INSTALLATION INSTRUCTIONS

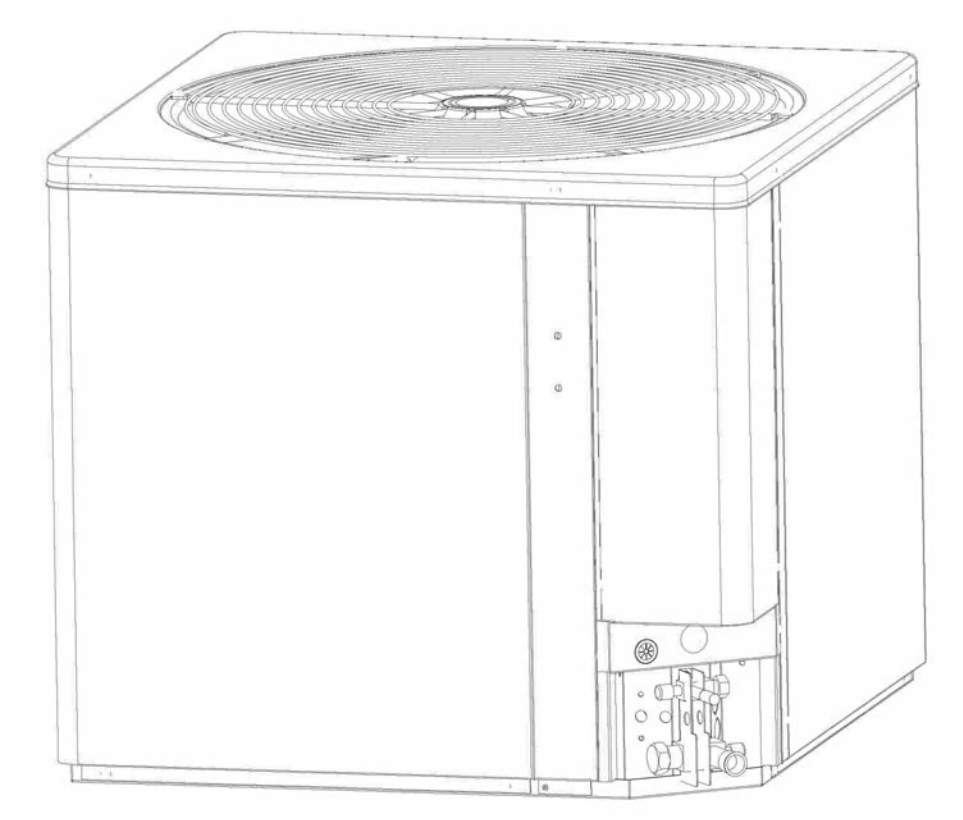
13 SEER SERIES CUBE HEAT PUMPS 1½ - 5 TONS

This product utilizes a compressor that is pre-charged with POE Oil.

This product is shipped with a nitrogen holding charge that must be vented prior to evacuation and charging and is identified by a tag on the unit shipping carton and on one of the unit service valves.

This product is only intended for heat pump change-out in existing R-22 systems with a matched indoor unit.

This product must be charged with R-22 refrigerant meeting AHRI 700 purity standard.



NOTE: AppeAr Ance of unit mAy vAr y.

RECOGNIZE THIS SYMBOL AS AN INDICATION OF IMPORTANT SAFETY INFORMATION!

⚠ WARNING

THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED, LICENSED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE OR MAINTENANCE POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

c UL us LISTED

AHRI CERTIFIED™ www.ahridirectory.org
Unitary Small HP
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

ENERGY STAR
(IN CERTAIN MATCHED SYSTEMS)

Accredited by the RvA
ABS Quality Evaluations, Inc. Management System Certification
ANAB ACCREDITED
ISO 9001:2008
Certificate Number: 30164

DO NOT DESTROY THIS MANUAL

PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE BY A SERVICEMAN

TABLE OF CONTENTS

1.0 SAFETY INFORMATION

⚠ WARNING

Disconnect all power to unit before starting maintenance. Failure to do so can cause electrical shock resulting in severe personal injury or death.

⚠ WARNING

Turn off electric power at the fuse box or service panel before making any electrical connections.

Also, the ground connection must be completed before making line voltage connections. Failure to do so can result in electrical shock, severe personal injury or death.

⚠ WARNING

These instructions are intended as an aid to qualified licensed service personnel for proper installation, adjustment and operation of this unit. Read these instructions thoroughly before attempting installation or operation. Failure to follow these instructions may result in improper installation, adjustment, service or maintenance possibly resulting in fire, electrical shock, property damage, personal injury or death.

⚠ WARNING

The unit must be permanently grounded. Failure to do so can cause electrical shock resulting in severe personal injury or death.

⚠ WARNING

The manufacturer's warranty does not cover any damage or defect to the heat pump caused by the attachment or use of any components. Accessories or devices (other than those authorized by the manufacturer) into, onto or in conjunction with the heat pump. You should be aware that the use of unauthorized components, accessories or devices may adversely affect the operation of the heat pump and may also endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized components, accessories or devices.

CAUTION

When coil is installed over a finished ceiling and/or living area, it is recommended that a secondary sheet metal condensate pan be constructed and installed under entire unit. Failure to do so can result in property damage.

CAUTION

Single-pole contactors are used on all standard single-phase units up through 5 tons. Caution must be exercised when servicing as only one leg of the power supply is broken with the contactor.

CAUTION

Dual fuel (fossil fuel) applications require the use of a high pressure control in the heat pump section. If a high pressure control was not originally provided with the heat pump section from the factory, a factory approved high pressure control kit must be purchased from the manufacturer and installed in the heat pump. Dual fuel (fossil fuel) applications in which a high pressure control is not installed in the outdoor heat pump section will void the safety approval of the product.

2.0 GENERAL

⚠ WARNING

The manufacturer's warranty does not cover any damage or defect to the heat pump caused by the attachment or use of any components. Accessories or devices (other than those authorized by the manufacturer) into, onto or in conjunction with the heat pump. You should be aware that the use of unauthorized components, accessories or devices may adversely affect the operation of the heat pump and may also endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized components, accessories or devices.

2.1 CHECKING PRODUCT RECEIVED

u pon receiving unit, inspect it for any shipping damage. c laims for damage, either apparent or concealed, should be filed immediately with the shipping company. c heck heat pump model number, electrical characteristics and accessories to determine if they are correct. c heck system components (evaporator coil, condensing unit, evaporator blower, etc.) to make sure they are properly matched.t he information contained in this manual has been prepared to assist in the proper installation, operation and maintenance of the heat pump system. improper installation, or installation not made in accordance with these instructions, can result in unsatisfactory operation and/or dangerous conditions, and can cause the related warranty not to apply.

r ead this manual and any instructions packaged with separate equipment required to make up the system prior to installation. r etain this manual for future reference.

t o achieve optimum efficiency and capacity, the indoor cooling coils listed in the heat pump specification sheet should be used.

MATCH ALL COMPONENTS:

- **OUTDOOR UNIT**
- **INDOOR COIL/METERING DEvICE**
- **INDOOR AIR HANDLER/FURNACE**
- **REFRIGERANT LINES**

2.2 APPLICATIONS

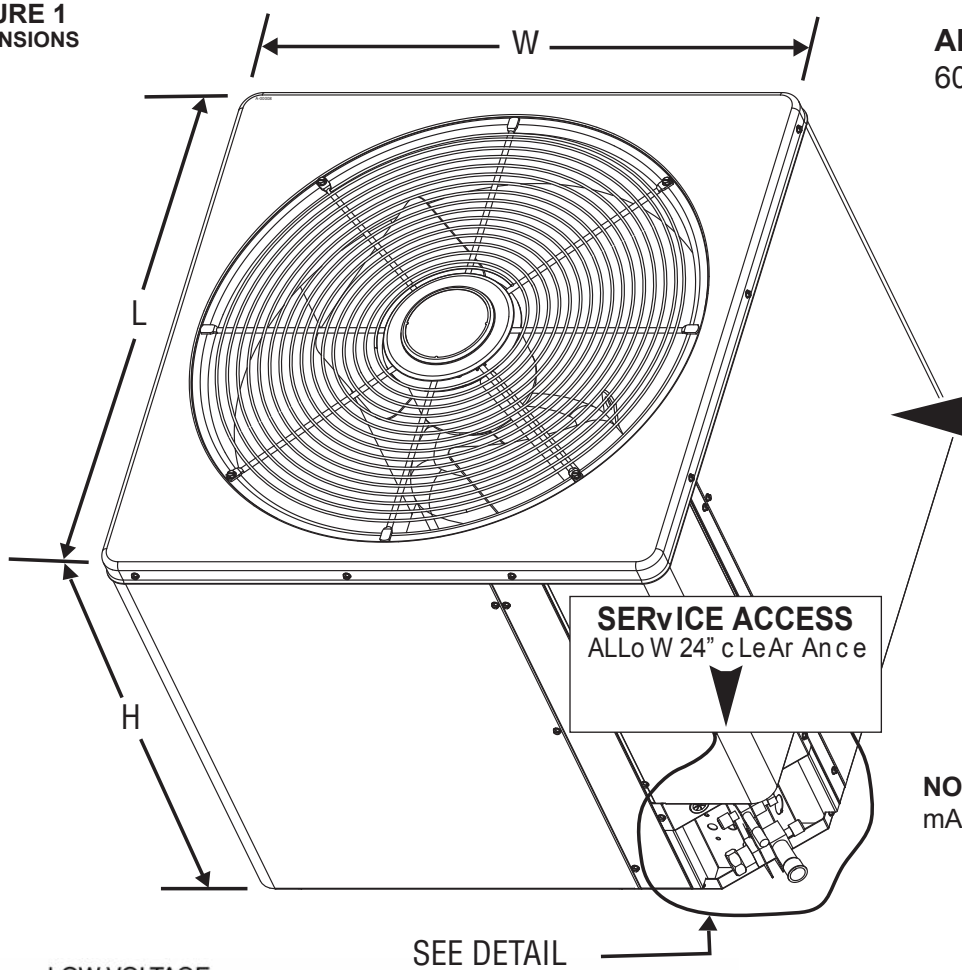
Before installing any heat pump equipment, a duct analysis of the structure and a heat gain calculation must be made. A heat gain calculation begins by measuring all external surfaces and openings that gain heat from the surrounding air and quantifying that heat gain. A heat gain calculation also calculates the extra heat load caused by sunlight and by humidity removal.

