

SINGLE PACKAGE HEAT PUMP INSTALLATION INSTRUCTIONS

MODEL PH24-2

**FOR RESIDENTIAL AND COMMERCIAL
HEATING / COOLING APPLICATIONS**

IMPORTANT

The equipment covered in this manual is to be installed by trained, experienced service and installation technicians. Any heat pump is more critical of proper operating charge and an adequate duct system than a straight air conditioning unit. All duct work, supply and return, must be properly sized for the design air flow requirement of the equipment. ACCA is an excellent guide to proper sizing. All duct work or portions thereof not in the conditioned space should be properly insulated in order to both conserve energy and prevent condensation or moisture damage.

SHIPPING DAMAGE

Upon receipt of equipment, the carton should be checked for external signs of shipping damage. If damage is found, the receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent.

GENERAL

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

The unit is designed for use with or without duct work. Flanges are provided for attaching the supply and return ducts.

These instructions explain the recommended method to install the air cooled self-contained unit and the electrical wiring connections to the unit.

These instructions and any instructions packaged with any separate equipment required to make up the entire air conditioning system should be carefully read before beginning the installation. Note particularly "Starting Procedure" and any tags and/or labels attached to the equipment.

While these instructions are intended as a general recommended guide, they do not supersede any national and/or local codes in any way. Authorities having jurisdiction should be consulted before the installation is made.

LOCATION

General - The unit must be located outside, or in a well ventilated area. It must not be in the space being heated or cooled. A sound absorbing material should be considered if the unit is to be installed in such a position or location that might cause transmission of sound or vibration to the living area or adjacent buildings.

Slab Mounting - In areas where winter temperatures DO NOT go below 32°F for periods over twelve hours, the unit may be slab mounted at grade level. When installing unit at grade level, install on a concrete slab at least four inches above finished grade level. Slab should have a slope tolerance away from the building structure of at least 1/4 inch per foot, while being level from side to side. This will prevent ice buildup under the unit during defrost cycles. Place slab in a location where run-off water from higher ground will not collect around unit. See Figure 1.

A minimum of 18 inches should be provided between the coil inlet and any building surfaces. Provide at least four feet between coil outlet and any building wall, fences or other vertical structures. Provide a minimum of three feet clearance on the service access side of the unit. See Figure 2.

Roof Mounting - When a unit is installed in areas where low ambient temperatures or strong winter winds exist, it should be placed so prevailing winter winds are not in direct line with the heat pump coil. If this is not possible, a wind barrier should be constructed. Place barrier 24 inches from the coil inlet side of the unit and in the direction of prevailing winds. Size barrier at least the same height and width as the unit. This may also be necessary on ground level installations. See Figure 3.

Winter Installation Below 32°F - In areas where winter conditions go below 32°F for extended periods, the unit must be elevated above the mounting surface to prevent snowfall or defrost ice accumulation from interfering with the operation of the unit. A minimum of twelve inch elevation is recommended, while greater elevation may be required for areas of high snow accumulation. Poured concrete, steel framework, brick, cement block, etc., can be utilized to construct a suitable raised mounting platform. See Figure 4.

