

INSTALLATION INSTRUCTIONS

***SH1BF4M1SP - 24K, 30K, 36K, 42K, & 48K (2, 2.5, 3, 3.5, & 4 TON), SINGLE STAGE SERIES & *SH1BF4M2SX - 60K (5 TON), 2-STAGE SERIES
SINGLE PHASE MODELS WITH MICROCHANNEL COILS**

IMPORTANT SAFETY INFORMATION	2	HEAT PUMP MAINTENANCE	8
HEAT PUMP INSTALLATION	3	Panel Removal.....	8
General Information	3	Panel Installation.....	8
Before You Install the Heat Pump.....	3	REFRIGERANT CHARGING	8
Locating the Heat Pump	3	Charging the Unit in AC Mode	9
Packaging Removal.....	3	Charging the Unit in Heating Mode.....	9
Ground Level	3	Charging Charts & Application Notes	9
Rooftop	3	Figure 8. Charging Chart for 2 Ton Models	10
Connecting Refrigerant Tubing Between the Indoor		Figure 9. Charging Chart for 2.5 Ton Models	10
& Outdoor Unit.....	4	Figure 10. Charging Chart for 3 Ton Models	11
Outdoor Orifice Removal & Installation.....	4	Figure 11. Charging Chart for 3.5 Ton Models	11
ELECTRICAL WIRING	5	Figure 12. Charging Chart for 4 Ton Models	12
Pre-Electrical Checklist.....	5	Figure 13. Charging Chart for 5 Ton Models	12
Line Voltage	5	Heat Mode Verification Tables & Application Notes	13
Grounding	5	Table 5. Verification Table for 2 Ton Models	14
Thermostat / Low Voltage Connections	6	Table 6. Verification Table for 2.5 Ton Models.....	14
Outdoor Fan Motor.....	6	Table 7. Verification Table for 3 Ton Models.....	14
Transformer Upgrade Kit.....	6	Table 8. Verification Table for 3.5 Ton Models.....	15
START UP & ADJUSTMENTS	7	Table 9. Verification Table for 4 Ton Models.....	15
Pre-Start Check List.....	7	WIRING DIAGRAMS	16
Start-Up Procedures	7	Figure 14. W.D. for 2 & 2.5 Ton Models With	
Operating Temperatures	7	PSC Motor.....	16
Air Circulation - Indoor Blower.....	7	Figure 15. W.D. for 3 Ton Models	17
Short Cycle Protection	7	Figure 16. W.D. for 3.5 & 4 Ton Models	18
System Cooling.....	7	Figure 17. W.D. for 5 Ton Models	19
System Heating.....	7	INSTALLATION CHECKLIST	20
Defrost Control Board Test Pins	7	REPLACEMENT PARTS	20

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.

WARNING:

ELECTRICAL SHOCK OR FIRE HAZARD

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

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.

WARNING:

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.

CAUTION:

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

WARNING:

The 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.
- 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.
- Installation of equipment may require brazing operations. The installer should 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.
- This unit is designed for outdoor installations only and should be positioned as shown on [page 3](#).
- Refrigerant and electrical line should be routed through suitably waterproofed openings to prevent water from leaking into the structure.
- Use caution when handling this appliance or removing components. Personal injury can occur from sharp metal edges present in all sheet metal constructed equipment.

HEAT PUMP INSTALLATION

General Information

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.

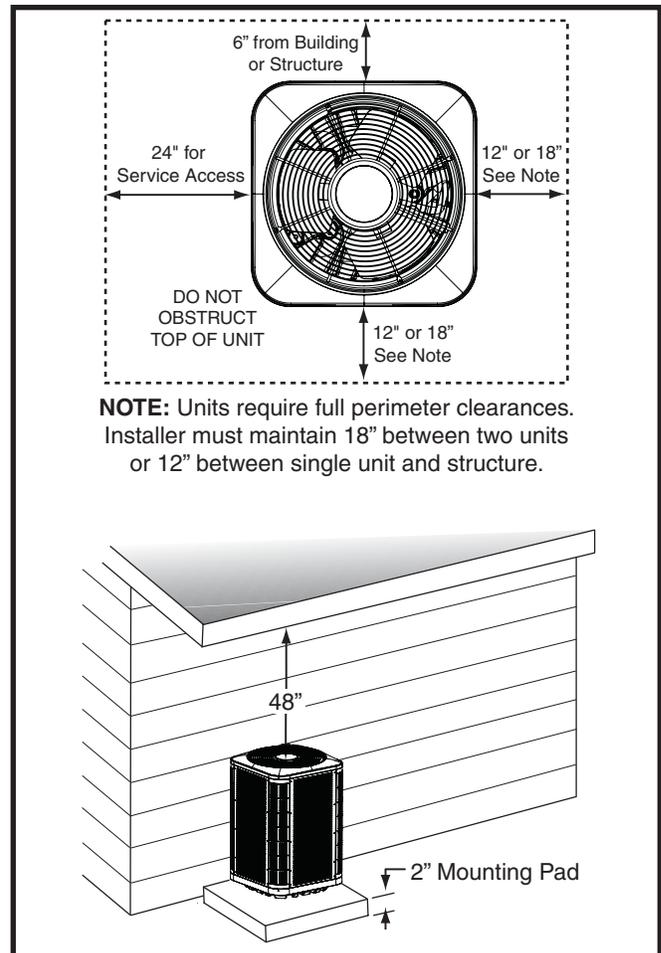
Ground Level

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.



NOTE: Units require full perimeter clearances. Installer must maintain 18" between two units or 12" between single unit and structure.

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](#).

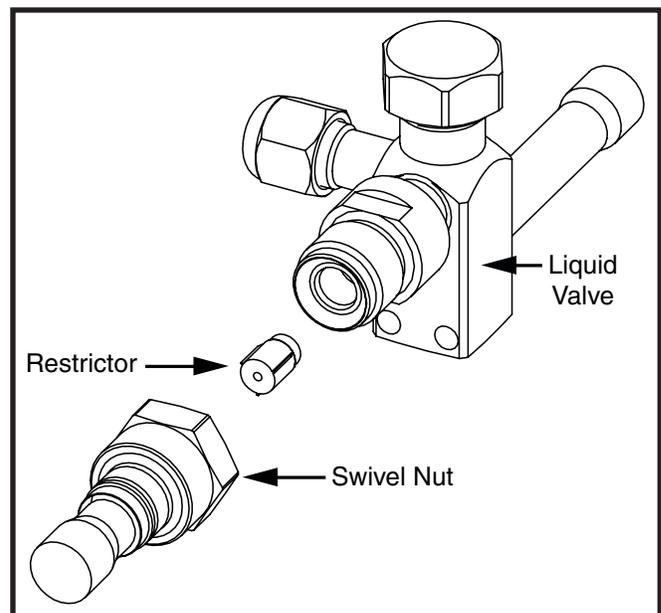


Figure 2. Liquid Valve, Restrictor, & Swivel Nut Adapter

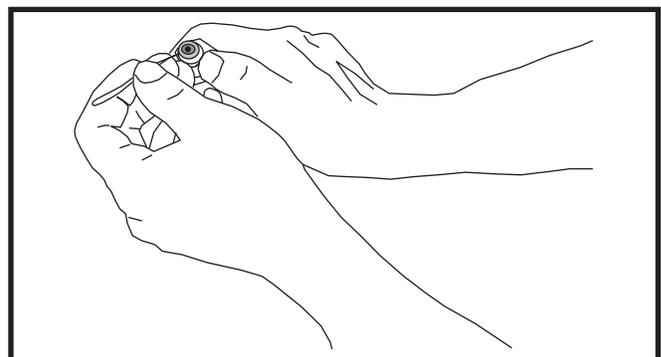


Figure 3. Removal of Orifice

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:

ELECTRICAL SHOCK OR FIRE HAZARD

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 14 \(page 16\)](#), [Figure 15 \(page 17\)](#), [Figure 16 \(page 18\)](#), & [Figure 17 \(page 19\)](#).

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 diagrams ([Figure 14](#), [Figure 15](#), [Figure 16](#), & [Figure 17](#)) 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.