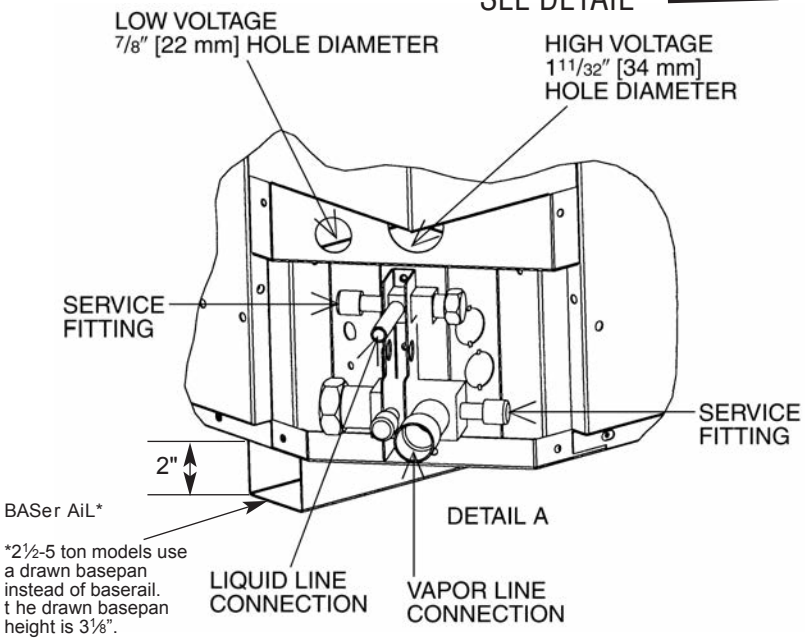
t here are several factors that the installers must consider:

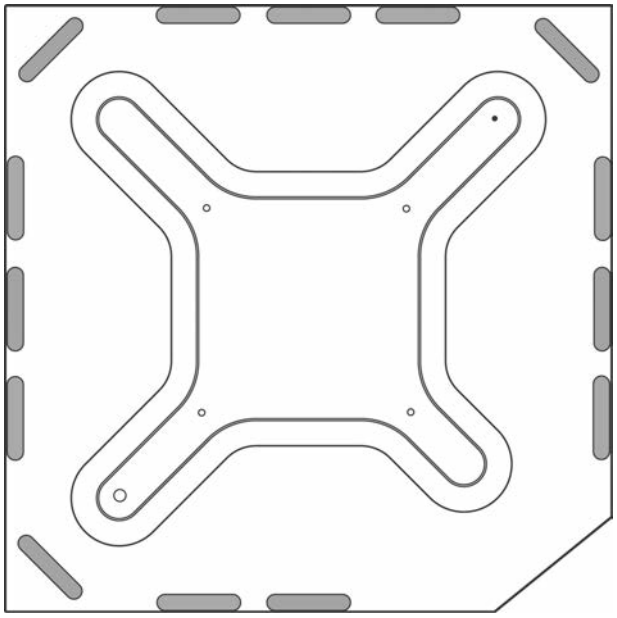
- o utdoor unit location
- System refrigerant charge
- indoor unit blower speed
- System air balancing
- p roper equipment evacuation
- indoor unit airflow
- Supply and return air duct design and sizing
- Diffuser and return air grille location and sizing

2.3 DIMENSIONS (SEE FIGURE 1)

FIGURE 1
DIMENSIONS







BASE PAN (BOTTOM vIEW)
Do not oBStr uct Dr Ain HoLeS (SHADeD).

DIMENSIONAL DATA

MODEL SIzE	18	24	30	36, 42, 48, 60
Height "H" (in.) [mm]	26 1/4 [666.7]	26 1/4 [666.7]	27 3/8 [695.3]	35 3/8 [898.5]
Length "L" (in.) [mm]	23 5/8 [600]	27 5/8 [701.6]	31 5/8 [803.2]	31 5/8 [803.2]
Width "W" (in.) [mm]	23 5/8 [600]	27 5/8 [701.6]	31 5/8 [803.2]	31 5/8 [803.2]

2.4 ELECTRICAL & PHYSICAL DATA (SEE TABLE 1)

TABLE 1
ELECTRICAL AND PHYSICAL DATA

Model Number	Electrical Data							Physical Data					
	Phase Frequency (Hz) voltage (volts)	Compressor		Fan Motor Full Load Amperes (FLA)	Minimum Circuit Ampacity Amperes	Fuse or HACR Circuit Breaker		Outdoor Coil			Refrig.* Per Circuit Oz. [g]	Weight	
		Rated Load Amperes (RLA)	Locked Rotor Amperes (LRA)			Minimum Amperes	Maximum Amperes	Face Area Sq. Ft. [m²]	No. Rows	CFM [L/s]		Net Lbs. [kg]	Shipping Lbs. [kg]
18	1-60-208/230	9/9	41	0.6	12/12	15/15	20/20	11.06 [1.03]	1	1700 [802]	81 [2296]	142 [64.4]	150 [68]
24	1-60-208/230	14.1/14.1	54	0.8	19/19	25/25	30/30	13.72 [1.27]	1	2370 [1118]	99 [2807]	180 [81.6]	190 [86.2]
30	1-60-208/230	14.6/14.6	67	0.8	20/20	25/25	30/30	16.39 [1.52]	1	2800 [1321]	115 [3260]	210 [95.3]	222 [100.7]
36	1-60-208/230	18/18	83	1.2	24/24	30/30	40/40	21.85 [2.03]	1	3575 [1687]	134 [3799]	224 [101.6]	236 [107]
42	1-60-208/230	19.2/19.2	105	1.2	26/26	35/35	40/40	21.85 [2.03]	1	3575 [1687]	150 [4252]	214 [97.1]	226 [102.5]
48	1-60-208/230	26.1/26.1	137	1.2	34/34	45/45	50/50	21.85 [2.03]	1	3575 [1687]	154 [4366]	220 [99.8]	232 [105.2]
60	1-60-208/230	25.3/25.3	150	1.2	33/33	40/40	50/50	21.85 [2.03]	2	3365 [1588]	256 [7258]	283 [128.4]	295 [133.8]

*note: units shipped with nitrogen holding charge. refrigerant quantity shown is for 15 ft. of standard line set.

3.0 LOCATING UNIT

3.1 CORROSIVE ENVIRONMENT

the metal parts of this unit may be subject to rust or deterioration if exposed to a corrosive environment. this oxidation could shorten the equipment's useful life. corrosive elements include, but are not limited to, salt spray, fog or mist in seacoast areas, sulphur or chlorine from lawn watering systems, and various chemical contaminants from industries such as paper mills and petroleum refineries.

if the unit is to be installed in an area where contaminants are likely to be a problem, special attention should be given to the equipment location and exposure.

- Avoid having lawn sprinkler heads spray directly on the unit cabinet.
- in coastal areas, locate the unit on the side of the building away from the waterfront.
- Shielding provided by a fence or shrubs may give some protection, but cannot violate minimum airflow and service access clearances.
- elevating the unit off its slab or base enough to allow air circulation will help avoid holding water against the basepan.

regular maintenance will reduce the build-up of contaminants and help to protect the unit's finish.

⚠ WARNING

Disconnect all power to unit before starting maintenance. Failure to do so can cause electrical shock resulting in severe personal injury or death.

- frequent washing of the cabinet, fan blade and coil with fresh water will remove most of the salt or other contaminants that build up on the unit.
- regular cleaning and waxing of the cabinet with an automobile polish will provide some protection.
- A liquid cleaner may be used several times a year to remove matter that will not wash off with water.

Several different types of protective coil coatings are offered in some areas. these coatings may provide some benefit, but the effectiveness of such coating materials cannot be verified by the equipment manufacturer.

3.2 HEAT PUMP LOCATION

c onsult local and national building codes and ordinances for special installation requirements. f ollowing location information will provide longer life and simplified servicing of the outdoor heat pump.

NOTE: t hese units must be installed outdoors. n o ductwork can be attached, or other modifications made, to the discharge grille. modifications will affect performance or operation.

3.3 OPERATIONAL ISSUES

- **IMPORTANT:** Locate the unit in a manner that will not prevent, impair or compromise the performance of other equipment horizontally installed in proximity to the unit. maintain all required minimum distances to gas and electric meters, dryer vents, exhaust and inlet openings. in the absence of n ational c odes, or manaufacturers' recommendations, local code recommendations and requirements will take presidence.
- r efrigerant piping and wiring should be properly sized and kept as short as possible to avoid capacity losses and increased operating costs.
- Locate the unit where water run off will not create a problem with the equipment. p osition the unit away from the drip edge of the roof whenever possible. u nits are weatherized, but can be affected by the following:
  - o Water pouring into the unit from the junction of rooflines, without protective guttering. Large volumes of water entering the heat pump while in operation can impact fan blade or motor life, and coil damage may occur to a heat pump if moisture cannot drain from the unit under freezing conditions.
  - o f reezing moisture, or sleeting conditions, can cause the cabinet to ice-over prematurely and prevent heat pump operation, requiring backup heat, which generally results in less economical operation.
- c losely follow clearance recommendations (See f igure 1).
  - o 24" to the service panel access
  - o 60" above heat pump fan discharge (unit top) to prevent recirculation
  - o 6" to heat pump coil grille air inlets (per heat pump).

3.4 FOR UNITS WITH SPACE LIMITATIONS

in the event that a space limitation exists, we will permit the following clearances:

Single Unit Applications: c learances below 6 inches will reduce unit capacity and efficiency. Do not reduce the 60-inch discharge, or the 24-inch service clearances.

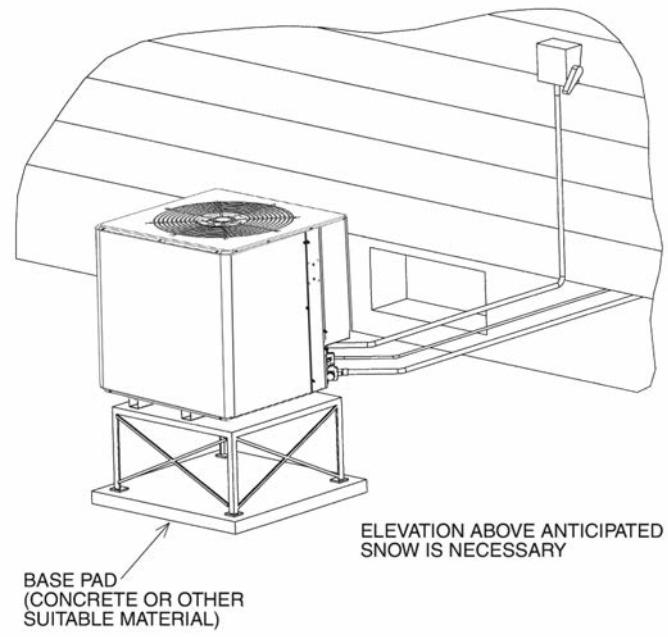
Multiple Unit Applications: When multiple heat pump grille sides are aligned, a 6-inch per unit clearance is recommended, for a total of 12" between two units. t wo combined clearances below 12 inches will reduce capacity and efficiency. Do not reduce the 60-inch discharge, or 24-inch service, clearances.