TYPICAL INSTALLATION

- 1. Roof-Mounted** - The unit is mounted on a sturdy base on the roof of the building. Return air to the unit is brought through a single return grille (grilles with built-in filters are best, since they enable easy access for filter changing). Return air ducts are attached to the lower section of the front panel. Supply air is brought from the unit to attic duct work or to a furred down hall. Supply air duct is attached to the top of the front panel. CAUTION: All outdoor duct work must be thoroughly insulated and weatherproofed. All attic duct work must be thoroughly insulated. Two inch thick insulation with suitable vapor barrier is recommended for both outdoor and attic runs. In rooftop installations, as in all installations, the heat pump must be level from side to side. However, the unit should have a pitch along the length to assure complete external drainage of precipitation and of defrost condensate.
- 2. Crawl Space** - Duct work installed in crawl space must be well insulated and provided with a vapor barrier. In addition, the crawl space must be thoroughly ventilated and provided with a good vapor barrier as a ground cover. It is most desirable to install the unit outdoors, rather than inside the crawl space, so that it will be readily accessible for service. In addition, it is necessary to dispose of the condensate from the outdoor coil on the heating cycle, and this is virtually impossible with the unit installed inside the crawl space.
- 3. Slab Mounted at Ground Level** - This type installation is ideal for homes with a slab floor construction, where a roof-mounted unit is not desired. The supply and return duct work can be run through a furred closet space.
- 4. Thru-the-Wall** - This type installation requires a suitable framework to be fabricated capable of withstanding the unit weight. Normally the unit will be installed so as to minimize supply and return duct work.
- 5. Other Installations** - Many other installations are possible with the packaged heat pump. No matter what the installation, always consider the following facts:
 - a. Insure that the discharge air is not obstructed in any way so as to cause operation difficulties.
 - b. The indoor coil drain pan is equipped with a coupling that must be piped through a condensate drain trap to a suitable drain.
 - c. Always mount the unit in such a position that it may be easily reached for servicing and maintenance.
 - d. Insure that the unit is clear so that proper air flow over the outdoor coil will be maintained.

IMPORTANT: Model PH24-2 has a single fan motor driving both the indoor blower and outdoor fan. This type of unit is particularly sensitive to natural air currents during defrost and some type of wind barrier is recommended. See Figure 3.

RATED CFM AND EXTERNAL STATIC PRESSURE (ESP) WET COIL (COOLING)			
Model	Rated CFM	Rated ESP	Recommended Air Flow Range
PH24-2	825	.13	725 - 975 CFM

AIR FILTERS

Air filters for the return air side of the system are not provided as part of the basic piece of equipment because of the various types of application for these models, and must be field supplied and installed as part of the final installation.

Prior thought should be given to return air location and placement of the air filter(s). The air filter(s) must be of adequate size and readily accessible to the operator of the equipment. Filters must be adequate in size and properly maintained for proper operation. If this is not done, excessive energy use, poor performance, and multiple service problems will result. IT IS IMPOSSIBLE TO OVERSIZE AIR FILTERS. Generous sizing will result in cleaner air and coils, as well as lower operating costs and extend the time between required changes. The following table shows minimum filter areas and recommended filter sizes. Actual filter sizes can vary with the installation due to single or multiple returns utilizing a filter/grille arrangement or being placed immediately ahead of the indoor coil face in the return air duct.

Model	Minimum Filter Areas	Recommended Size
PH24-2	336 sq.in. (2.34 sq.ft)	12 x 30-5/8 x 1

NOTE: If Roof Hood Accessory is to be used, information on air filters may be found under that heading in this manual. Air filters are supplied as part of that package.

WIRING - MAIN POWER

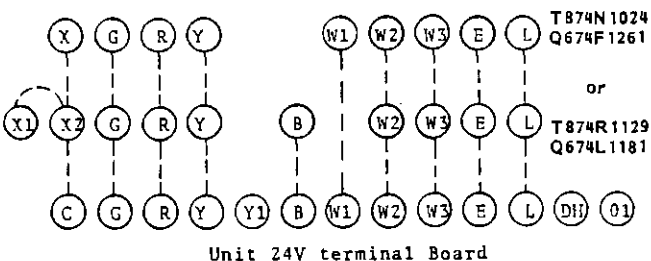
Refer to the unit rating plate for wire sizing information and maximum fuse size. Each outdoor unit is marked with a "Minimum Circuit Ampacity." This means that the field wiring used must be sized to carry that amount of current. Depending on the installed Kw of electric heat, there may be two field power circuits required. If this is the case, the unit serial plate will so indicate. Some models are suitable only for connection with copper wire, while others can be wired with either copper or aluminum wire. Each unit and/or wiring diagram will be marked "Use Copper Conductors Only" or "Use Copper or Aluminum Conductors." These instructions MUST BE adhered to. Refer to the National Electrical Code for complete current carrying capacity data on the various insulation grades of wiring material.

