
	**0	0	1	0	1395	23	1325	24	1250	25	1160	27	1065	30	1000	32	935	34	780	41
	1	0	1	0	1525	21	1445	22	1365	23	1290	24	1215	26	1130	28	1045	30	915	35
	0	1	1	0	1630	19	1555	20	1480	21	1420	22	1360	23	1290	24	1215	26	1085	29
	*1	1	1	0	1725	18	1665	19	1605	20	1535	21	1470	21	1400	23	1330	24	1180	27
	0	0	0	1	1825	17	1765	18	1710	18	1650	19	1595	20	1535	21	1470	21	1345	23
	1	0	0	1	1880	17	1830	17	1780	18	1725	18	1670	19	1615	20	1555	20	1440	22
	0	1	0	1	1975	16	1920	16	1865	17	1820	17	1770	18	1725	18	1680	19	1560	20
	1	1	0	1	2065	15	2005	16	1940	16	1895	17	1845	17	1790	18	1740	18	1635	19
	0	0	1	1	2120	15	2070	15	2025	16	1970	16	1915	16	1875	17	1830	17	1730	18
	1	0	1	1	2210	14	2155	15	2095	15	2040	15	1985	16	1945	16	1905	17	1805	18
	0	1	1	1	2230	14	2190	14	2150	15	2100	15	2045	15	2000	16	1950	16	1860	17
	1	1	1	1	2355	13	2290	14	2220	14	2185	14	2145	15	2100	15	2050	15	1955	16

Compressor high and low heating and cooling airflows are the Same. Compressor low heating and cooling airflows are approx. 70% of high values.

\* Denotes factory set cooling speed

\*\* Denotes factory set electric heating speed

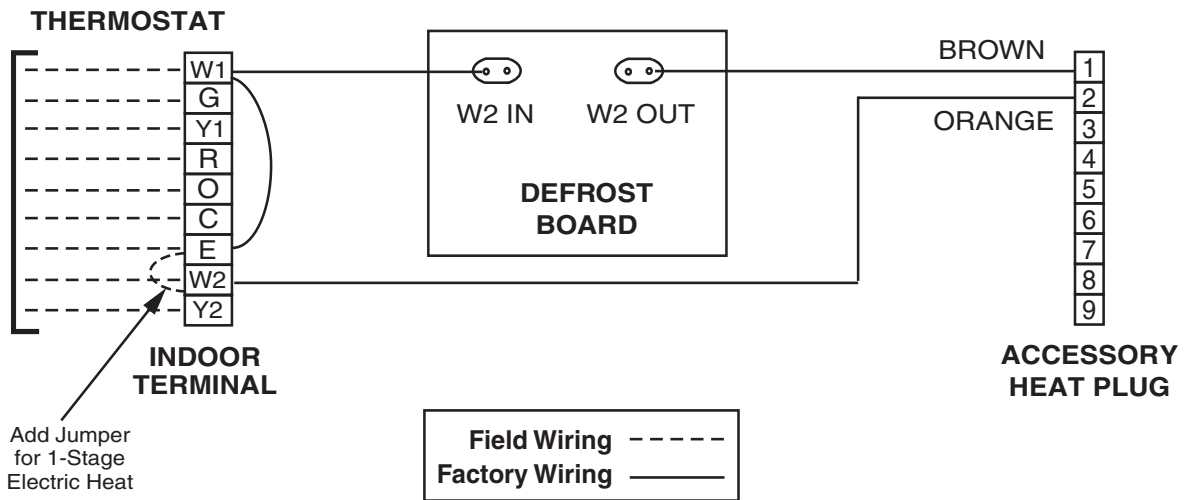
Emergency heat has only high speed settings.