- Do not obstruct the bottom drain opening in the heat pump base pan. it is essential to provide defrost condensate drainage to prevent possible refreezing of the condensation. p rovide a base pad for mounting the unit, which is slightly pitched away from the structure. r oute condensate off the base pad to an area which will not become slippery and result in personal injury.
- Where snowfall is anticipated, the heat pump must be elevated above the base pad to prevent ice buildup that may crush the tubing of the heat pump coil or cause fin damage. Heat pump units should be mounted above the average expected accumulated snowfall for the area.

3.5 CUSTOMER SATISFACTION ISSUES

- t he heat pump should be located away from the living, sleeping and recreational spaces of the owner and those spaces on adjoining property.
- t o prevent noise transmission, the mounting pad for the outdoor unit should not be connected to the structure, and should be located sufficient distance above grade to prevent ground water from entering the unit.

FIGURE 2
RECOMMENDED ELEvATED INSTALLATION



3.6 UNIT MOUNTING

if elevating the heat pump, either on a flat roof or on a slab, observe the following guidelines.

- t he base pan provided elevates the heat pump 2” above the base pad.
- if elevating a unit on a flat roof, use 4” x 4” (or equivalent) stringers positioned to distribute unit weight evenly and prevent noise and vibration (see f igure 2).

  NOTE: Do not block drain openings shown in f igure 1.
- if unit must be elevated because of anticipated snow fall, secure unit and elevating stand such that unit and/or stand will not tip over or fall off. Keep in mind that someone may try to climb on unit.

3.7 FACTORY-PREFERRED TIE-DOWN METHOD FOR OUTDOOR UNITS:

IMPORTANT: t he manufacturer’s approved/recommended method is a guide to securing equipment for wind and seismic loads. o ther methods might provide the same rresult, but the manufacturer’s method is the only one endorsed by the manufacturer for securing equipment where wind or earthquake damage can occur. Additional information is available in the p t S (p roduct t echnical Support) section of the manufacturer’s website r heemote.net and can be found as a listing under each outdoor model. if you do not have access to this site, your Distributor can offer assistance.

4.0 REFRIGERANT CONNECTIONS

All units are factory charged with a nitrogen holding charge. All models are supplied with service valves. Keep tube ends sealed until connection is to be made to prevent system contamination.

5.0 REPLACEMENT UNITS

t o prevent failure of a new heat pump unit, the existing tubing system must be correctly sized and cleaned or replaced. c are must be exercised that the expansion device is not plugged. f or new and replacement units, a liquid line filter drier should be installed and refrigerant tubing should be properly sized. t est the oil for acid. if positive, a liquid line filter drier is mandatory.

6.0 INDOOR COIL

r ef er t o in Do o r c o iL m An u f Ac t ur er 'S in St ALLAt io n in St r uc t io n S.

imp o r t An t : t he manufacturer is not responsible for the performance and operation of a mismatched system, or for a match listed with another manufacturer's coil.

6.1 LOCATION

Do not install the indoor coil in the return duct system of a gas or oil furnace. p rovide a service inlet to the coil for inspection and cleaning. Keep the coil pitched toward the drain connection.

CAUTION

When coil is installed over a finished ceiling and/or living area, it is recommended that a secondary sheet metal condensate pan be constructed and installed under entire unit. Failure to do so can result in property damage.

7.0 INTERCONNECTING TUBING

7.1 VAPOR AND LIQUID LINES

Keep all lines sealed until connection is made.

r efer to Line Size information in t ables 2 and 4 for correct size and multipliers to be used to determine capacity for various vapor line diameters and lengths of run. t he losses due to the lines being exposed to outdoor conditions are not included.

IMPORTANT: u nits are shipped with a nitrogen holding charge. o pen service valves to vent the nitrogen before connecting the suction and liquid lines to the service valves. Lines must be connected immediately after nitrogen is vented to prevent contamination of system. Do not leave the system open to the atmosphere more than 15 minutes.

t he nameplate refrigeration charge in the outdoor unit is zero. t he charging chart for the outdoor unit is based on the unit and 15 feet of standard size interconnecting liquid and vapor lines. f or different lengths, adjust the charge as indicated below.

1/4" ± .3 oz. per foot

5/16" ± .4 oz. per foot

3/8" ± .6 oz. per foot

1/2" ± 1.2 oz. per foot

7.2 MAXIMUM LENGTH OF LINES

t he maximum length of interconnecting line is 150 feet. Always use the shortest length possible with a minimum number of bends. Additional compressor oil is not required for any length up to 150 feet.

NOTE: e xcessively long refrigerant lines cause loss of equipment capacity.

7.3 OUTDOOR UNIT INSTALLED ABOVE INDOOR COIL

Keep the vertical separation between coils to a minimum. However, the vertical distance can be as great as 120 feet with the condensing unit ABo v e the indoor coil. u se the following guidelines when installing the unit:

1. Do n o t exceed 120 feet maximum vertical separation.
2. Do n o t change the flow check piston sizes if the vertical separation does not exceed the values in t able 3.
3. e xpansion v alve c oil:
   a. t he vertical separation can be greater than the t able value, but no more than 120 feet.
   b. n o changes are required for expansion valve coils.
4. Always use the smallest liquid line size permitted to minimize the system charge.
5. t able 3 may be used for sizing horizontal runs.

7.4 OUTDOOR UNIT BELOW INDOOR COIL

Keep the vertical separation to a minimum. u se the following guidelines when installing the unit:

1. Do n o t exceed the vertical separations as indicated on t able 3.
2. Always use the smallest liquid line size permitted to minimize system charge.
3. n o changes are required for either flow check piston coils or expansions coils.
4. t able 4 may be used for sizing horizontal runs.

7.5 TUBING INSTALLATION

o bserve the following when installing correctly sized type “L” refrigerant tubing between the condensing unit and evaporator coil:

- if a portion of the liquid line passes through a hot area where liquid refrigerant can be heated to form vapor, insulating the liquid line is required.
- u se clean, dehydrated, sealed refrigeration grade tubing.
- Always keep tubing sealed until tubing is in place and connections are to be made.
- Blow out the liquid and vapor lines with dry nitrogen before connecting to the outdoor unit and indoor coil. Any debris in the line set will end up plugging the expansion device.
- As an added precaution it is recommended that a high quality, bi-directional filter drier is installed in the liquid line.
- Do not allow the vapor line and liquid line to be in contact with each other. t his causes an undesirable heat transfer resulting in capacity loss and increased power consumption. t he vapor line must be insulated.
- if tubing has been cut, make sure ends are deburred while holding in a position to prevent chips from falling into tubing. Burrs such as those caused by tubing cutters can affect performance dramatically, particularly on small liquid line sizes.
- f or best operation, keep tubing run as short as possible with a minimum number of elbows or bends.
- Locations where the tubing will be exposed to mechanical damage should be avoided. if it is necessary to use such locations, the copper tubing should be housed to prevent damage.
- if tubing is to be run underground, it must be run in a sealed watertight chase.
- u se care in routing tubing and do not kink or twist. u se a tubing bender on the vapor line to prevent kinking.
- r oute the tubing using temporary hangers, then straighten the tubing and install permanent hangers. Line must be adequately supported.

- t he vapor line must be insulated to prevent dripping (sweating) and prevent performance losses. Armaflex and r ubatex are satisfactory insulations for this purpose. u se 1/2” minimum insulation thickness, additional insulation may be required for long runs.
- c heck t able 2 for the correct vapor line size. c heck t able 3 for the correct liquid line size.

7.6 TUBING CONNECTIONS

indoor coils have only a holding charge of dry nitrogen. Keep all tube ends sealed until connections are to be made.

- u se type “L” copper refrigeration tubing. Braze the connections with accepted industry practices.
- Be certain both refrigerant shutoff valves at the outdoor unit are closed.
- c lean the inside of the fittings before brazing.
- r emove the cap and schrader core from service port to protect seals from heat damage.
- u se an appropriate heatsink material around the copper stub and the service valves before applying heat.
- **IMPORTANT:** Do not braze any fitting with the t ev sensing bulb attached.
- Braze the tubing between the outdoor unit and indoor coil. f low dry nitrogen into a service port and through the tubing while brazing.
- t he service valves are not backseating valves. t o open the valves, remove the valve cap with an adjustable wrench. insert a 3/16” or 5/16” hex wrench into the stem. Back out counterclockwise.
- r eplace the valve cap finger tight then tighten an additional 1/2 hex flat for a metal-to-metal seal.

7.7 LEAK TESTING

- p ressurize line set and coil through service fittings with dry nitrogen to 150 p SiG maximum. Leak test all joints using liquid detergent. if a leak is found, relieve pressure and repair.

TABLE 2
SUCTION LINE LENGTH AND CAPACITY MULTIPLIER

Unit Size		1 1/2 Ton	2 Ton	2 1/2 Ton	3 Ton	3 1/2 Ton	4 Ton	5 Ton
Suction Line Connection Size		3/4" I.D.	3/4" I.D.	3/4" I.D.	7/8" I.D.	7/8" I.D.	7/8" I.D.	7/8" I.D.
Suction Line Run - Feet		5/8 3/4* ---	5/8 3/4* 7/8	5/8 3/4* 7/8	3/4 7/8* ---	3/4 7/8* 1 1/8	7/8 1 1/8* ---	7/8 1 1/8* ---
	Optional	0.99	0.99	0.98	0.99	0.99	0.99	0.99
25'	Standard	1.00	1.00	1.00	1.00	1.00	1.00	1.00
....	Optional	---	1.00	1.00	---	1.00	---	---
	Optional	0.97	0.96	0.96	0.98	0.97	0.98	0.97
50'	Standard	0.99	0.99	0.98	0.99	0.98	0.99	0.99
....	Optional	---	0.99	0.99	---	1.00	---	---
	Optional	0.94	0.92	0.94	0.95	0.93	0.95	0.95
100'	Standard	0.96	0.96	0.96	0.96	0.96	0.98	0.98
....	Optional	---	0.97	0.97	---	0.98	---	---
	Optional	0.90	0.89	0.92	0.93	0.92	0.93	0.93
150'	Standard	0.93	0.93	0.93	0.94	0.94	0.96	0.96
....	Optional	---	0.95	0.95	---	0.96	---	---

NOTES:
*Standard line size
n /A: u sing suction line larger than shown in chart will result in poor oil return and is not recommended.