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!

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

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

Table 2. Thermostat Wire

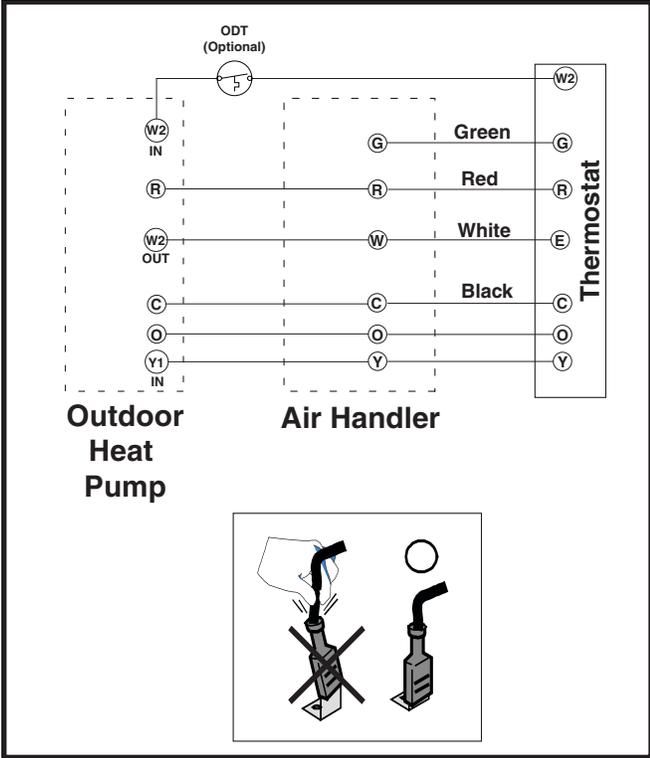


Figure 4. Thermostat Connections for SH1BF4M1SP 2 - 4 Ton Units

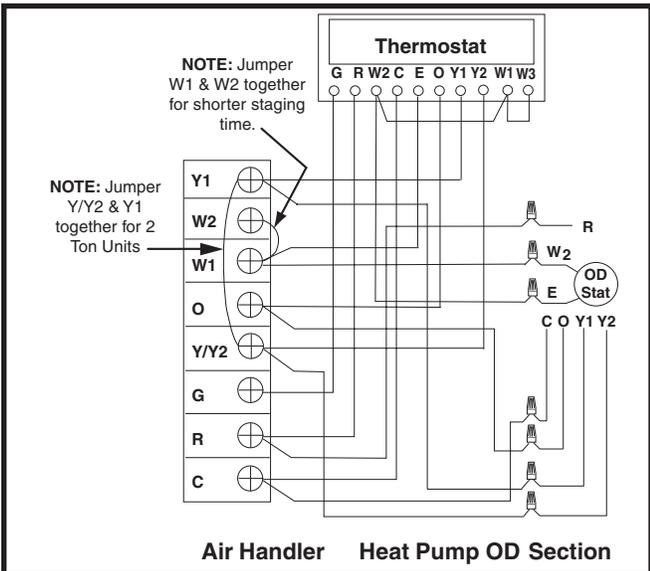


Figure 5. Thermostat Connections for SH1BF4M2SX 5-Ton Units

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. For typical installations with a heat pump thermostat and air handler see [Figure 4](#) and [Figure 5](#).
- 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 units 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.

Outdoor Fan Motor

If the unit utilizes a 2-speed condenser fan motor, this motor will operate on low speed when in low cooling, and on high speed when in high cooling. A relay within the control area switches the fan motor from low to high speed using the call for high cooling as the trigger. Other models that utilize BLDC fixed torque variable speed fan motors will not require a relay.

Transformer Upgrade Kit

If this 2-stage heat pump is installed in conjunction with a gas furnace and fossil fuel kit, the furnace transformer **MUST** be upgraded to one with a 60 VA rating or using the transformer upgrade kit (904077). To upgrade the transformer:

- Remove the existing transformer and install the new 60 VA transformer.
- Remove the 3 amp fuse on the furnace control board and install the 5 amp fuse provided.

NOTE: The new transformer may be larger than the existing transformer that is mounted in the furnace. If this happens, mount the 60 VA transformer using one of the mounting holes in the furnace panel. On the other side either drill a 0.149 hole in the panel and use the existing fastener, or use a self-drilling fastener to secure the other side of the transformer.

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

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
Q1	Fault	Pressure switch, low
Q2	Fault	Pressure switch, high
Q3	Fault	Temperature Sensor, Ambient
Q4	Fault	Temperature Sensor, Coil
Q5	Fault	Board
DF (FLASHING)	Input Error	Forced defrost - test short applied longer than 11 minutes

Table 4. Defrost Control Board Status Indicators

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.

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.

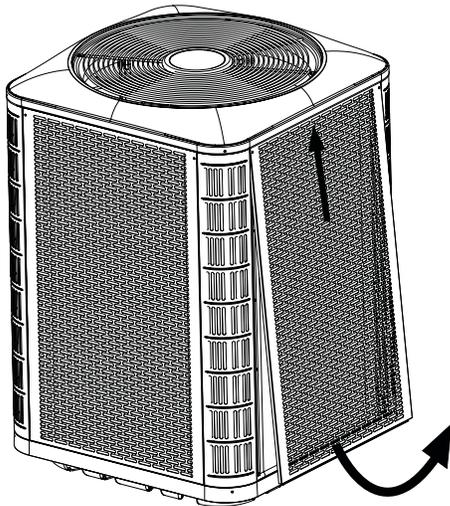


Figure 6. Panel Removal

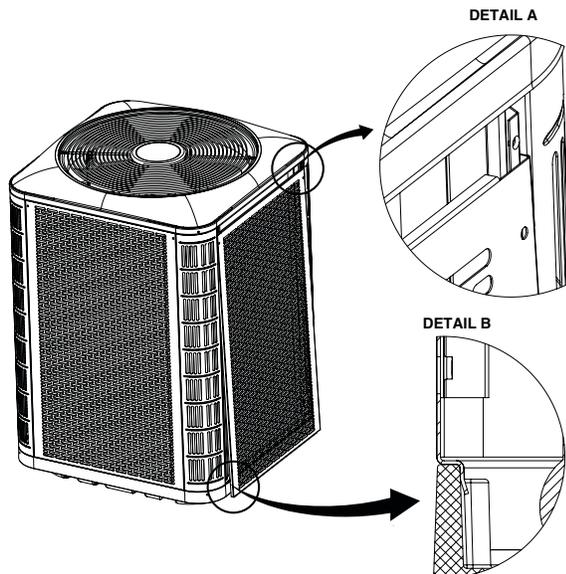


Figure 7. Panel Installation

- 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.

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 6.
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 7.
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. Install screws into the panel to secure it to the unit.

REFRIGERANT CHARGING

WARNING:

SH1BF4M1SP split system heat pumps are 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.
- The refrigerant charging charts are applicable only to matched equipment and listed airflow for the indoor coil. For systems matched with an indoor unit and a TXV, refer to Figure 8 (page 10), Figure 9 (page 10), Figure 10

(page 11), Figure 11 (page 11), Figure 12 (page 12), & Figure 13 (page 12) for correct system charging.

- **Refer to the unit's Quick Reference Data sheet to determine if additional refrigerant will need to be weighed-in to attain the base refrigerant amount for the system match that is being installed. Please note that the charge additions provided in the QRD are estimates based on test data and should only be used as a starting point. Complete the steps in the charging procedure to obtain the final system charge.**
- Use of SH1BF4M1SP 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.
- 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.
- 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 (TXV Matches)

(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 8](#), [Figure 9](#), [Figure 10](#), [Figure 11](#), [Figure 12](#), & [Figure 13](#).
 - 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.