The electrical specifications on page 4 lists fuse and wire sizes (60°F copper) for all models, including the most commonly used heater sizes. Also shown are the number of field power circuits required for the various models with heaters.

The unit rating plate lists a "Maximum Time Delay Fuse" or "HACR" Type Circuit Breaker that is to be used with the equipment. The correct size must be used for proper circuit protection and also to assure that there will be no nuisance tripping due to the momentary high starting current of the compressor.

WIRING - 24V CONTROL CIRCUIT

Nine (9) wires should be run from thermostat subbase to the 24V terminal board in the unit. A nine conductor, 18 gauge copper, color-coded thermostat cable is recommended. The connection points are shown on most of the wiring diagrams and are also shown below.



IMPORTANT NOTE: Only the thermostat and subbase combinations as shown above will work with this equipment. The stat and subbase MUST be matched, and correct operation can be assured only by proper selection and application of these parts.

COMPRESSOR CUT-OFF THERMOSTAT & OUTDOOR THERMOSTAT

Heat pump compressor operation at outdoor temperatures below 0°F are neither desirable nor advantageous in terms of efficiency. Since most equipment at time of manufacture is not designated for any specific destination of the country, and most of the equipment is installed in areas not approaching the lower outdoor temperature range, the compressor cut-offs are not factory installed.

Outdoor thermostats are available to hold off various banks of electric heat until needed as determined by outdoor temperature. The set point of either type of thermostat is variable with geographic region and sizing of the heating equipment to the structure. Utilization of the Heating Application Data and the heat loss calculation of the building are useful in determining the correct set points.

COMPRESSOR CUT-OFF AND OUTDOOR THERMOSTAT WIRING

See specific wiring information for the different models, heater Kw's, and voltages on page 4.

WALL THERMOSTAT AND SUBBASE COMBINATIONS			
Group	Thermostat	Subbase	Predominant Feature
A	8403-017 (T874R1129)	8404-009 (Q674L1181)	Heat or Cool ① No Auto
B	8403-018 (T874N1024)	8404-010 (Q674F1261)	Automatic Heat-Cool Changeover Position ②

① No automatic changeover position--must manually place in heat or cool. Reversing valve remains energized at all times system switch is in heat position (except during defrost cycle). No pressure equalization noise when thermostat is satisfied on either heating or cooling.

② Allows thermostat to control both heating and cooling operation when set in "AUTO" position. Reversing valve de-energizes at end of each "ON" heating cycle.

IMPORTANT NOTE: Both thermostat and subbase combinations shown above incorporate the following features: Man-Auto fan switch, Off-Heat-Cool-Em. Heat Switch, and two (2) indicator lamps--one for emergency heat and one for compressor malfunction.

THERMOSTAT INDICATOR LAMPS

The red lamp marked "EM.HT." comes on and stays on whenever the system switch is placed in the Em. Ht. position. The green lamp marked "check" will come on if there is any problem that prevents the compressor from running when it is supposed to be.

EMERGENCY HEAT POSITION

The operator of the equipment must manually place the system switch in this position. This is done when there is a known problem with the outdoor section, or when the green "check" lamp comes on indicating a problem.

COMPRESSOR MALFUNCTION RELAY (Single Phase Models Only)

Actuation of the green "check" lamp is accomplished by a voltage type relay which is factory installed. Any condition such as loss of charge, defective capacitor, defective contactor, etc., that will prevent compressor from operating will cause green lamp to activate. This is a signal to the operator of the equipment to place system in emergency heat position.

PRESSURE SERVICE PORTS

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressure curves can be found later in the manual covering all models on both cooling and heating cycles. It is imperative to match the correct pressure curve to the unit by model number.

SEQUENCE OF OPERATION

Cooling - Circuit R-Y makes at thermostat pulling in compressor contactor starting the compressor and outdoor motor. The G (indoor motor) circuit is automatically completed on any call for cooling operation, or can be energized by manual fan switch on subbase for constant air circulation.