TABLE 3
LIQUID LINE SIzE

System Capacity	Liquid Line Connection Size (Inch I.D.)	Line Size (Inch OD)	Liquid Line Size Outdoor unit above or below indoor coil (Heat Pumps Only)					
			Total Equivalent Length - Feet					
			25	50	75	100	125	150
			Maximum Vertical Separation - Feet					
1 1/2 Ton	3/8"	1/4	21	8	N/A	N/A	N/A	N/A
		5/16	25	27	24	21	17	14
		3/8*	25	40	39	38	37	35
2 Ton	3/8"	1/4	16	N/A	N/A	N/A	N/A	N/A
		5/16	25	26	21	15	10	5
		3/8*	25	38	36	35	33	31
2 1/2 Ton	3/8"	1/4	0	N/A	N/A	N/A	N/A	N/A
		5/16	25	17	8	0	N/A	N/A
		3/8*	25	37	34	31	29	26
3 Ton	3/8"	5/16	25	15	4	N/A	N/A	N/A
		3/8*	25	30	26	23	19	16
3 1/2 Ton	3/8"	5/16	25	17	2	N/A	N/A	N/A
		3/8*	25	37	32	28	23	18
4 Ton	3/8"	3/8*	25	33	27	21	15	9
		1/2	25	43	42	40	39	38
5 Ton	3/8"	3/8*	25	25	17	8	0	N/A
		1/2	25	39	37	36	34	32

NOTES:
* Standard line size.
n /A = Application not recommended

8.0 DEMAND DEFROST CONTROL

t he demand defrost control is a printed circuit board assembly consisting of solid state control devices with electro-mechanical outputs. t he demand defrost control monitors the outdoor ambient temperature, outdoor coil temperature, and the compressor run-time to determine when a defrost cycle is required.

8.1 DEFROST INITIATION

A defrost will be initiated when the three conditions below are satisfied:

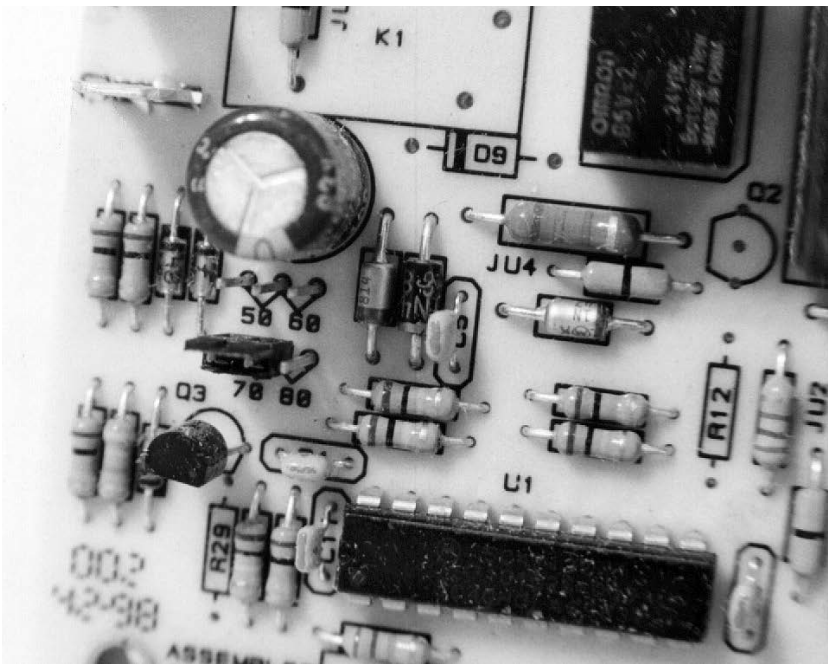
1) t he outdoor coil temperature is below 35°f .
2) t he compressor has operated for at least 34 minutes with the outdoor coil temperature below 35°f .
3) t he measured difference between the ambient temperature and the outdoor coil temperature is greater than the calculated delta t .

Additionally, a defrost will be initiated if six hours of accumulated compressor runtime has elapsed without a defrost with the outdoor coil temperature below 35°f .

8.2 DEFROST TERMINATION (See Figure 4)

o nce a defrost is initiated, the defrost will continue until fourteen minutes has elapsed or the coil temperature has reached the terminate temperature. t he terminate temperature is factory set at 70°f , although the temperature can be changed to 50°f , 60°f , 70°f or 80°f by relocating a jumper on the board.

FIGURE 4
DEFROST TERMINATION SETTINGS



8.3 TEMPERATURE SENSORS

t he coil sensor is clipped to the top tube on the outdoor coil at the point feed by the distribution tubes from the expansion device (t e v) (short 3/8” dia. tube). t he air sensor is located on the defrost control board.

if the ambient sensor fails the defrost control will initiate a defrost every 34 minutes with the coil temperature below 35°f .

if the coil sensor fails the defrost control will not initiate a defrost.

8.4 TEST MODE

t he test mode is initiated by shorting the t eSt pins. in this mode of operation, the enable temperature is ignored and all timers are sped up by a factor of 240. t o initiate a manual defrost, short the t eSt pins. r emove the short when the system switches to defrost mode. t he defrost will terminate on time (14 minutes) or when the termination temperature has been achieved. Short t eSt pins again to terminate the defrost immediately.

8.5 DEMAND DEFROST OPERATION

it is important that such systems be off for a minimum of 5 minutes before restarting to allow equalization of pressures. t he thermostat should not be moved to cycle unit without waiting five minutes. t o do so may cause the compressor to stop on an automatic opening overload device or blow a fuse. p oor electrical service can cause nuisance tripping on overloads or blow fuses. f or p Sc type operation, the refrigerant metering must be done with cap tubes, flow check, or bleed type expansion valve because of low starting torque.

IMPORTANT: t he compressor has an internal overload protector. u nder some conditions, it can take up to 2 hours for this overload to reset. make sure overload has had time to reset before condemning the compressor.

8.6 TROUBLE SHOOTING DEMAND DEFROST

Set the indoor thermostat select switch to heat and thermostat lever to a call for heat.

Jumper the “test pins” to put the unit into defrost. if the unit goes into defrost and comes back out of defrost, the indication is that the control is working properly.

if the unit did not go into defrost using the test pins, check to ensure that 24v is being supplied to the control board. if 24v is present then replace the control.

t he defrost control is equipped with a red Le D that will flash fault codes if a fault has been detected. t he codes are as follows:

LED	Trouble-shooting codes:
St eADy “o n”	n ormal o peration
1 flash	Defrost initiated
2 flashes	o utdoor c oil t emperature Sensor f ault
3 flashes	o utdoor Ambient t emperature Sensor f ault

9.0 EVACUATION PROCEDURE

e vacuation is the most important part of the entire service proceddure. t he life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air and moisture from the line set and indoor coil.

Air in the system causes high condensing temperatures and pressure, resulting in increased power input and non-verifiable performance.

moisture chemically reacts with the refrigerant and oil to form corrosive hydrofluoric and hydrochloric acids. t hese attack motor windings and parts, causing breakdown.

After the system has been leak checked and proven sealed, connect the vacuum pump and evacuate system to 500 microns. t he vacuum pump must be connected to both the high and low sides of the system through adequate connections. u se the largest size connections available since restrictive service connections may lead to false readings because of pressure drop through the fittings.

IMPORTANT: c ompressors (especially scroll type) should never be used to evacuate the air conditioning system because internal electrical arcing may result in a damaged or failed compressor.

NOTE: u nit is shipped with a nitrogen holding charge. Service valves must be opened prior to evacuation to allow condensing unit to be evacuated along with the line set and indoor coil.

10.0 START UP AND PERFORMANCE

After system evacuation, charge system with the amount shown in t able 1 on page 6, before the system is started for the first time. t he charge must then be checked to the charge table attached to the service panel and adjusted, if required. Allow a minimum of 5 minutes running. Before analyzing charge, see the instructions on the unit service panel rating plate for marking the total charge.

11.0 CHECKING AIRFLOW

t he air distribution system has the greatest effect on airflow. t he duct system is totally controlled by the contractor. f or this reason, the contractor should use only industry-recognized procedures.

Heat pump systems require a specified airflow. e ach ton of cooling requires between 350 and 450 cubic feet of air per minute (c f m), or 400 c f m nominally.

Duct design and construction should be carefully done. System performance can be lowered dramatically through bad planning or workmanship.

Air supply diffusers must be selected and located carefully. t hey must be sized and positioned to deliver treated air along the perimeter of the space. if they are too small for their intended airflow, they become noisy. if they are not located properly, they cause drafts. r eturn air grilles must be properly sized to carry air back to the blower. if they are too small, they also cause noise.

t he installers should balance the air distribution system to ensure proper quiet airflow to all rooms in the home. t his ensures a comfortable living space.

An air velocity meter or airflow hood can give a reading of the system c f m's.

12.0 CHECKING REFRIGERANT CHARGE

c harge for all systems should be checked against the c harging c hart inside the access panel cover.

IMPORTANT: Do not operate the compressor without charge in system.

Addition of r -22 will raise pressures (vapor, liquid and discharge).

if adding r -22 raises both vapor pressure and temperature, the unit is overcharged.

IMPORTANT: u se industry-approved charging methods to ensure proper system charge.

12.1 CHARGING BY LIQUID PRESSURE

t he liquid pressure method is used for charging systems in the cooling and heating mode. t he service port on the liquid (small valve) and suction (large valve) is used for this purpose.

v erify that the outdoor unit is running and the indoor air mover is delivering the maximum airflow for this system size. r ead and record the outdoor ambient temperature. r ead and record the liquid and suction pressures at the ports on the liquid and suction valves.

if refrigerant lines are sized using the nameplate charge, the correct liquid pressure is found at the intersection of the suction pressure and the outdoor ambient.

1. r emove refrigerant charge if the liquid pressure is above the chart value.
2. Add refrigerant charge if the liquid pressure is below the chart value.

12.2 CHARGING BY WEIGHT (UNITS SHIPPED WITH NITROGEN HOLDING CHARGE ONLY)

evacuate the entire system. Be sure to open both service valves prior to evacuation. Add the charge shown in table 1 of these instructions. note that charge value includes charge required for 15 ft. of standard size interconnecting liquid line. calculate actual charge required with installed liquid line size and length using:

1/4" o.D. = .3 oz./ft.
5/16" o.D. = .4 oz./ft.
3/8" o.D. = .6 oz./ft.
1/2" o.D. = 1.2 oz./ft.

With an accurate scale (+/– 1 oz.) or volumetric charging device, adjust charge difference between that shown on the unit data plate and that calculated for the new system installation. if the entire system has been evacuated, add the total calculated charge.

12.3 FINAL LEAK TESTING

After the unit has been properly evacuated and charged, a halogen leak detector should be used to detect leaks in the system. All piping within the condensing unit, evaporator, and interconnecting tubing should be checked for leaks. if a leak is detected, the refrigerant should be recovered before repairing the leak. the clean Air Act prohibits releasing refrigerant into the atmosphere.