Charging the Unit in Heating Mode

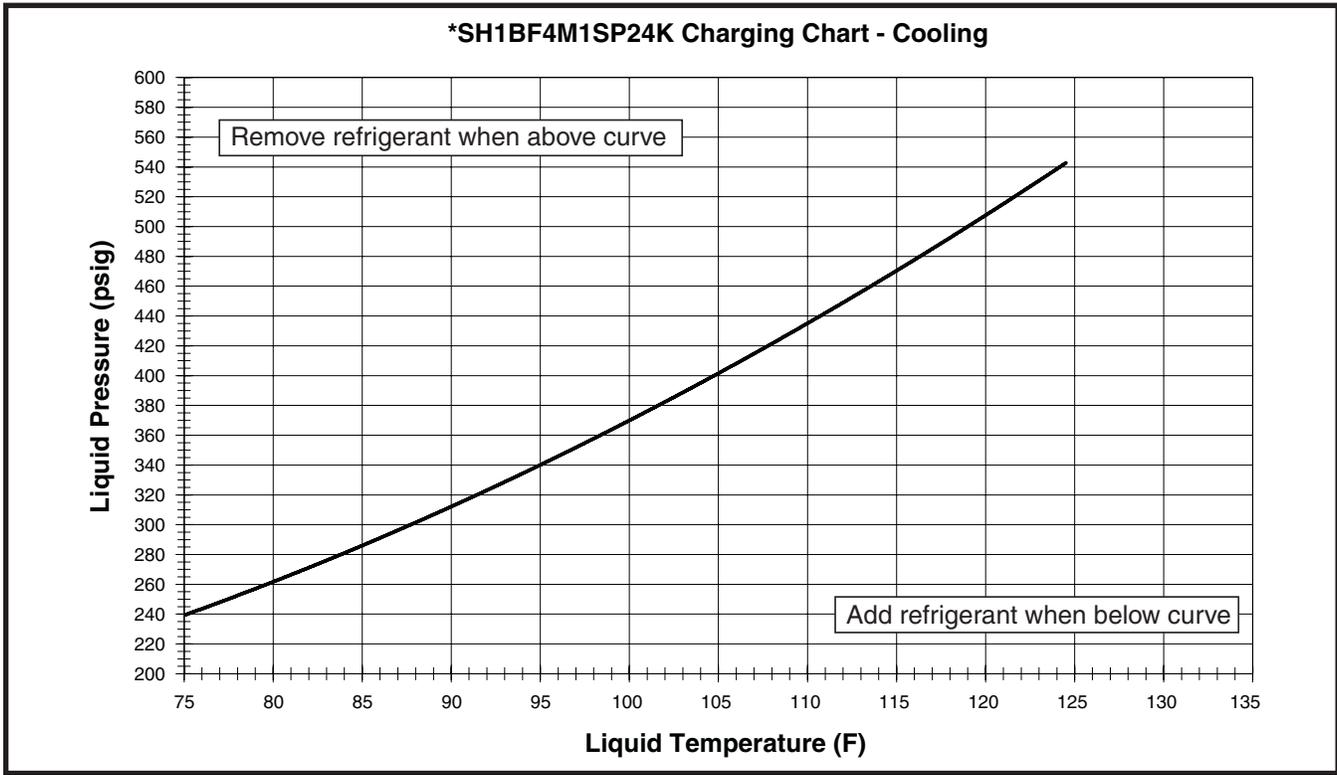
Applies to SH1BF4M2SX 5-Ton Units only

1. Evacuate the unit to 350-500 microns.
2. Weigh in the proper charge as indicated on the unit label.
NOTE: Initial charge must be verified in cooling season.
3. Verify the unit is operating properly according to the system heating section on page.

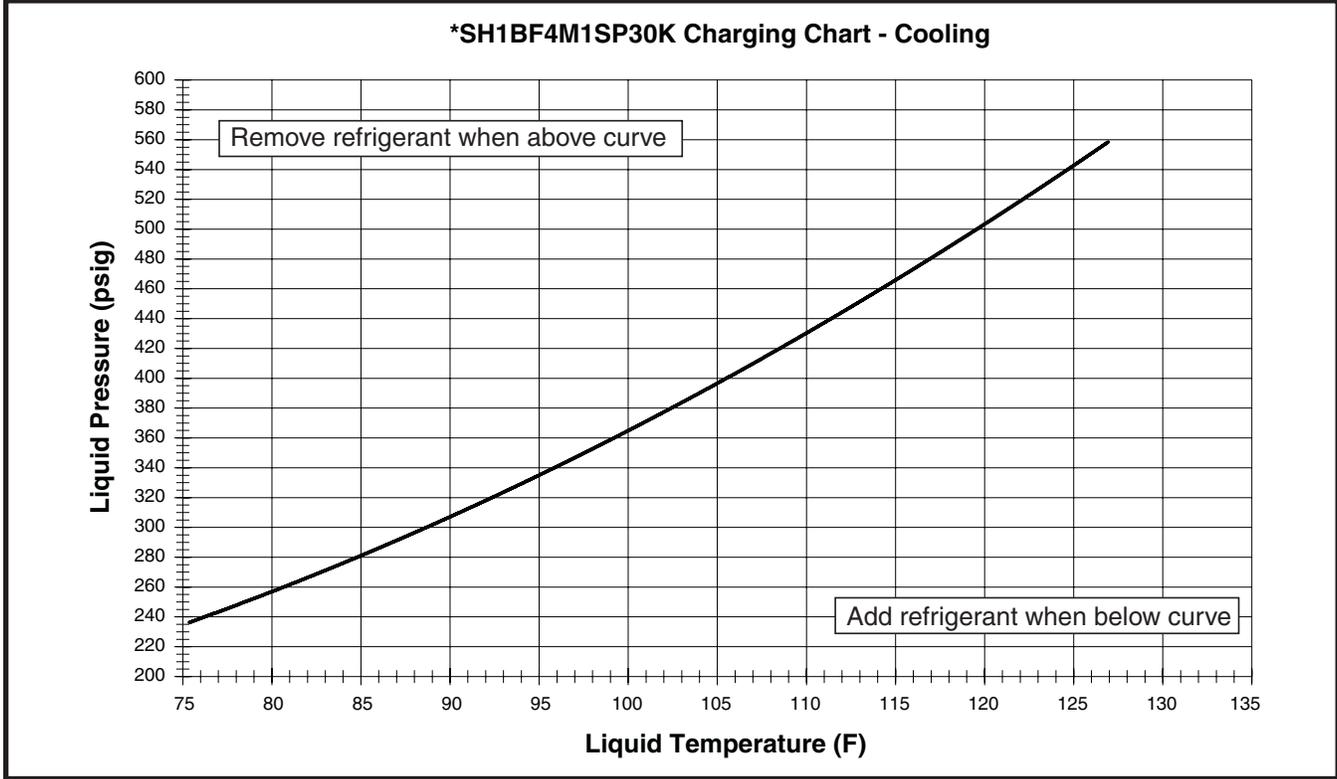
Charging Charts & Application Notes

(Cooling Mode Only)