Heating - A 24V solenoid coil on reversing valve controls heating cycle operation. Two thermostat options, one allowing "Auto" changeover from cycle to cycle and the other constantly energizing solenoid coil during heating season and thus eliminating pressure equalization noise except during defrost, are to be used. On "Auto" option, a circuit is completed from R-W1 and R-Y on each heating "on" cycle, energizing reversing valve solenoid and pulling in compressor contactor starting compressor and outdoor motor. R-G also make starting indoor blower motor. Heat pump heating cycle now in operation. The second option has no "Auto" changeover position, but instead energizes the reversing valve solenoid constantly whenever the system switch on subbase is placed in "Heat" position, the "B" terminal being constantly energized from R. A thermostat demand for heat completes R-Y circuit, pulling in compressor contactor starting compressor and outdoor motor. R-G also make starting indoor blower motor.

DEFROST CYCLE

The defrost cycle is controlled by time and temperature. The 24 volt timer motor runs all the time the compressor is in operation. When the outdoor temperature is in the lower 40°F temperature range or colder, the outdoor coil temperature is 32°F or below. This temperature is sensed by the defrost thermostat mounted near the bottom of the outdoor coil on a return bend. The defrost thermostat closes at approximately 32°F. Every 60 (or 30) minutes that the compressor is running, contacts 3-5 close for 7 minutes, with contacts 3-4 closed for the first 40 seconds of that 7 minutes. If the defrost thermostat is closed, the defrost relay energizes and places the system in defrost mode. An interlocking circuit is created with timer contacts 3-5 and defrost relay contacts 7-9 in series.

During the defrost mode, the refrigerant cycle switches back to the cooling cycle, the outdoor motor stops, electric heaters are energized, and hot gas passing through the outdoor coil melts any accumulated frost. When the temperature rises to approximately 57°F (Model PH24-2 is 42°F), the defrost thermostat opens, de-energizing the defrost relay and returning the system to heating operation.

If some abnormal or temporary condition such as a high wind causes the heat pump to have a prolonged defrost cycle, contacts 3-5 of the defrost timer will open after 7 minutes and restore the system to heating operations automatically.

There are two time settings on the defrost timer--30 minutes and 60 minutes. Most models are shipped wired on the 60 minute setting for greatest operating economy. If special circumstances require a change to the shorter time, remove wire connected to terminal 5/60 and reconnect to terminal 5/30.

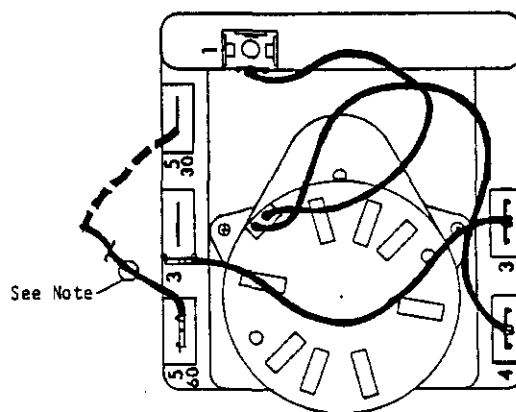
NOTE: Model PH24-2 has single motor which stops during defrost cycle. There is also an interlocking circuit which prevents any electric heat from being on during the defrost period when there is no air flow across the indoor coil.

There is a manual advance knob located on the timer. This can be used to advance timer to contact closure point if it is desired to check out defrost cycle operation, without waiting for time to elapse.

IMPORTANT INSTALLER NOTE

For improved start-up performance wash the indoor coil with a dishwasher detergent.

DEFROST TIMER WIRING



NOTE: PH24-2 is connected to 5/30 terminal (30 minutes) as shown by dotted line. Any model can be changed from 60 minutes to 30 minutes by unplugging from 5/60 terminal and reconnecting to 5/30 terminal.

SERVICE HINTS

1. Caution homeowner to maintain clean air filters at all times. Also, not to needlessly close off supply and return air registers. This reduces air flow through the system, which shortens equipment service life as well as increasing operating costs.
2. Switching to heating cycle at 75°F or higher outside temperature may cause a nuisance trip of the manual reset high pressure switch.
3. The heat pump wall thermostats perform multiple functions. Be sure that all function switches are correctly set for the desired operating mode before trying to diagnose any reported service problems.
4. Check all power fuses or circuit breakers to be sure that they are the correct rating.
5. Periodic cleaning of the outdoor coil to permit full and unrestricted airflow circulation is essential.