13.0 ELECTRICAL WIRING

⚠ WARNING

Turn off electric power at the fuse box or service panel before making any electrical connections.

Also, the ground connection must be completed before making line voltage connections. Failure to do so can result in electrical shock, severe personal injury or death.

field wiring must comply with the national electric code (c.e.c. in canada) and any applicable local code.

13.1 POWER WIRING

it is important that proper electrical power from a commercial utility is available at the heat pump contactor. voltage ranges for operation are shown in table 6.

install a branch circuit disconnect within sight of the unit and of adequate size to handle the starting current (see table 1).

power wiring must be run in a rain-tight conduit. conduit must be run through the connector panel below the access cover (see figure 1) and attached to the bottom of the control box.

connect power wiring to contactor located in outdoor heat pump electrical box. (See wiring diagram attached to unit access panel.)

check all electrical connections, including factory wiring within the unit and make sure all connections are tight.

Do not connect aluminum field wire to the contactor terminals.

13.2 GROUNDING

A grounding lug is provided near the contactor for a ground wire.

⚠ WARNING

The unit must be permanently grounded. Failure to do so can cause electrical shock resulting in severe personal injury or death.

TABLE 4
VOLTAGE RANGES (60 Hz)

Nameplate Voltage	Operating Voltage Range at Copeland Maximum Load Design Conditions for Compressors
208/230 (1 Phase)	197 - 253

13.3 CONTROL WIRING

(See Figure 5)

If the low voltage control wiring is run in conduit with the power supply, Class I insulation is required. Class II insulation is required if run separate. Low voltage wiring may be run through the insulated bushing provided in the 7/8 hole in the base panel, up to and attached to the pigtails from the bottom of the control box. Conduit can be run to the base panel if desired by removing the insulated bushing.

A thermostat and a 24 volt, 40 VA minimum transformer are required for the control circuit of the condensing unit. The furnace or the air handler transformer may be used if sufficient. See the wiring diagram for reference. Use Table 5 to size the 24 volt control wiring.

FIGURE 5
CONTROL WIRING FOR AIR HANDLER

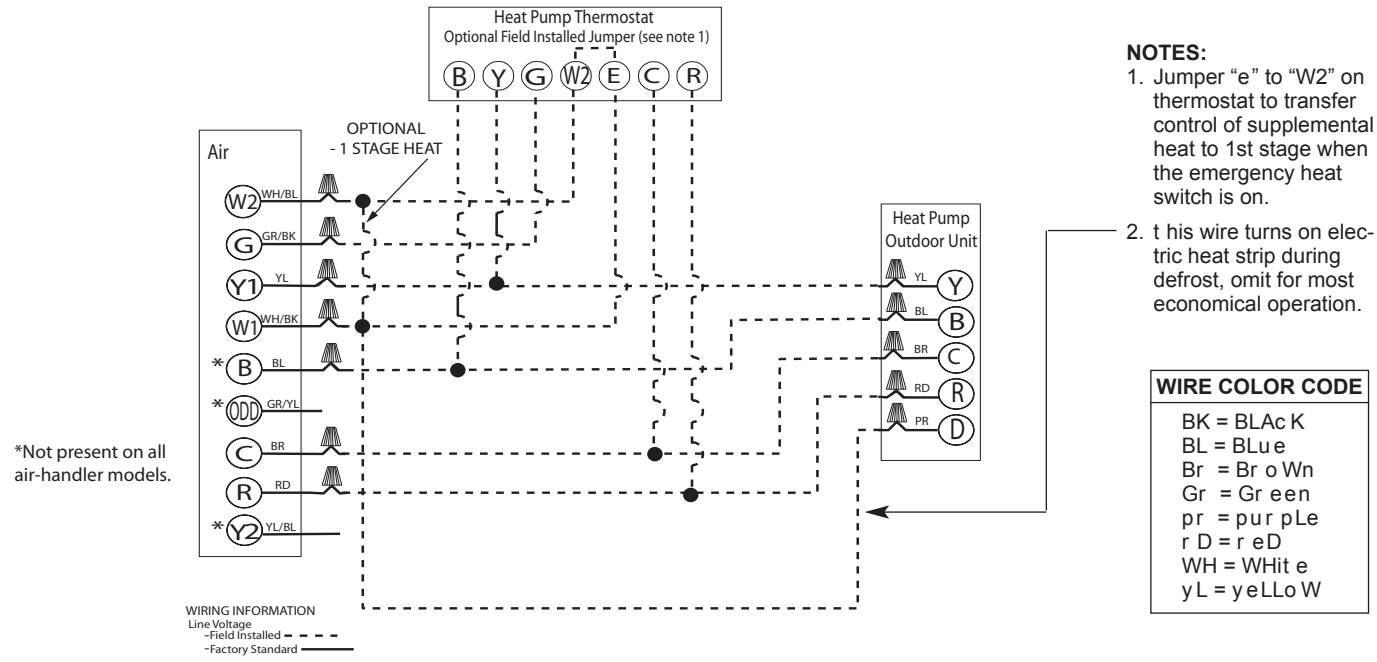


TABLE 5
FIELD WIRE SIZE FOR 24 VOLT THERMOSTAT CIRCUITS

Thermostat Load - Amps	SOLID COPPER WIRE - AWG.					
3.0	16	14	12	10	10	10
2.5	16	14	12	12	10	10
2.0	18	16	14	12	12	10
	50	100	150	200	250	300
	Length of Run - Feet (1)					

(1) Wire length equals twice the run distance.

NOTE: Do not use control wiring smaller than No. 18 AWG between thermostat and outdoor unit.

14.0 FIELD INSTALLED ACCESSORIES

14.1 COMPRESSOR CRANKCASE HEATER (CCH)

While scroll compressors usually do not require crankcase heaters, there are instances when a heater should be added. r efrigerant migration during the off cycle can result in a noisy start up. Add a crankcase heater to minimize refrigeration migration, and to help eliminate any start up noise or bearing “wash out.”

TABLE 6
MAXIMUM SYSTEM CHARGE vALUES

Model Size*	Compressor Manufacturer	Compressor Model Number	Charge Limit Without Crankcase Heat*
42	Danfoss	Hr m038u 1Lp6	8 lbs.
48	Danfoss	Hr m045u 1Lp6	8 lbs.

***All other models come with the crankcase heater factory-installed.**

NOTE: t he installation of a crankcase heater is recommended if the system charge exceeds the values in t able 6.

All heaters are located on the lower half of the compressor shell. its purpose is to drive refrigerant from the compressor shell during long off cycles, thus preventing damage to the compressor during start-up.

At initial start-up or after extended shutdown periods, make sure the heater is energized for at least 12 hours before the compressor is started. (Disconnect switch on and wall thermostat off.)

14.2 LOW AMBIENT CONTROL (LAC) – COOLING MODE ONLY

t his component senses compressor head pressure and shuts the heat pump fan off when the head pressure drops to approximately 175 pSiG. t his allows the unit to build a sufficient head pressure at lower ambient in order to maintain system balance and obtain improved capacity. Low ambient control should be used on all equipment operated below 65°f ambient.

14.3 HIGH PRESSURE CONTROL (HPC)

t his control keeps the compressor from operating in pressure ranges which can cause damage to the compressor. t his control is in the low voltage control circuit.

High pressure control (Hpc) is a manual reset which opens near 450 pSiG. Do not reset arbitrarily without first determining what caused it to trip.

15.0 SERVICE

15.1 SINGLE-POLE COMPRESSOR CONTACTOR (CC)

CAUTION

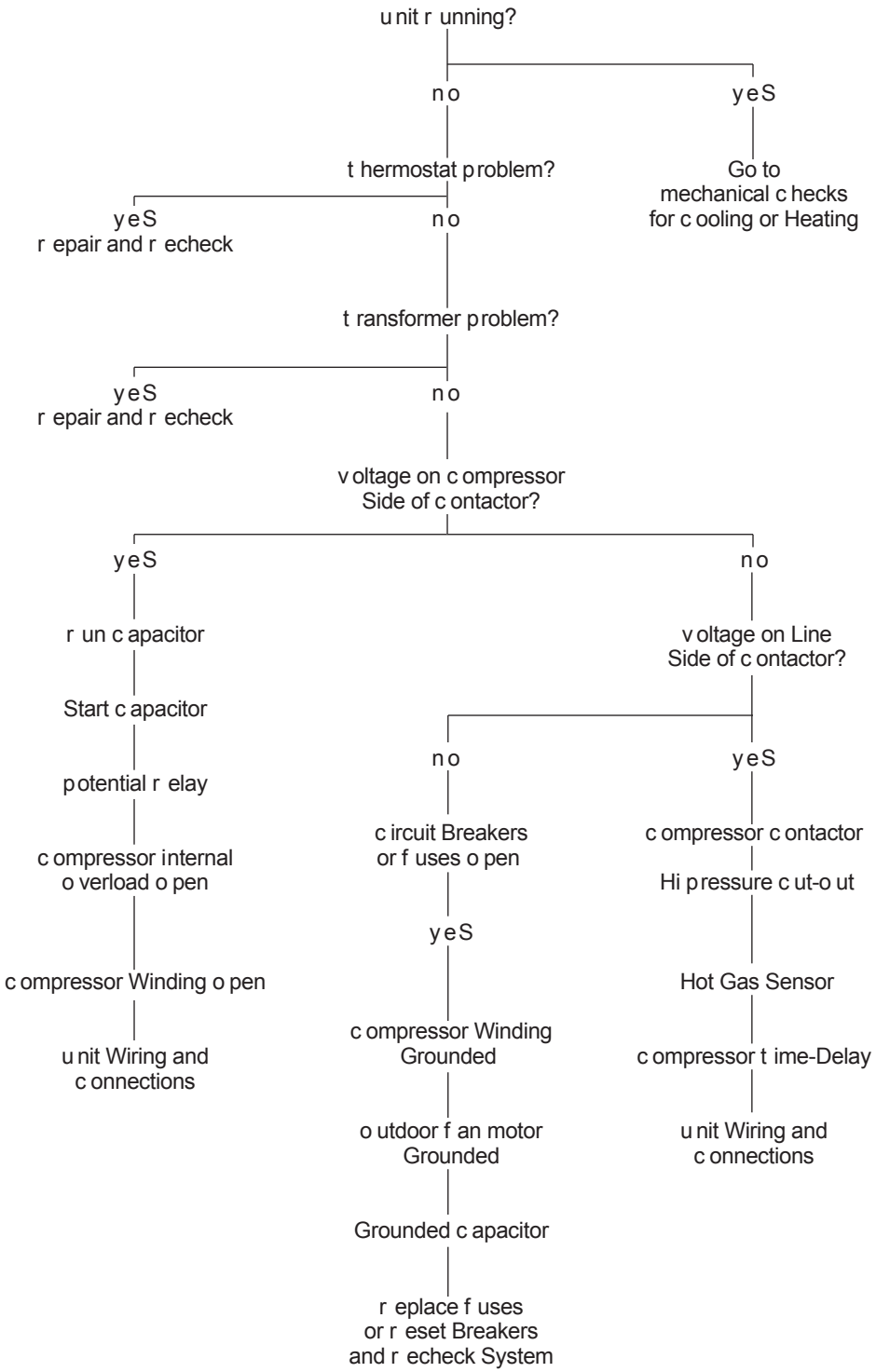
Single-pole contactors are used on all standard single-phase units up through 5 tons. Caution must be exercised when servicing as only one leg of the power supply is broken with the contactor.