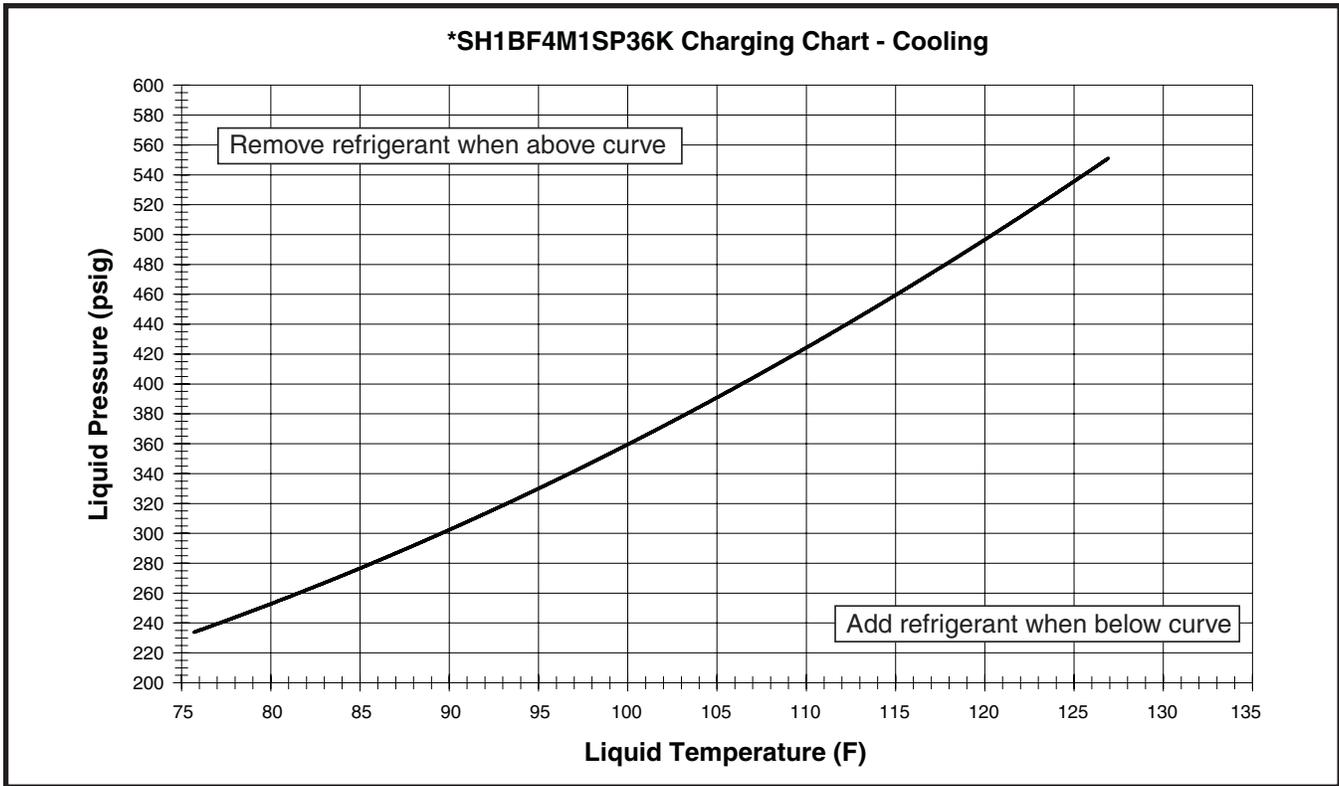
- **This unit's cooling system contains refrigerant under high pressure. Always use safe and environmentally sound methods when handling refrigerant handling or servicing the unit. Review the factory literature and safety warnings prior to servicing.**
- When repairing system leaks, always use a nitrogen (inert) gas to protect the refrigerant system and pressure check the repair before re-charging. Always replace the filter-driers 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.
- The 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 the charging charts, make sure the unit is in a stable operating mode. As shown in [Figure 9](#), [Figure 10](#), [Figure 11](#), [Figure 12](#), & [Figure 13](#), 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)



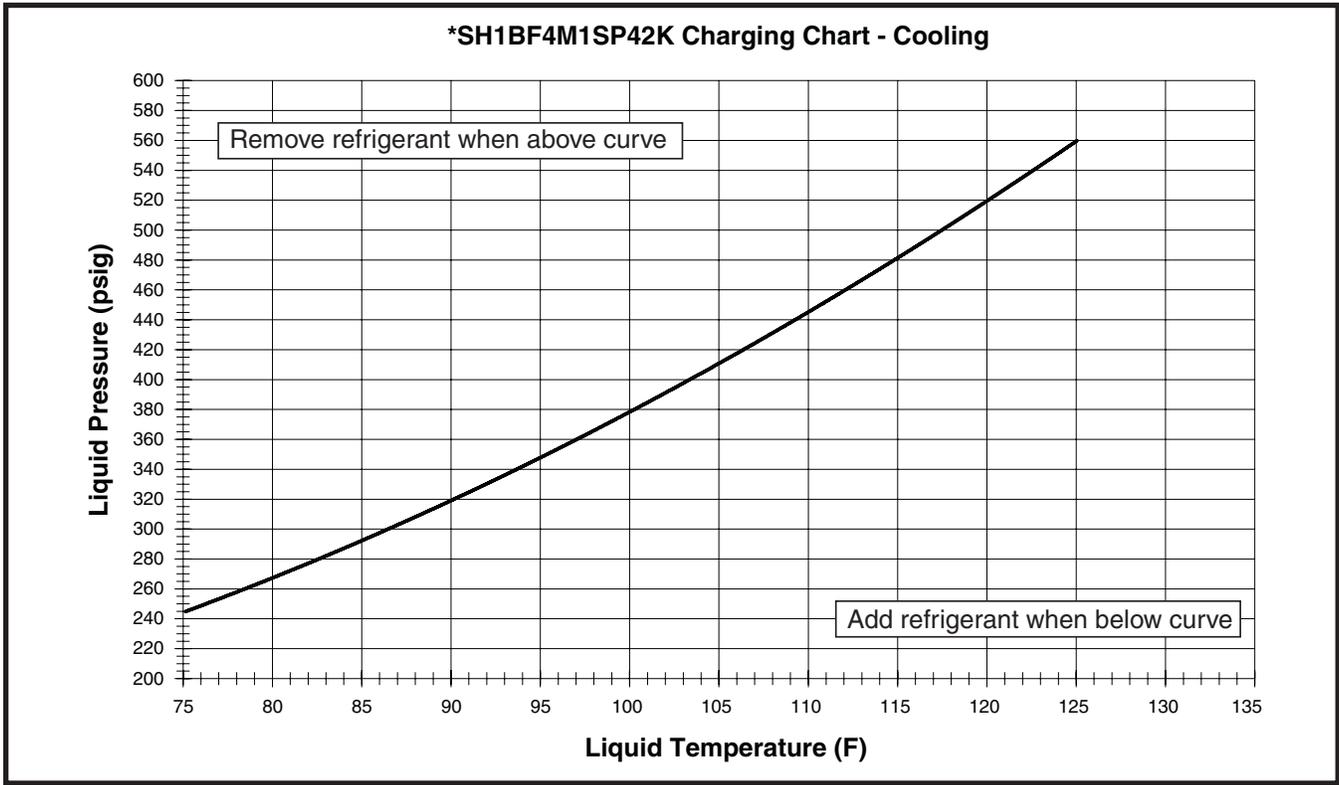
**Figure 8. Charging Chart for 2 Ton Models
(TXV Matches)**



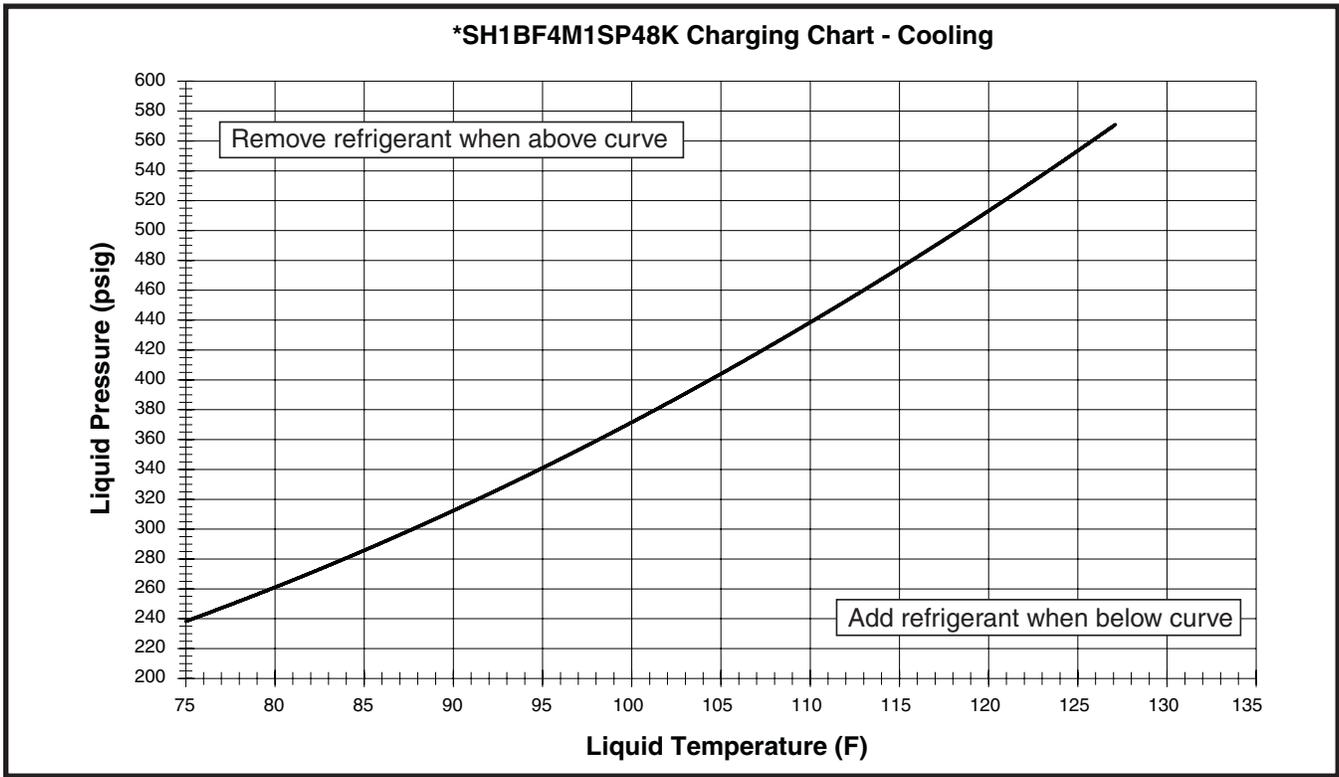
**Figure 9. Charging Chart for 2.5 Ton Models
(TXV Matches)**