Heat rise calculated based on 10KW of electric heat

**Table 6. Q8SF Airflow Data**

## Electrical Diagrams

Typical Wiring for 2-Stage HP, 1 Stage Electric Heat



Typical Wiring for 2 Stage HP, 2-Stage Electric Heat

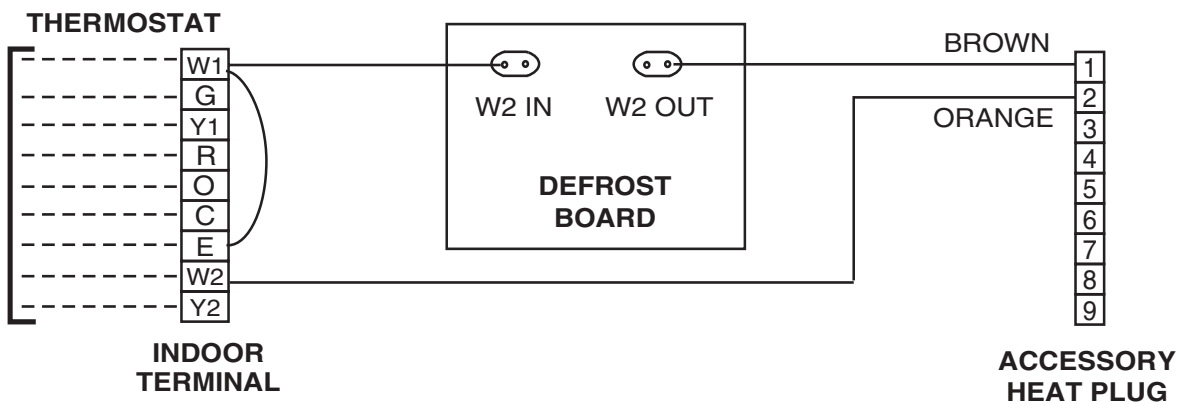


Figure 11. Typical Heat Pump Thermostat Connections

# WIRING DIAGRAM

## Large Package 2 Stage Heat Pump

## Voltage 208/230

## Single Phase 60 Hz

### NOTES:

1. Disconnect all power before servicing.
2. For supply connections use copper conductors only.
3. Not suitable on systems that exceed 150V to ground.
4. For replacement wires use conductors suitable for 105°C.
5. Thermostat connections are class 2.

1. Couper le courant avant de faire l'entretien.
2. Employez uniquement des conducteurs en cuivre.
3. Ne convient pas aux installations de plus de 150V à la terre.
4. Remplacement pour utiliser les fils conducteurs adaptés à 105°C.

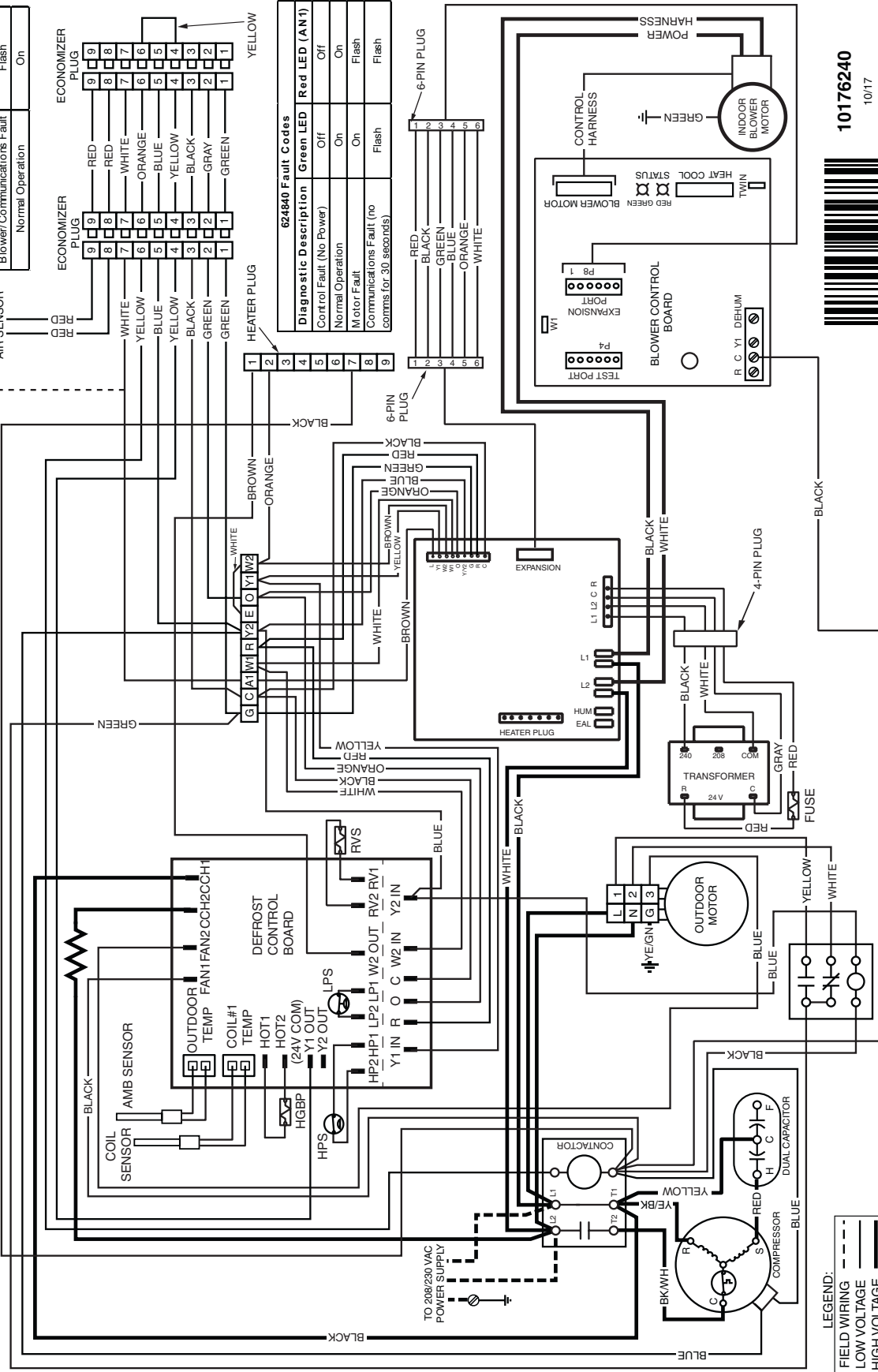
24 VDC OUTPUT TO  
A COMPATIBLE THERMOSTAT  
SEE II FOR DETAILS