16.0 TROUBLE SHOOTING

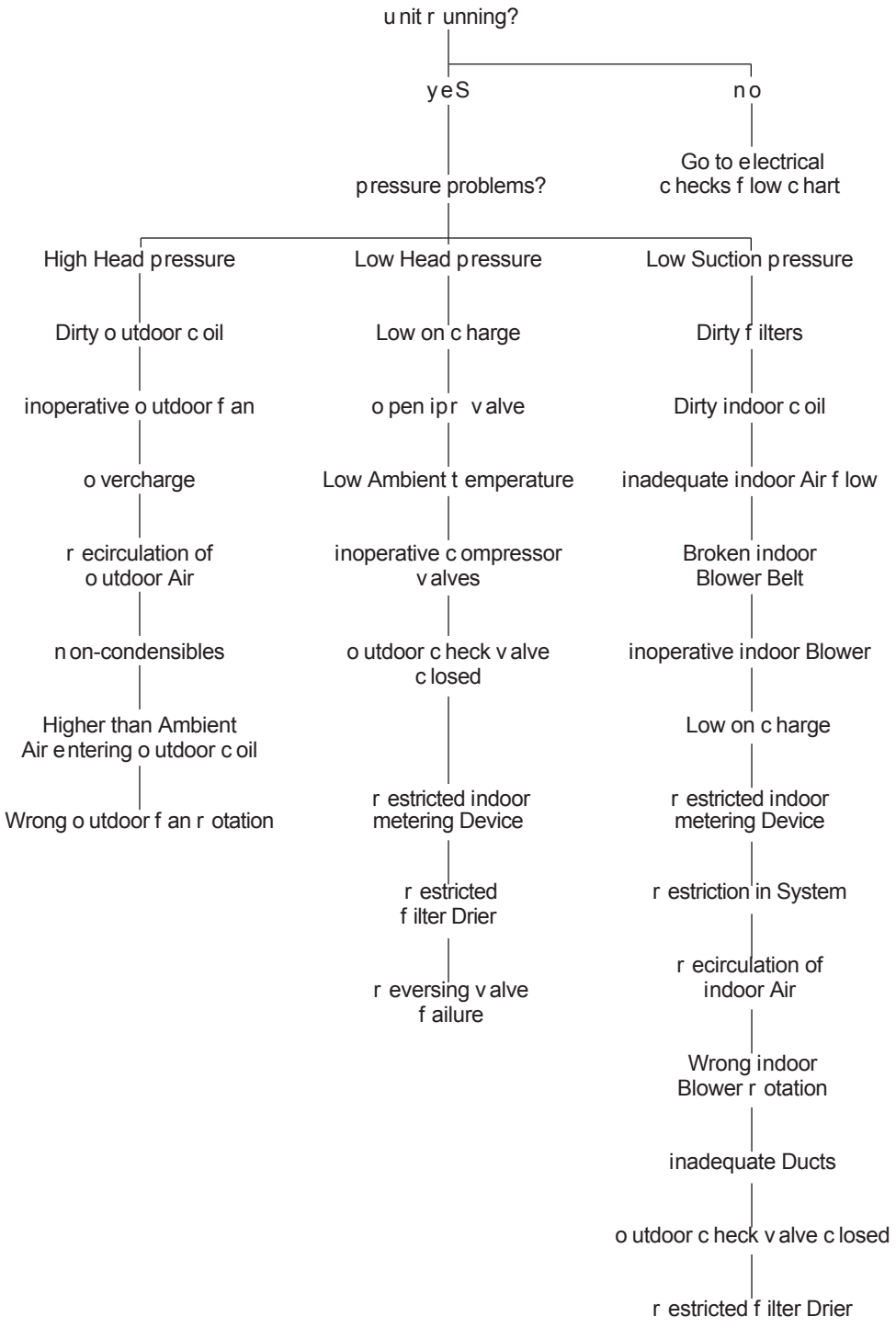
in diagnosing common faults in the heat pump system, develop a logical thought pattern as used by experienced technicians. t he charts which follow are not intended to be an answer to all problems but only to guide the technician's thinking. t hrough a series of yes and no answers, follow the logical path to a likely conclusion.

A novice technician should use these charts like a road map. r emember that the chart should clarify a logical path to the problem's solution.

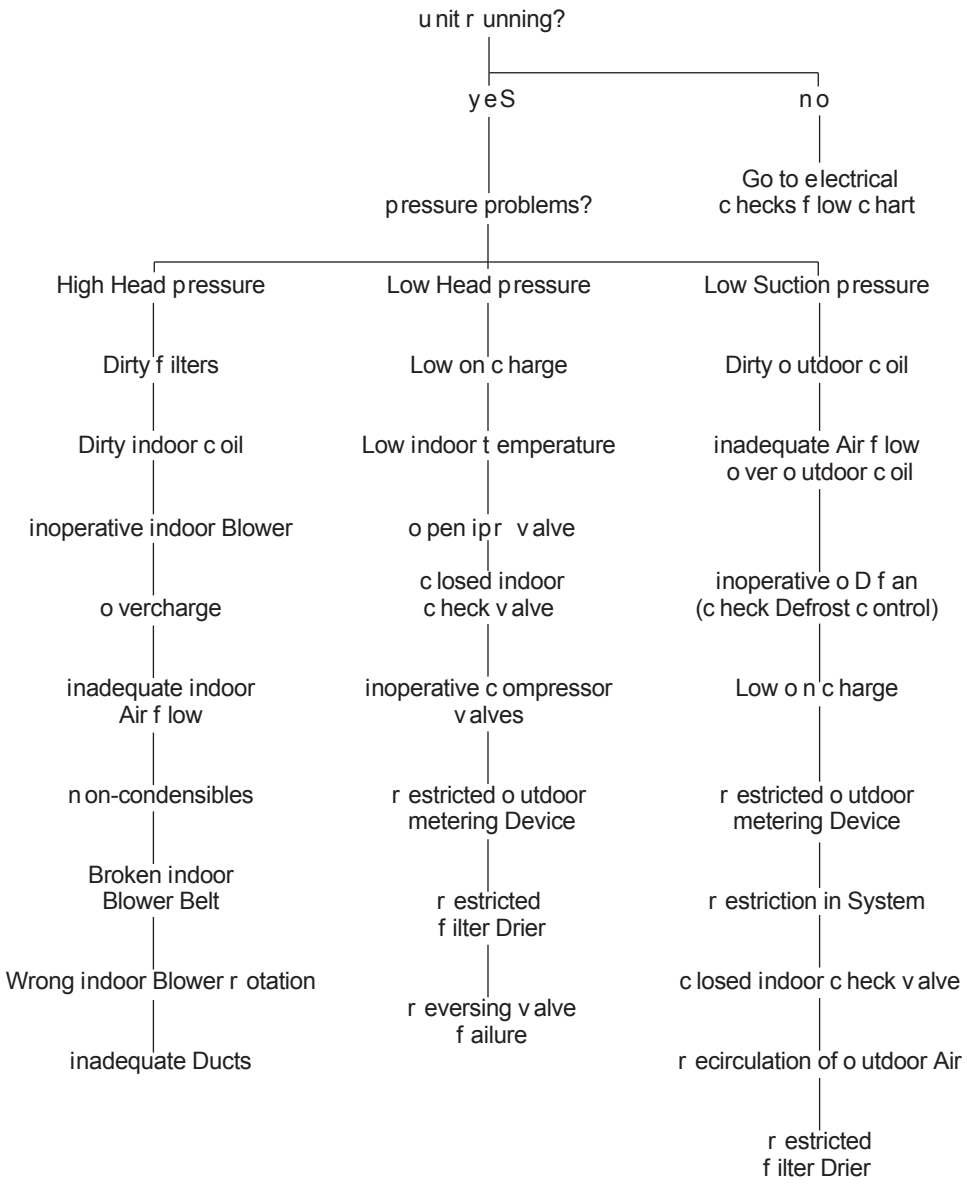
16.1 ELECTRICAL CHECKS FLOW CHART



16.2 COOLING MECHANICAL CHECKS FLOW CHART



16.3 HEATING MECHANICAL CHECKS FLOW CHART



16.4 DEFROST MECHANICAL CHECKS FLOW CHART

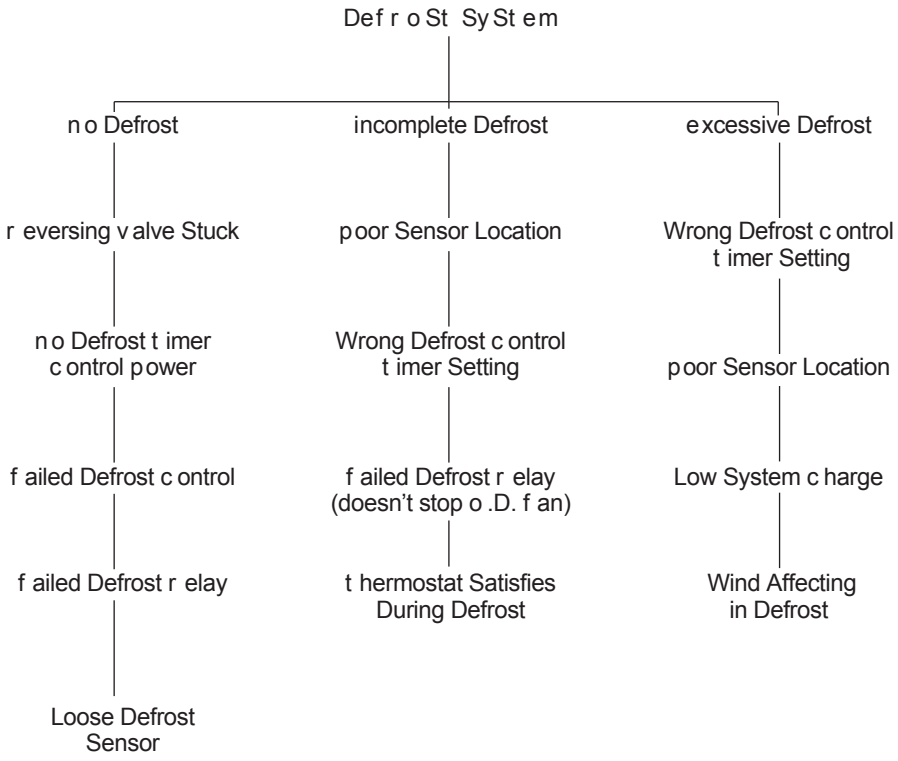


TABLE 7
TEMPERATURE PRESSURE CHART

TEMP (Deg. F)	R-22 PSIG
-150	*29.4
-140	*29.1
-130	*28.5
-120	*27.7
-110	*26.6
-100	*25.1
-90	*23.0
-80	*20.2
-70	16.6
-60	*11.9
-50	*6.1
-40	0.6
-35	2.6
-30	4.9
-25	7.5
-20	10.2
-15	13.2
-10	16.5
-5	20.1
0	24.0
5	28.3
10	32.8
15	37.8
20	43.1
25	48.8
30	54.9
35	61.5
40	68.5
45	76.1
50	84.1
55	92.6
60	101.6
65	111.3
70	121.4
75	132.2
80	143.7
85	155.7
90	168.4
95	181.8
100	196.0
105	210.8
110	226.4
115	242.8
120	260.0
125	278.1
130	297.0
135	316.7
140	337.4
145	359.1
150	381.7