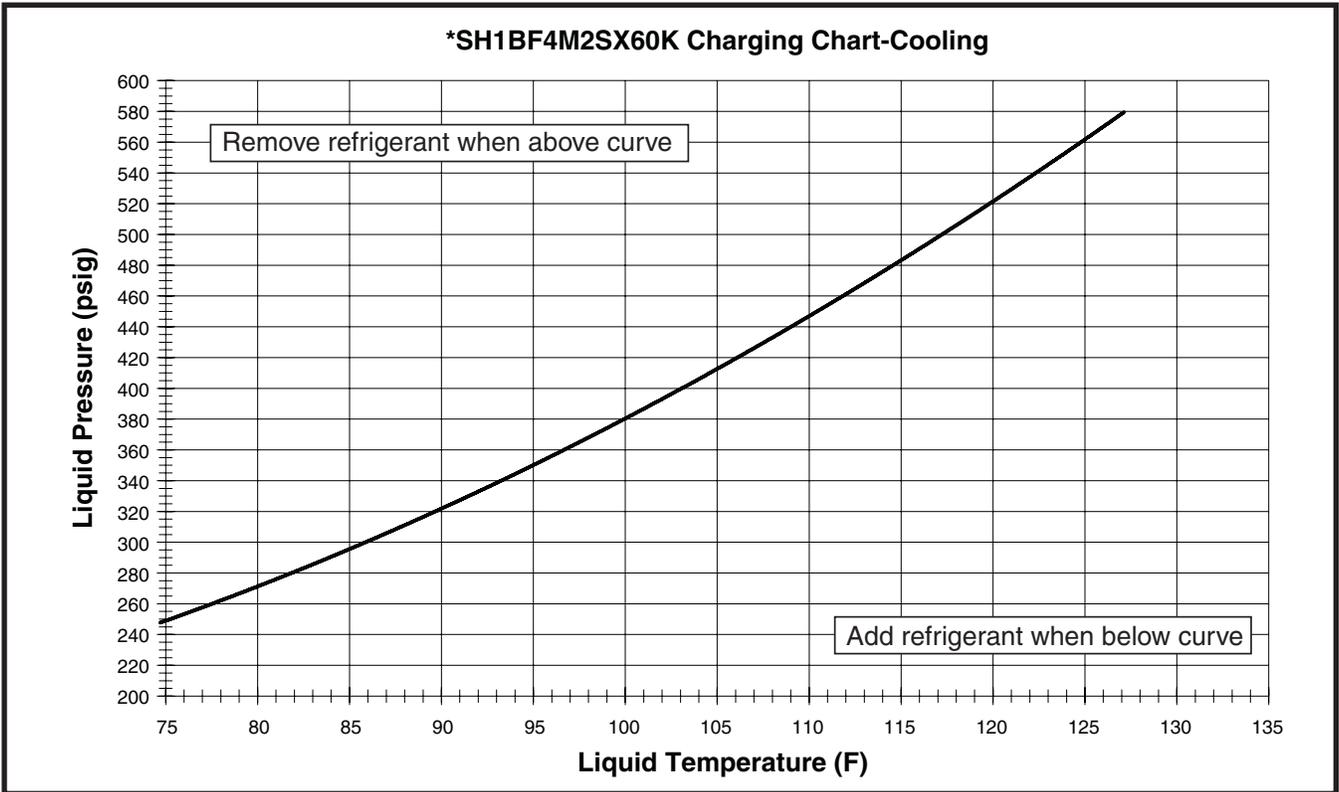
**Figure 10. Charging Chart for 3 Ton Models
(TXV Matches)**



**Figure 11. Charging Chart for 3.5 Ton Models
(TXV Matches)**



**Figure 12. Charging Chart for 4 Ton Models
(TXV Matches)**



**Figure 13. Charging Chart for 5 Ton Models
(TXV Matches)**

Heat Mode Verification Tables & Application Notes

(Heat Mode Only)

- **Read all notes and warnings for the Cooling-mode charging charts prior to using the Heating-mode charge verification tables. 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.**
- 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 5 \(page 14\)](#), [Table 6 \(page 14\)](#), [Table 7 \(page 14\)](#), [Table 8 \(page 15\)](#), & [Table 9 \(page 15\)](#).
- 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 5 \(page 14\)](#), [Table 6 \(page 14\)](#), [Table 7 \(page 14\)](#), [Table 8 \(page 15\)](#), & [Table 9 \(page 15\)](#). 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.

DO NOT 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.

LEGEND

- 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.

NOTES:

1. All pressures are listed psig and all temperatures in °F
2. Discharge temperatures GREATER than charted values indicate an UNDERCHARGED system.
3. Discharge temperatures LESS than charted values indicate an OVERCHARGED system.

OUTDOOR TEMPERATURE (DEG. F)																												
	0				10				20				30				40				50				60			
	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.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.				
37	206	212	113	51	226	231	119	66	245	250	125	80	264	270	131	96	274	280	139	113	298	304	151	131	322	327	162	
38	213	219	111	52	232	237	117	67	250	255	123	81	268	273	129	97	281	287	136	114	305	311	146	132	329	334	156	
39	220	226	109	53	238	243	115	68	255	260	121	82	272	277	127	98	288	294	134	115	312	318	142	133	336	341	150	
40	227	233	107	54	243	249	113	69	259	265	119	83	275	281	125	99	295	301	131	116	319	325	137	134	343	348	144	
41	234	240	105	55	249	255	111	70	264	270	117	84	279	284	123	100	302	308	128	117	326	332	133	135	350	355	138	
42	241	247	103	56	255	261	109	71	269	274	115	85	283	288	121	101	309	315	125	118	333	339	128	136	357	362	132	
43	248	254	101	57	261	267	107	72	274	279	113	86	286	292	119	102	316	322	122	119	340	346	124	137	364	369	125	

Table 5. Verification Table for 2 Ton Models (Orifice Matches)

OUTDOOR TEMPERATURE (DEG. F)																												
	0				10				20				30				40				50				60			
	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.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.
54	232	241	82	57	238	246	92	60	243	251	102	63	248	257	112	81	268	276	124	114	326	334	139	148	383	392	153	
55	239	248	80	58	244	252	90	61	248	256	100	64	252	260	110	82	275	283	121	115	333	341	134	149	390	399	147	
56	246	255	78	59	249	258	88	62	252	261	98	65	255	264	108	83	282	290	118	116	340	348	130	150	397	406	141	
57	253	262	76	60	255	264	86	63	257	266	96	66	259	268	106	84	289	297	116	117	347	355	125	151	404	413	135	
58	260	269	74	61	261	270	84	64	262	271	94	67	263	271	104	85	296	304	113	118	354	362	121	152	411	420	129	
59	267	276	72	62	267	276	82	65	267	275	92	68	266	275	102	86	303	311	110	119	361	369	116	153	418	427	123	
60	274	283	70	63	273	282	80	66	272	280	90	69	270	279	100	87	310	318	107	120	368	376	112	154	425	434	116	