REFRIGERANT CHARGE

The correct system R-22 charge is shown on the unit rating plate. Optimum unit performance will occur with a refrigerant charge resulting in a suction line temperature (6" from compressor) as shown in the following table:

Model	Rated Airflow	95°F O.D. Temp.	82°F O.D. Temp.
PH24-2	825	60 - 62	68 - 70

The above suction line temperatures are based upon 80°F dry bulb/67°F wet bulb (50% R.H.) temperature and rated airflow across the evaporator during cooling cycle.

CRANKCASE HEATERS

All units are provided with some form of compressor crankcase heat. Some single phase units utilize the compressor motor start winding in series with a portion of the run capacitor to generate heat within the compressor shell to prevent liquid refrigerant migration.

Some single and three phase models have an insertion well-type heater located in the lower section of the compressor housing. This is a self-regulating type heater that draws only enough power to maintain the compressor at a safe temperature.

Some form of crankcase heat is essential to prevent liquid refrigerant from migrating to the compressor, causing oil pump out on compressor start-up and possible valve failure due to compressing a liquid.

Refer to unit wiring diagram to find exact type of crankcase heater used.

The following decal is affixed to all outdoor units detailing start-up procedure. This is very important. Please read carefully.

IMPORTANT

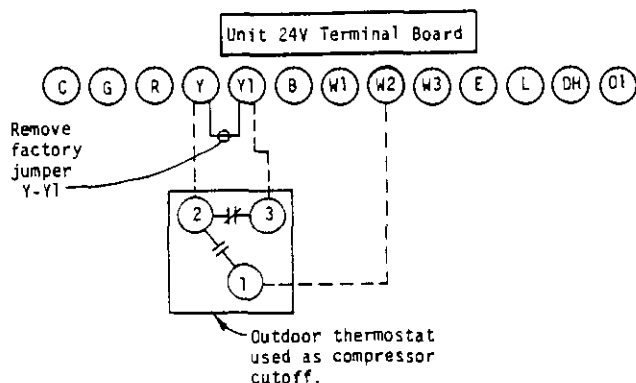
THESE PROCEDURES MUST BE FOLLOWED AT INITIAL START-UP AND AT ANY TIME POWER HAS BEEN REMOVED FOR 12 HOURS OR LONGER.