16.5 SUBCOOLING CALCULATION

1. measure the liquid pressure at the liquid line service valve.
2. c onvert the liquid line pressure to saturated temperature. See t able 9.
3. measure the liquid line temperature at the liquid line service valve.
4. c ompare the liquid line temperature to the saturated temperature.
5. t he difference between saturated temperature and liquid line temperature is the subcooling. Subcooling normal range 9° to 12°.

NOTE: t he subcooling charging method should only be used in the cooling mode as the heating subcooling design level varies widely from one unit to the next while the cooling subcooling design level is fairly consistent at 8-12 degrees.

TABLE 8
HEAT PUMP SYSTEM TROUBLESHOOTING TIPS

HEAT PUMP SYSTEM TROUBLESHOOTING TIPS					
SYSTEM PROBLEM	INDICATORS				
	DISCHARGE PRESSURE	SUCTION PRESSURE	SUPERHEAT	SUBCOOLING	COMPRESSOR AMPS
o vercharge	High	High	Low	High	High
u ndercharge	Low	Low	High	Low	Low
Liquid r estriction (Drier)	Low	Low	High	High	Low
Low e vaporator Airflow	Low	Low	Low	Low	Low
Dirty Heat p ump	High	High	Low	Low	High
Low o utside Ambient t emperature	Low	Low	High	High	Low
i nefficient c ompressor	Low	High	High	High	Low
t e v f eeler Bulb c harge Lost	Low	Low	High	High	Low
p oorly insulated Sensing Bulb	High	High	Low	Low	High

16.6 GENERAL TROUBLE SHOOTING CHART

⚠ WARNING

Disconnect all power to unit before servicing. Contactor may break only one side. Failure to shut off power can cause electrical shock resulting in personal injury or death.

SYMPTOM	POSSIBLE CAUSE	REMEDY
unit will not run	• power off or loose electrical connection • thermostat out of calibration-set too high • Defective contactor • Blown fuses / tripped breaker • transformer defective • High pressure control open (if provided)	• check for correct voltage at contactor in condensing unit • reset • check for 24 volts at contactor coil - replace if contacts are open • replace fuses / reset breaker • check wiring-replace transformer • reset-also see high head pressure remedy-the high pressure control opens at 450 psig
outdoor fan runs, compressor doesn't	• run or start capacitor defective • Start relay defective • Loose connection • compressor stuck, grounded or open motor winding, open internal overload. • Low voltage condition	• replace • replace • check for correct voltage at compressor - check & tighten all connections • Wait at least 2 hours for overload to reset. if still open, replace the compressor. • Add start kit components
insufficient cooling	• improperly sized unit • improper indoor airflow • incorrect refrigerant charge • Air, non-condensibles or moisture in system	• recalculate load • check - should be approximately 400 cfm per ton. • charge per procedure attached to unit service panel • recover refrigerant, evacuate & recharge, add filter drier
compressor short cycles	• incorrect voltage • Defective overload protector • refrigerant undercharge	• At compressor terminals, voltage must be ± 10% of nameplate marking when unit is operating. • replace - check for correct voltage • Add refrigerant
registers sweat	• Low indoor airflow	• increase speed of blower or reduce restriction - replace air filter
High head-low vapor pressures	• restriction in liquid line, expansion device or filter drier • flowcheck piston size too small • incorrect capillary tubes	• remove or replace defective component • change to correct size piston • change coil assembly
High head-high or normal vapor pressure - cooling mode	• Dirty outdoor coil • refrigerant overcharge • outdoor fan not running • Air or non-condensibles in system	• clean coil • correct system charge • repair or replace • recover refrigerant, evacuate & recharge
Low head-high vapor pressures	• flowcheck piston size too large • Defective compressor valves • incorrect capillary tubes	• change to correct size piston • replace compressor • replace coil assembly
Low vapor - cool compressor - iced indoor coil	• Low indoor airflow • operating below 65°f outdoors • moisture in system	• increase speed of blower or reduce restriction - replace air filter • Add Low Ambient Kit • recover refrigerant - evacuate & recharge - add filter drier
High vapor pressure	• excessive load • Defective compressor	• recheck load calculation • replace
fluctuating head & vapor pressures	• tev hunting • Air or non-condensibles in system	• check tev bulb clamp - check air distribution on coil - replace tev • recover refrigerant, evacuate & recharge
Gurgle or pulsing noise at expansion device or liquid line	• Air or non-condensibles in system	• recover refrigerant, evacuate & recharge

16.7 SERVICE ANALYZER CHART

COMPRESSOR OVERHEATING		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK/REMEDIES**
High superheat	Low charge	c heck system charge
	f aulty metering device	r estricted cap tube, t e v (t Xv)
		p ower element superheat adjustment
		f oreign matter stopping flow
	High internal load	Hot air (attic) entering return
		Heat source on; mis-wired or faulty control
	r estriction in liquid line	Drier plugged
		Line kinked
	Low head pressure	Low charge
		o perating in low ambient temperatures
	Suction or liquid line subjected to high heat source	Hot attic
		Hot water line
Low voltage	Loose wire connections	c heck wiring
	Dirty or pitted compressor contactor contacts	r eplace contactor
	p ower company problem, transformer	Have problem corrected before diagnosis continues
	u ndersized wire feeding unit	c orrect and complete diagnosis
High voltage	p ower company problem	Have problem corrected
High head pressure	o vercharge	c heck system charge
	Dirty heat pump coil	c lean coil
	f aulty or wrong size heat pump fan motor	r eplace fan motor
	f aulty fan blade or wrong rotation	r eplace fan blade
		r eplace with correct rotation motor
	r ecirculation of air	c orrect installation
	Additional Heat Source	c heck for dryer vent near unit
		c heck for recirculation from other equipment
	n on-condensibles	r ecover refrigerant, e vacuate and recharge system
	e quipment not matched	c orrect mis-match
Short cycling of compressor	f aulty pressure control	r eplace pressure control
	Loose wiring	c heck unit wiring
	t hermostat	Located in supply air stream
		Differential setting too close
		c ustomer misuse
	t e v	internal foreign matter
		p ower element failure
		v alve too small
		Distributor tube/tubes restricted
	c apillary tube	r estricted with foreign matter
		Kinked
		i.D. reduced from previous compressor failure

SYMPTOMS	POSSIBLE CAUSE	CHECK OR REMEDIES
Short cycling of compressor (cont.)	Low charge	check system charge
	Low evaporator air flow	Dirty coil
		Dirty filter
		Duct too small or restricted
	faulty run capacitor	replace
	faulty internal overload	replace compressor
faulty compressor valves	fast equalization/ Low pressure difference	replace compressor and examine system to locate reason
ELECTRICAL		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK OR REMEDIES**
voltage present on load side of compressor contactor and compressor won't run	compressor start components	check start capacitor
		check potential relay
	run capacitor	check with ohmmeter
	internal overload	Allow time to reset
	compressor windings	check for correct ohms
voltage present on line side of pressor contactor only	thermostat	check for control voltage to com-contactor coil
	compressor control circuit	High pressure switch
		Low pressure switch
		Ambient thermostat
		Solid state protection control or internal thermal sensors
		compressor timed off/on control or interlock
no voltage on line side of compressor contactor	Blown fuses or tripped circuit breaker	check for short in wiring or unit
	improper wiring	re-check wiring diagram
improper voltage	High voltage	Wrong unit
		power supply problem
	Low voltage	Wrong unit
		power supply problem
		Wiring undersized
		Loose connections
	Single phasing (3 phase)	check incoming power and fusing
CONTAMINATION		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK OR REMEDIES**
moisture	poor evacuation on installation or during service	in each case, the cure is the same. recover refrigerant. Add filter drier, evacuate and re-charge
High head pressure	non-condensibles air	
unusual head and suction readings	Wrong refrigerant	
foreign matter-copper filings	copper tubing cuttings	
copper oxide	Dirty copper piping	
Welding scale	nitrogen not used	
Soldering flux	Adding flux before seating copper part way	
excess soft solder	Wrong solder material	

LOSS OF LUBRICATION		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK OR REMEDIES**
compressor failures	Line tubing too long	Add oil to the recommended level
	Line tubing too large	reduce pipe size to improve oil return
Low suction pressure	Low charge	check system charge
	refrigerant leaks	repair and recharge
cold, noisy compressor - Slugging	Dilution of oil with refrigerant	observe piping guidelines
noisy compressor	migration	check crankcase heater
cold, sweating compressor	flooding	check system charge
Low Load	reduced air flow	Dirty filter
		Dirty coil
		Wrong duct size
		restricted duct
	thermostat setting	Advise customer
Short cycling of compressor	faulty pressure control	replace control
	Loose wiring	check all control wires
	thermostat	in supply air stream, out of calibration,
		customer misuse

FLOODED STARTS		
SYMPTOMS	**POSSIBLE CAUSES**	**CHECK OR REMEDIES**
Liquid in the compressor shell	faulty or missing crankcase heater	replace crankcase heater
too much liquid in system	incorrect piping	check piping guidelines
	overcharge	check and adjust charge

SLUGGING		
SYMPTOMS	**POSSIBLE CAUSES**	**CHECK OR REMEDIES**
on start up	incorrect piping	review pipe size guidelines
tev hunting when running	oversized tev	check tev application