Table 6. Verification Table for 2.5 Ton Models (Orifice Matches)

OUTDOOR TEMPERATURE (DEG. F)																												
	0				10				20				30				40				50				60			
	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.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.
34	193	199	132	48	224	230	138	62	255	261	143	76	286	292	148	91	307	313	159	106	342	348	177	121	377	383	194	
35	200	206	130	49	230	236	136	63	260	266	141	77	289	296	146	92	314	320	156	107	349	355	172	122	384	390	188	
36	207	213	128	50	236	242	134	64	264	271	139	78	293	299	144	93	321	327	154	108	356	362	168	123	391	397	182	
37	214	220	126	51	242	248	132	65	269	275	137	79	297	303	142	94	328	334	151	109	363	369	163	124	398	404	176	
38	221	227	124	52	248	254	130	66	274	280	135	80	300	307	140	95	335	341	148	110	370	376	159	125	405	411	169	
39	228	234	122	53	253	260	128	67	279	285	133	81	304	310	138	96	342	348	145	111	377	383	154	126	412	418	163	
40	235	241	120	54	259	266	126	68	283	290	131	82	308	314	136	97	349	355	142	112	384	390	150	127	419	425	157	

Table 7. Verification Table for 3 Ton Models (Orifice Matches)

LEGEND

-  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.

NOTES:

1. All pressures are listed psig and all temperatures in °F
2. Discharge temperatures GREATER than charted values indicate an UNDERCHARGED system.
3. Discharge temperatures LESS than charted values indicate an OVERCHARGED system.

OUTDOOR TEMPERATURE (DEG. F)																												
	0				10				20				30				40				50				60			
	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.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.				
35	212	223	134	49	235	245	135	64	257	267	136	78	280	290	138	94	293	303	146	111	321	331	160	128	348	359	174	
36	219	230	132	50	241	251	133	65	262	272	134	79	283	294	136	95	300	310	143	112	328	338	156	129	355	366	168	
37	226	237	130	51	247	257	131	66	267	277	132	80	287	297	134	96	307	317	140	113	335	345	151	130	362	373	162	
38	233	244	128	52	252	263	129	67	272	282	130	81	291	301	132	97	314	324	137	114	342	352	147	131	369	380	156	
39	240	251	126	53	258	269	127	68	276	287	128	82	294	305	130	98	321	331	134	115	349	359	142	132	376	387	150	
40	247	258	124	54	264	274	125	69	281	291	126	83	298	308	128	99	328	338	131	116	356	366	138	133	383	394	144	
41	254	265	122	55	270	280	123	70	286	296	124	84	302	312	126	100	335	345	129	117	363	373	133	134	390	401	137	

Table 8. Verification Table for 3.5 Ton Models (Orifice Matches)

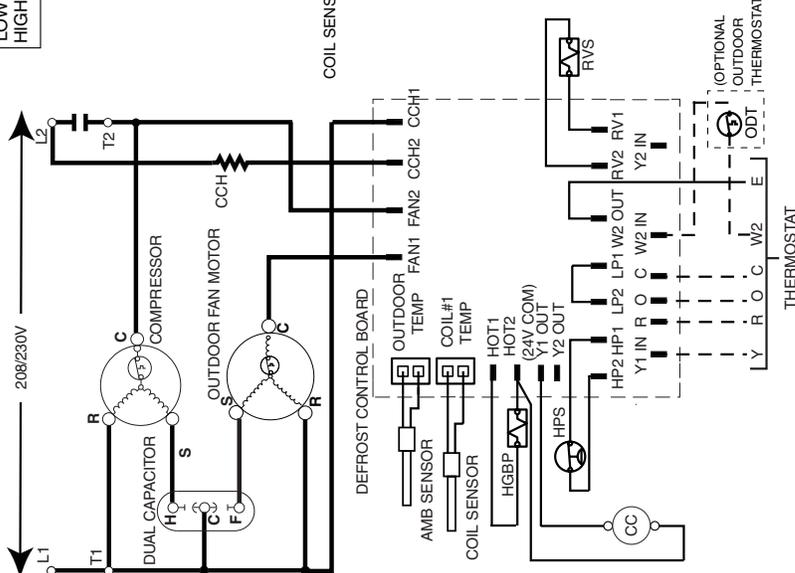
OUTDOOR TEMPERATURE (DEG. F)																												
	0				10				20				30				40				50				60			
	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.	SUC. PRESS.	LIQUID PRESS.	DISCH. PRESS.	DISCH. TEMP.				
32	203	219	121	47	229	244	125	62	255	270	129	77	280	296	133	92	294	310	141	108	321	336	153	124	347	362	164	
33	210	226	119	48	235	250	123	63	259	275	127	78	284	299	131	93	301	317	139	109	328	343	148	125	354	369	158	
34	217	233	117	49	241	256	121	64	264	280	125	79	288	303	129	94	308	324	136	110	335	350	144	126	361	376	152	
35	224	240	115	50	247	262	119	65	269	284	123	80	291	307	127	95	315	331	133	111	342	357	139	127	368	383	146	
36	231	247	113	51	252	268	117	66	274	289	121	81	295	310	125	96	322	338	130	112	349	364	135	128	375	390	140	
37	238	254	111	52	258	274	115	67	278	294	119	82	299	314	123	97	329	345	127	113	356	371	130	129	382	397	134	
38	245	261	109	53	264	280	113	68	283	299	117	83	302	318	121	98	336	352	124	114	363	378	126	130	389	404	127	

Table 9. Verification Table for 4 Ton Models (Orifice Matches)

WIRING DIAGRAM

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/40va/class 2 circuit. See furnace/air handler installation instructions for control circuit and optional relay/transformer kits.



- AMB SENSOR - Ambient Sensor
- CC - Contactor Coil
- CCH - Crankcase Heater
- HPS - High Pressure Switch
- HGBP - Hot Gas By Pass Valve
- RVS - Reversing Valve Solenoid
- * HARD START KIT (OPTIONAL)