TO PREVENT COMPRESSOR DAMAGE WHICH MAY RESULT FROM THE PRESENCE OF LIQUID REFRIGERANT IN THE COMPRESSOR CRANKCASE

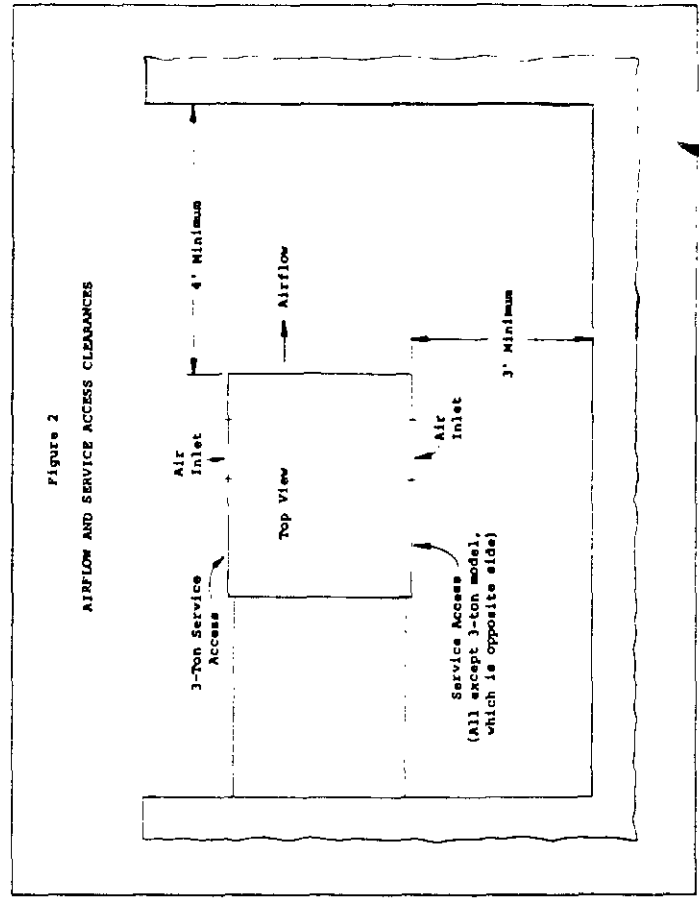
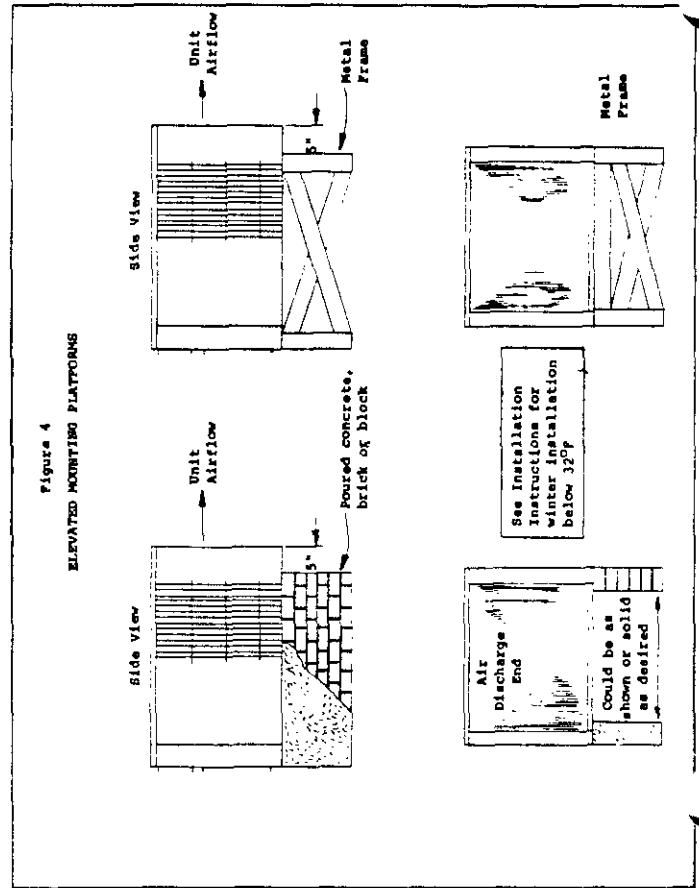
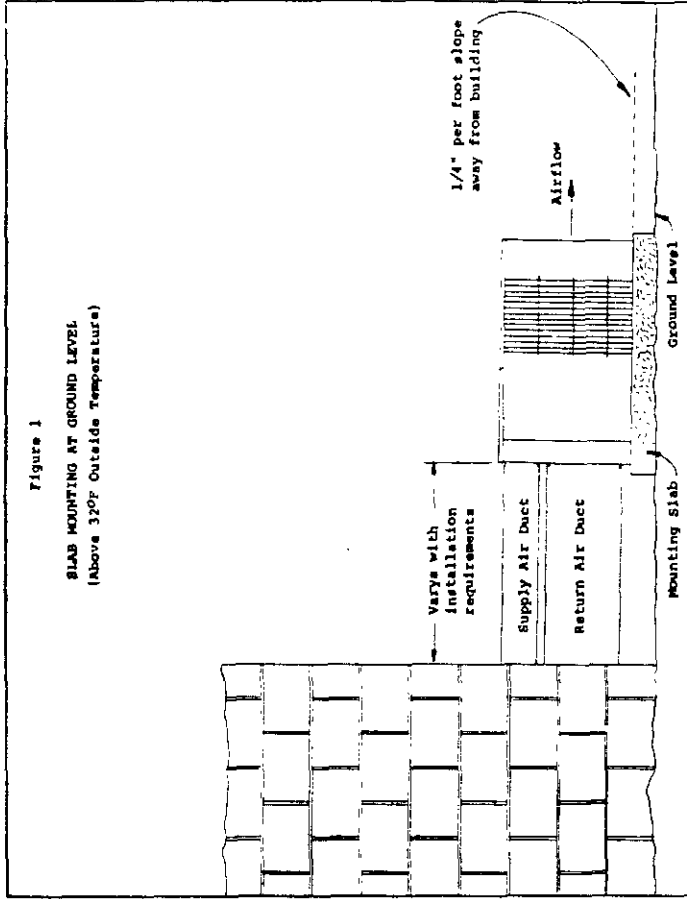
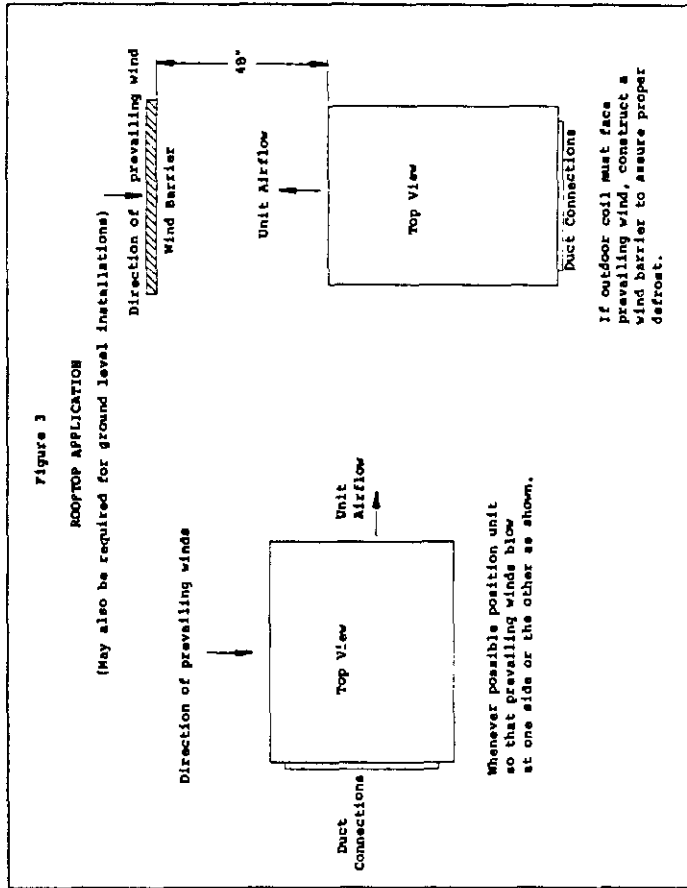
1. MAKE CERTAIN THE ROOM THERMOSTAT IS IN THE "OFF" POSITION. (THE COMPRESSOR IS NOT TO OPERATE).
2. APPLY POWER BY CLOSING THE SYSTEM DISCONNECT SWITCH THIS ENERGIZES THE COMPRESSOR HEATER WHICH EVAPORATES THE LIQUID REFRIGERANT IN THE CRANKCASE.
3. ALLOW 4 HOURS OR 60 MINUTES PER POUND OF REFRIGERANT IN THE SYSTEM AS NOTED ON THE UNIT RATING PLATE, WHICHEVER IS GREATER.
4. AFTER PROPERLY ELAPSED TIME THE THERMOSTAT MAY BE SET TO OPERATE THE COMPRESSOR.
5. EXCEPT AS REQUIRED FOR SAFETY WHILE SERVICING — DO NOT OPEN SYSTEM DISCONNECT SWITCH.