TO DISCHARGE  
AIR SENSOR

624736 Fault Codes		
Diagnostic Description	Red LED (AN2)	
Control Fault (No Power)	Off	
Blower/Communications Fault	Flash	
Normal Operation	On	

ECONOMIZER PLUG		
9	RED	9
8	RED	8
7	WHITE	7
6	ORANGE	6
5	BLUE	5
4	YELLOW	4
3	BLACK	3
2	GRAY	2
1	GREEN	1

624840 Fault Codes		
Diagnostic Description	Green LED (AN1)	
Control Fault (No Power)	Off	
Normal Operation	On	
Motor Fault	On	
Communications Fault (no comms for 30 seconds)	Flash	



LEGEND:  
--- FIELD WIRING  
--- LOW VOLTAGE  
--- HIGH VOLTAGE

10176240  
10/17

Figure 12. Wiring Diagram for 208/230V Units









## INSTALLATION CHECKLIST

<b>INSTALLATION ADDRESS:</b>		
CITY _____	STATE _____	
UNIT MODEL # _____		
UNIT SERIAL # _____		
Unit Installed Minimum clearances per Figure 1 (page 4)	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

VENTING SYSTEM		
Is the vent hood installed?	YES	NO
Is vent hood free from restrictions	YES	NO
Filter(s) secured in place?	YES	NO
Filter(s) clean?	YES	NO

<b>PROPOSITION 65 WARNING:</b>
<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.

REFRIGERATION SYSTEM		
Was unit given 24 hr warm up period for crankcase heaters (if applicable)?	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		
L1-L2 Volts: _____ VOLTS		
Has the thermostat been calibrated?	YES	NO
Is the thermostat level?	YES	NO
Is the heat anticipator setting correct?	YES	NO

### REPLACEMENT PARTS

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

#### ELECTRICAL:

- Ambient Sensor
  - Capacitors
  - Coil Sensor
  - Compressors
- Contactors
  - Pressure Switches
  - Relays
  - Transformers

#### MOTORS:

- Blower Motor
- Fan Motor

#### COMPONENTS:

- Blower Assembly
  - Cabinet Panels
  - Expansion Valves
- Fan Grille
  - Filter/Driers



**IMPORTANT** - This product has been designed and manufactured to meet ENERGY STAR criteria for energy efficiency. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow the manufacturer's refrigerant charging and air flow instructions. Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.