Single Phase

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

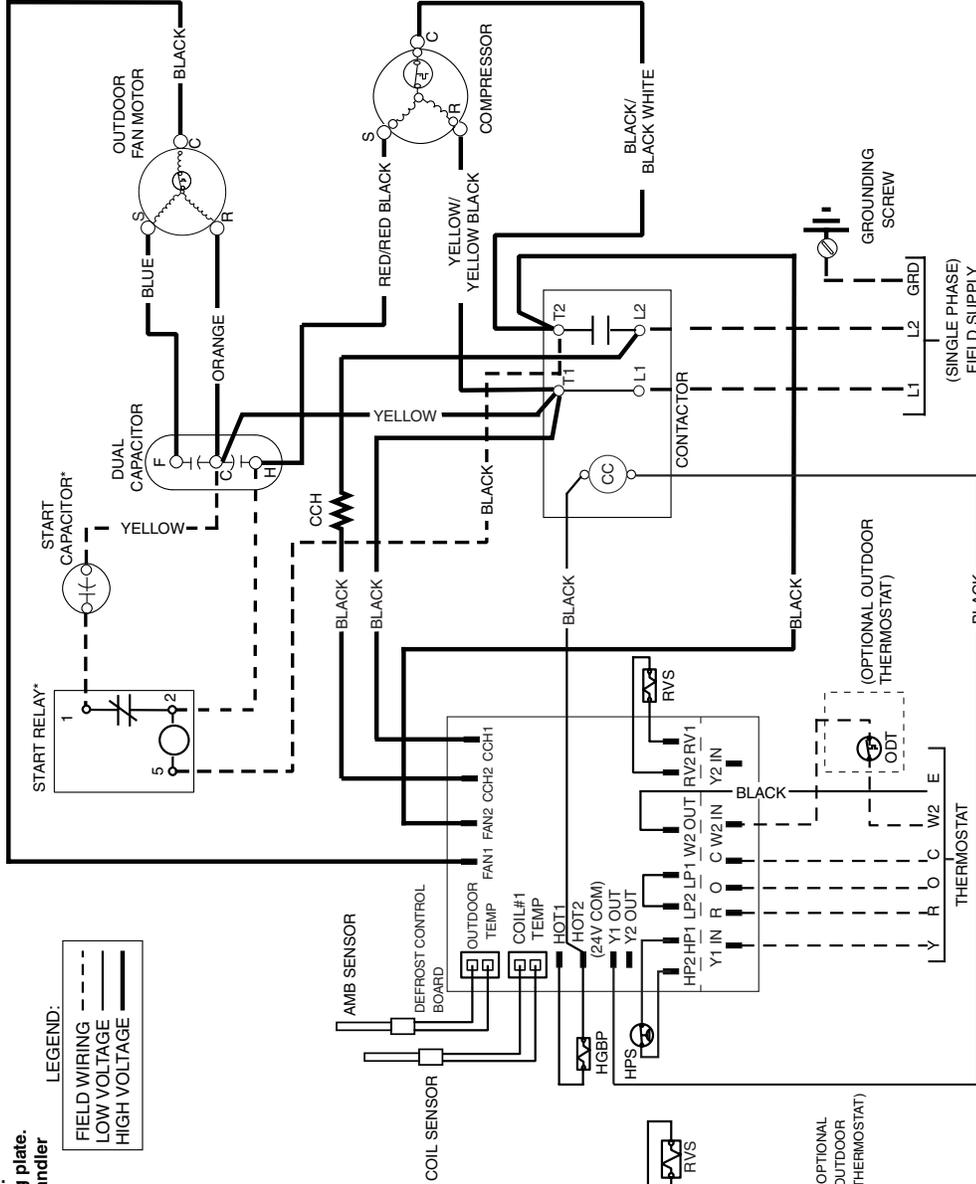


Figure 14. W.D. for 2 & 2.5 Ton Models With PSC Motor

WIRING DIAGRAM

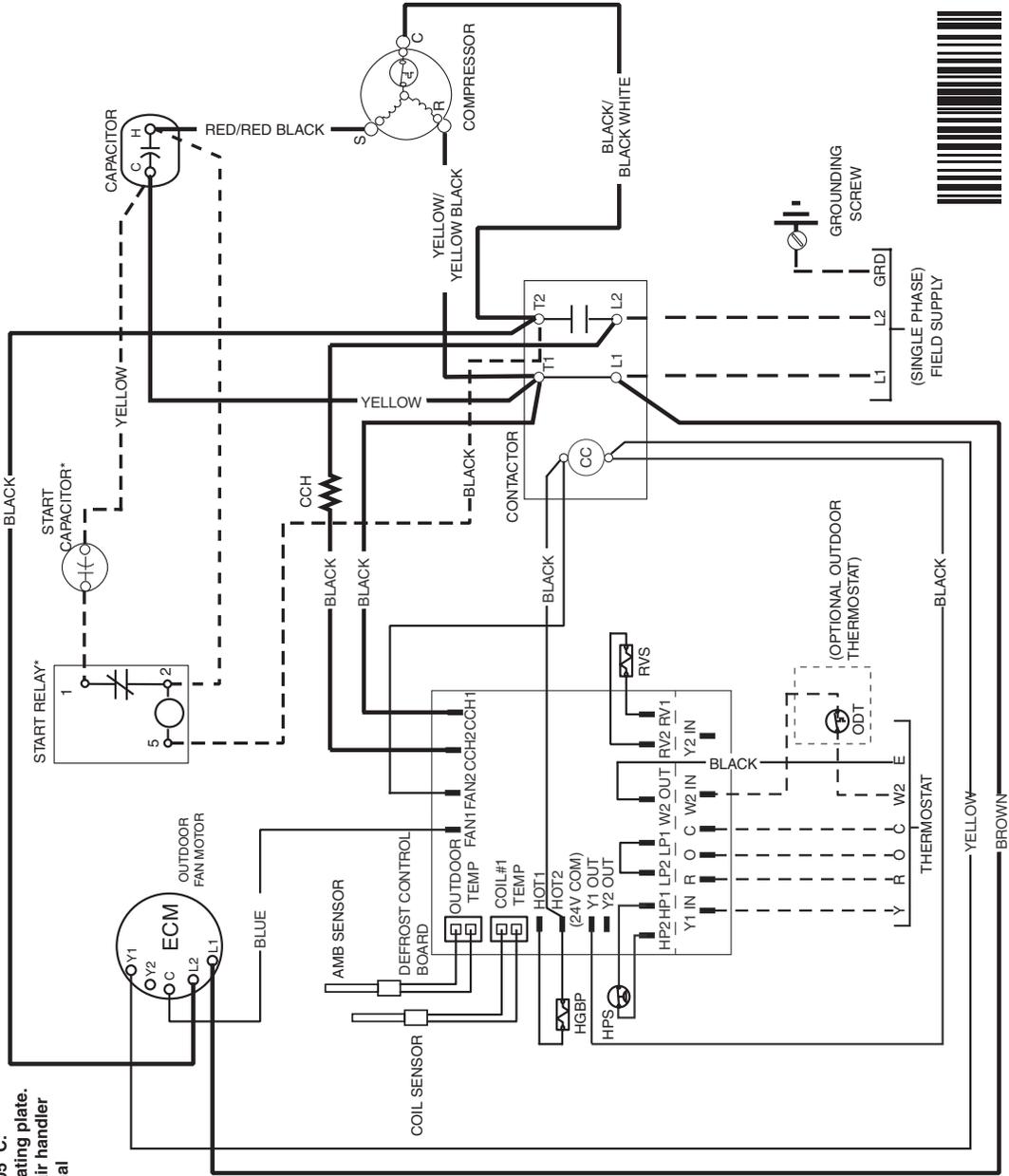
Split System Heat Pump (Outdoor Section) - Medium Speed ECM Motor

Single Phase

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/40va/class 2 circuit. See furnace/air handler installation instructions for control circuit and optional relay/transformer kits.

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 150 volt a la terre.



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

- AMB SENSOR - Ambient Sensor
- CC - Contactor Coil
- CCH - Crankcase Heater
- HPS - High Pressure Switch
- HGBP - Hot Gas By Pass Valve
- RVS - Reversing Valve Solenoid
- * HARD START KIT (OPTIONAL)



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Figure 15. W.D. for 3 Ton Models