FLOODING		
SYMPTOMS	**POSSIBLE CAUSES**	**CHECK OR REMEDIES**
poor system control using a tev	Loose sensing bulb	Secure the bulb and insulate
	Bulb in wrong location	relocate bulb
	Wrong size tev	use correct replacement
	improper superheat setting	Adjust, if possible; replace, if not
poor system control using capillary tubes	overcharge	check system charge
	High head pressures	Dirty heat pump
		restricted air flow
		recirculation of air
	evaporator air flow too low	Adjust air flow to 400 cfm/ton

THERMOSTATIC EXPANSION VALVES

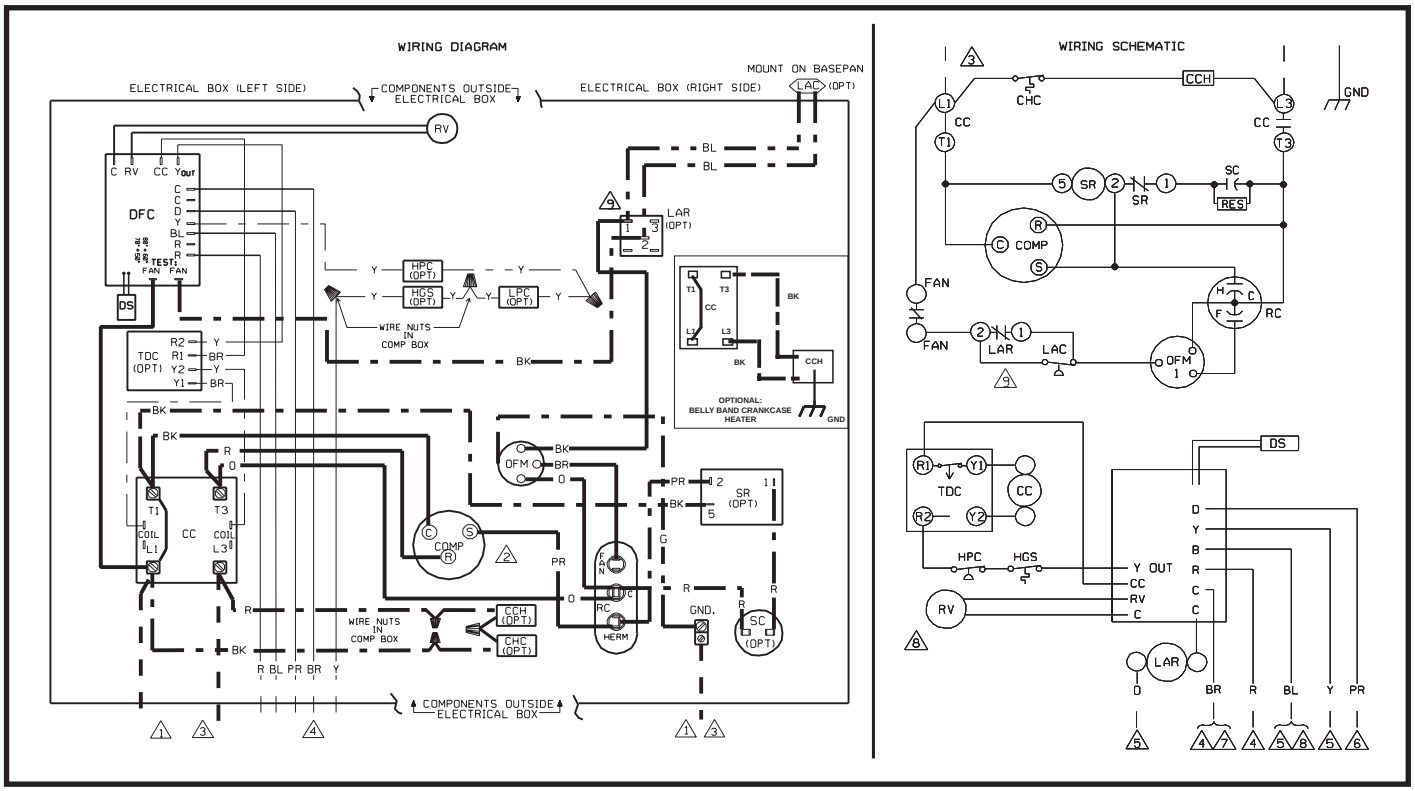
SYMPTOMS	POSSIBLE CAUSE	CHECK OR REMEDIES
High Superheat, Low Suction pressure	moisture freezing and blocking valve	recover charge, install filter-drier, evacuate system, recharge
	Dirt or foreign material blocking valve	recover charge, install filter-drier, evacuate system, recharge
	Low refrigerant charge	correct the charge
	vapor bubbles in liquid line	remove restriction in liquid line correct the refrigerant charge
		remove non-condensible gases
		Size liquid line correctly
	misapplication of internally equalized valve	use correct tev
	plugged external equalizer line	remove external equalizer line restriction
	undersized tev	replace with correct valve
	Loss of charge from power head sensing bulb	replace power head or complete tev
	charge migration from sensing bulb to power head (Warm power head with warm, wet cloth. Does valve operate correctly now?)	ensure tev is warmer than sensing bulb
	improper superheat adjustment (only applicable to tev with adjustable superheat settings)	Adjust superheat setting counter-clockwise
valve feeds too much refrigerant, with low superheat and higher than mal suction pressure	moisture causing valve to stick open.	recover refrigerant, replace filter-drier, evacuate system and then nor-recharge
	Dirt or foreign material causing valve to stick open	recover refrigerant, replace filter-drier, evacuate system and recharge
	tev seat leak (A gurgling or hissing sound is heard At t He tev during the off cycle, if this is the cause.) not AppLicABLe to BLeeD port vALveS.	replace the tev
	oversized tev	install correct tev
	incorrect sensing bulb location	install bulb with two mounting straps, in 2:00 or 4:00 position on suction line, with insulation
	Low superheat adjustment (only applicable to tev with adjustable superheat setting)	turn superheat adjustment clockwise
	incorrectly installed, or restricted external equalizer line	remove restriction, or relocate external equalizer
compressor flood back upon start up	refrigerant drainage from flooded evaporator	install trap riser to the top of the evaporator coil
	compressor in cold location	install crankcase heater on compressor
	Any of the causes listed under Symptoms of problem #2	Any of the solutions listed under Solutions of problem #2

THERMOSTATIC EXPANSION VALVES

SYMPTOMS	POSSIBLE CAUSE	CHECK OR REMEDIES
Superheat is low to normal with low suction pressure	unequal evaporator circuit loading	ensure air flow is equally distributed through evaporator
		ensure proper piston is inserted into rcBA or rcHA evaporator coil distributor
		check for blocked distributor tubes
	Low load or airflow entering evaporator coil	ensure blower is moving proper air cfm
		remove/correct any air flow restriction
Superheat and suction pressure fluctuate (valve is hunting)	expansion valve is oversized	install correct tev
	Sensing bulb is affected by liquid refrigerant or refrigerant oil flowing through suction line	relocate sensing bulb in another position around the circumference of the suction line
	unequal refrigerant flow through evaporator circuits	ensure proper distributor piston is inserted in rcBA or rcHA coil
		ensure sensing bulb is located properly
		check for blocked distributor tubes
	improper superheat adjustment (only possible with tev having superheat adjustment)	replace tev or adjust superheat
	moisture freezing and partially blocking tev	recover refrigerant, change filter-drier, evacuate system and recharge
valve does not regulate at all	external equalizer line not connected or line plugged	connect equalizer line in proper location, or remove any blockage
	Sensing bulb lost its operating charge	replace tev
	valve body damaged during soldering or by improper installation	replace tev

17.0 WIRING DIAGRAMS

FIGURE 6
WIRING DIAGRAM



COMPONENT CODE

CC	COMPRESSOR CONTACTOR
CCH	CRANKCASE HEATER
CHC	CRANKCASE HEATER CONTROL
COMP	COMPRESSOR
DFC	DEFROST CONTROL
DS	DEFROST SENSOR
GND	GROUND, CHASSIS
HPC	HIGH PRESSURE CUT-OUT CONTROL
LAC	LOW AMBIENT COOLING CONTROL
LAR	LOW AMBIENT RELAY
LPC	LOW PRESSURE CUT-OUT CONTROL
OFM	OUTDOOR FAN MOTOR
OPT	OPTIONAL
RC	RUN CAPACITOR
SC	START CAPACITOR
SR	START RELAY
TDC	TIME DELAY CONTROL
HGS	HOT GAS SENSOR
PTCR	POSITIVE TEMPERATURE COEFFICIENT RELAY
RV	REVERSING VALVE

NOTES: △

1. CONNECTORS SUITABLE FOR USE WITH COPPER CONDUCTORS ONLY.
2. COMPRESSOR MOTOR THERMALLY PROTECTED AND ALL 3 PHASE ARE PROTECTED UNDER PRIMARY SINGLE PHASE CONDITIONS.
3. CONNECT FIELD WIRING IN GROUNDED RAINTIGHT CONDUIT TO 60 HERTZ FUSED DISCONNECT; VOLTAGE AND PHASE PER RATING PLATE.
4. LOW VOLTAGE CIRCUIT TO BE N.E.C. CLASS 2 WITH A CLASS 2 TRANSFORMER 24 VOLT, 60 HERTZ.
5. TO THERMOSTAT SUB-BASE, REFER TO SYSTEM SCHEMATICS OR SCHEMATICS ON INDOOR SECTION FOR LOW VOLTAGE CONTROL WIRING.
6. THIS WIRE IS USED TO TURN ON ELECTRIC RESISTANCE HEAT DURING DEFROST.
   OMIT CONNECTION FOR MOST ECONOMICAL OPERATION.
7. TO HEAT PUMP MONITOR 2.5 VA. MAX. WHEN USED.
8. THIS COMPONENT IS ENERGIZED IN HEATING MODE.
9. IF LAC/LAR IS NOT USED, CONNECT BLACK WIRE FROM OFM TO FAN TERMINAL ON DEFROST CONTROL.

WIRING INFORMATION

LINE VOLTAGE
- -FACTORY STANDARD
- -FACTORY OPTION
- -FIELD INSTALLED

LOW VOLTAGE
- -FACTORY STANDARD
- -FACTORY OPTION
- -FIELD INSTALLED

REPLACEMENT WIRE
- -MUST BE THE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (105 °C MIN.)

WARNING
- -CABINET MUST BE PERMANENTLY GROUNDED AND CONFORM TO I.E.C., N.EC., C.E.C. AND LOCAL CODES AS APPLICABLE.

WIRE COLOR CODE

BK__BLACK	O___ORANGE
BR__BROWN	PR__PURPLE
BL___BLUE	R___RED
G___GREEN	W___WHITE
GY__GRAY	Y___YELLOW

WIRING DIAGRAM

REMOTE HEAT PUMPS
208/230 VOLT SINGLE PHASE

DR. BY	APP. BY	DATE	DWG. NO.	REV
JHB		01-19-04	90-101229-02	03