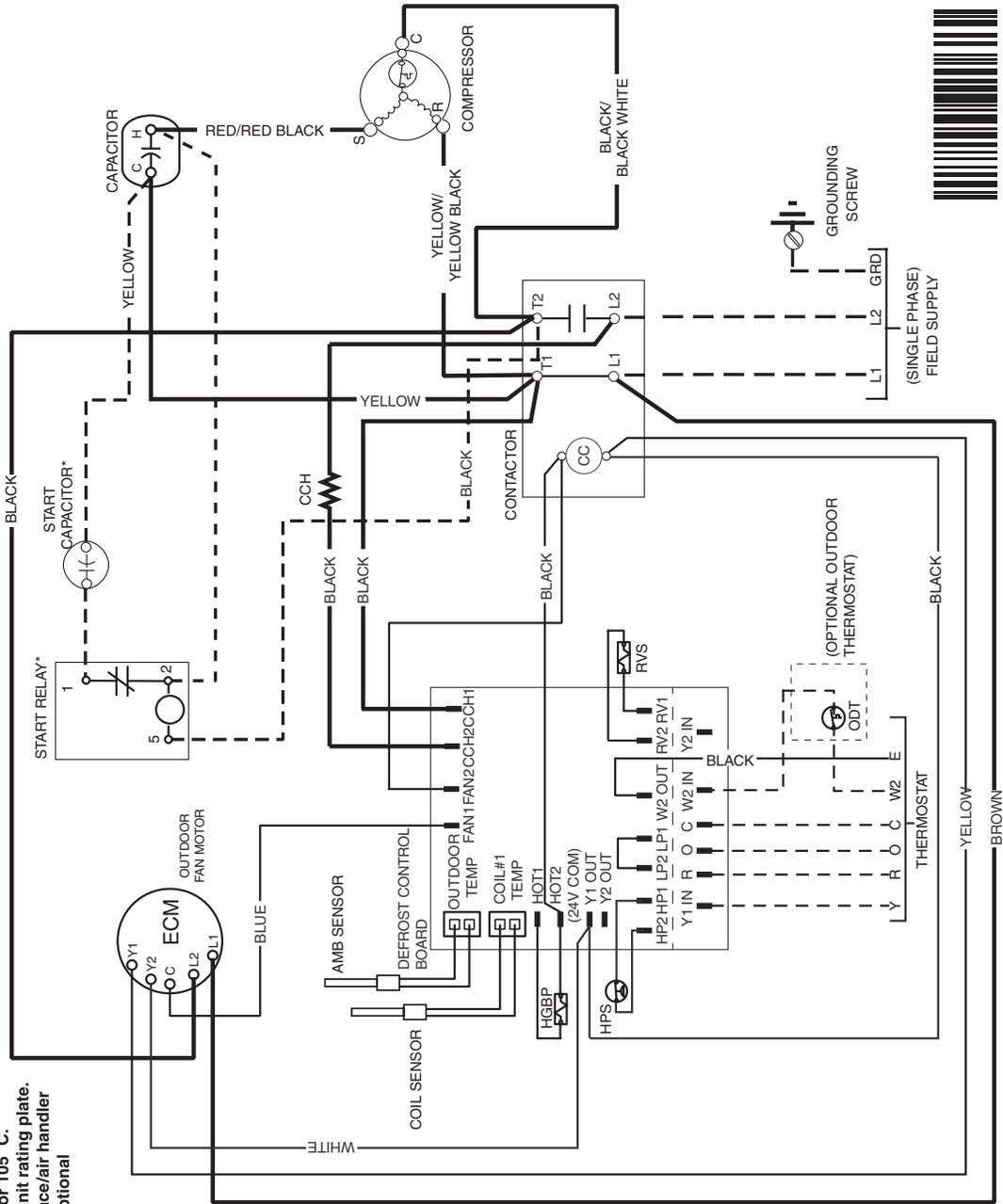
WIRING DIAGRAM

Split System Heat Pump (Outdoor Section) - High Speed ECM Motor

Single Phase

- 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/40va/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 retraitement.
2. Employez uniquement des conducteurs en cuivre.
3. Ne convient pas aux installations de plus de 150 volt a la terre.



LEGEND:

FIELD WIRING	---
LOW VOLTAGE	---
HIGH VOLTAGE	—

- AMB SENSOR - Ambient Sensor
- CC - Contactor Coil
- CCH - Crankcase Heater
- HPS - High Pressure Switch
- HGBP - Hot Gas By Pass Valve
- RVS - Reversing Valve Solenoid
- * HARD START KIT (OPTIONAL)

(SINGLE PHASE)
FIELD SUPPLY

GROUNDING
SCREW



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Figure 16. W.D. for 3.5 & 4 Ton Models

WIRING DIAGRAM

Two Stage Split System Heat Pump (Outdoor Section) With ECM Fan Motor

208/230V 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 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/40va/class 2 circuit. See furnace/airhandler installation instructions for control circuit and optional relay/transformer kits.

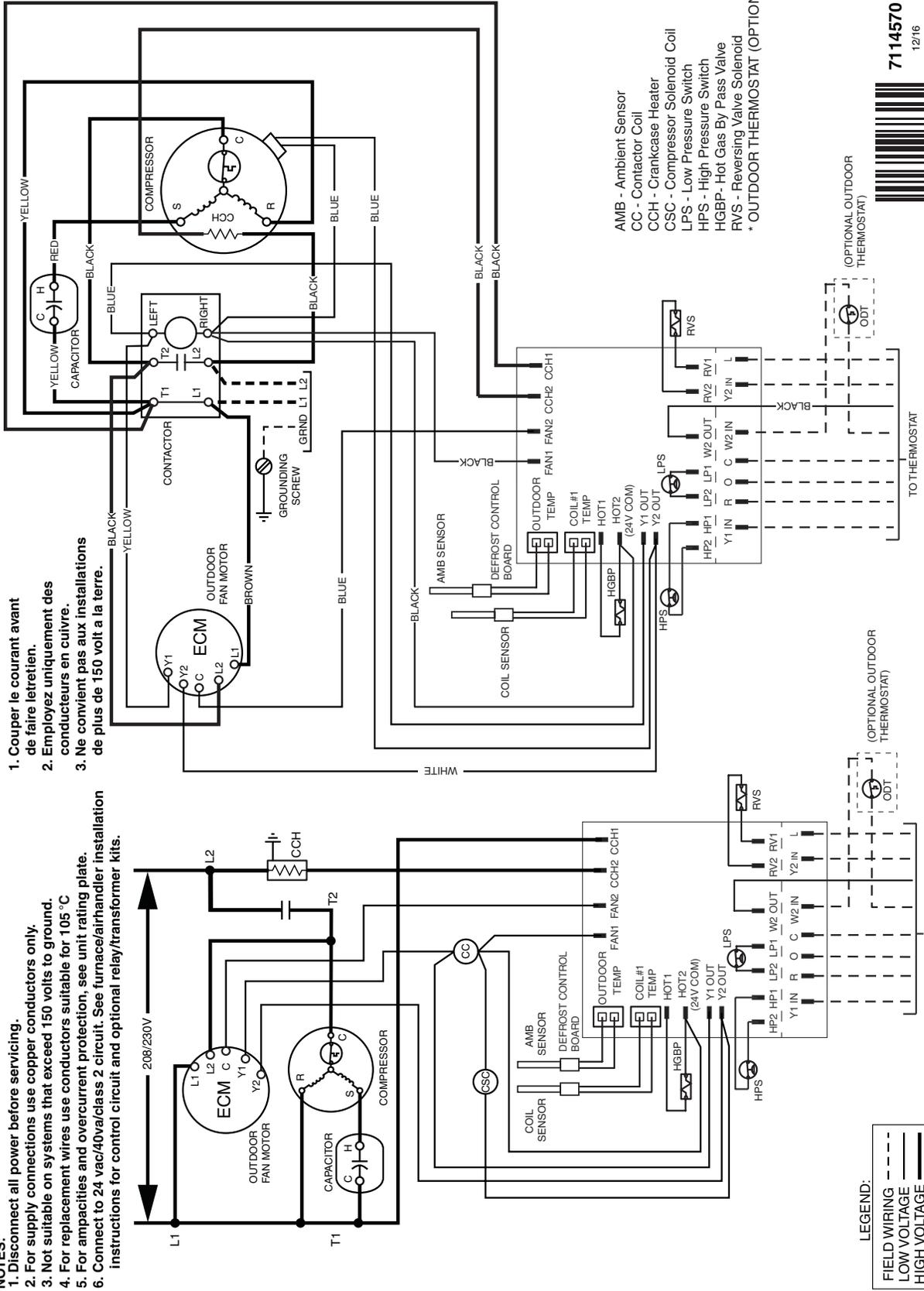


Figure 17. W.D. for 5 Ton Models

INSTALLATION CHECKLIST

INSTALLATION ADDRESS:		
CITY:	STATE:	
UNIT MODEL #		
UNIT SERIAL #		
INSTALLER NAME:		
CITY:	STATE:	
Unit installed minimum clearances shown on page 3 ?	YES	NO
Has the owner's information been reviewed with the customer?	YES	NO
Has the literature package been left with the unit?	YES	NO

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

PROPOSITION 65 WARNING:

WARNING: This product contains chemicals known to the state of California to cause cancer.

WARNING: 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.

ELECTRICAL:

- | | |
|-------------------|----------------------------|
| Capacitors | Temperature Limit Switches |
| Compressors | Thermostats |
| Contactors | Time Delay Relays |
| Pressure Switches | Transformers |
| Relays | |

MOTORS:

- Blower Motor
- Fan Motor

COMPONENTS:

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