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COMPRESSOR CUT-OFF WIRING

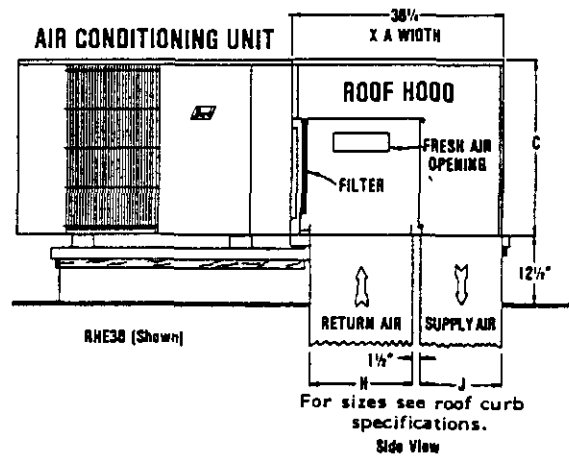
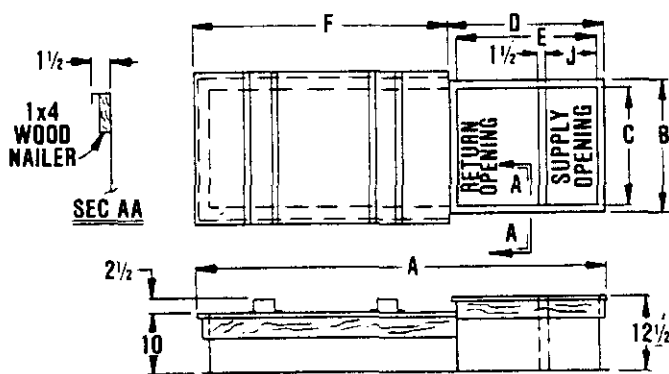


ELECTRICAL DATA										
Model	Rated Volts & PH	Operating Voltage Range	Heater Kw @ 240V	Max. Unit Amps	No. Field Power Circuits	Internal Fuses Ckt. A	Req'd Maximum External Fuses or Ckt. Breaker** Ckt. A	Minimum Circuit Ampacity Ckt. A	Field Power Wiring** Ckt. A	Ground Wire Size** Ckt. A/B
PH24-2	230/208 1	197-253	0	17.5	1	60/30	30	21	10	10
			5	38.3	1		50	47	6	10
			10	59.2	1		80	73	3	8
*Maximum time delay fuse or HACR type circuit breaker.						**Based on 60° Copper Wire.				



PRE-FABRICATED ROOF CURB SPECIFICATIONS

HEAVY GAUGE GALVANIZED WITH WOOD NAILING STRIP, WELDED/LEAKPROOF
ONE PIECE CONSTRUCTION - READY TO INSTALL



CURB AND ROOF HOOD DETAILS

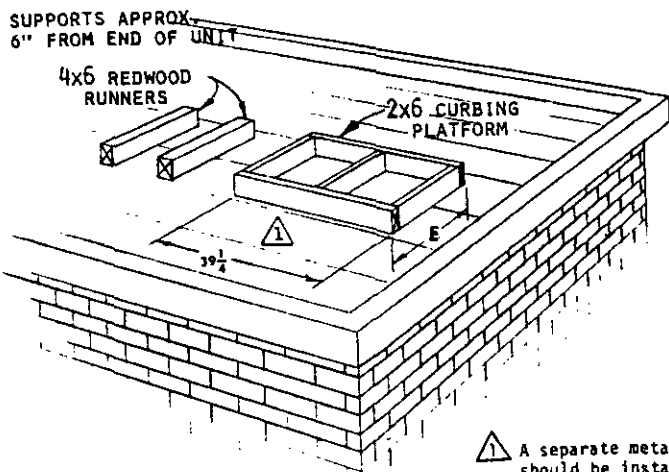
	A	B	C*	D	E	F	J*	H*	Roof Hood Model	Heat Pump and Air Conditioning Units
P24 Curb	72-3/8	34-1/8	31-1/8	38-3/8	35-3/8	34	14-3/4	19-1/8	RHE24	P24A2, PH24-2

***Duct Sizing Information**

Return Air Dimension "C" is length
Dimension "H" is width

Supply Air Dimension "C" is length
Dimension "J" is width

FIELD FABRICATED CURBING

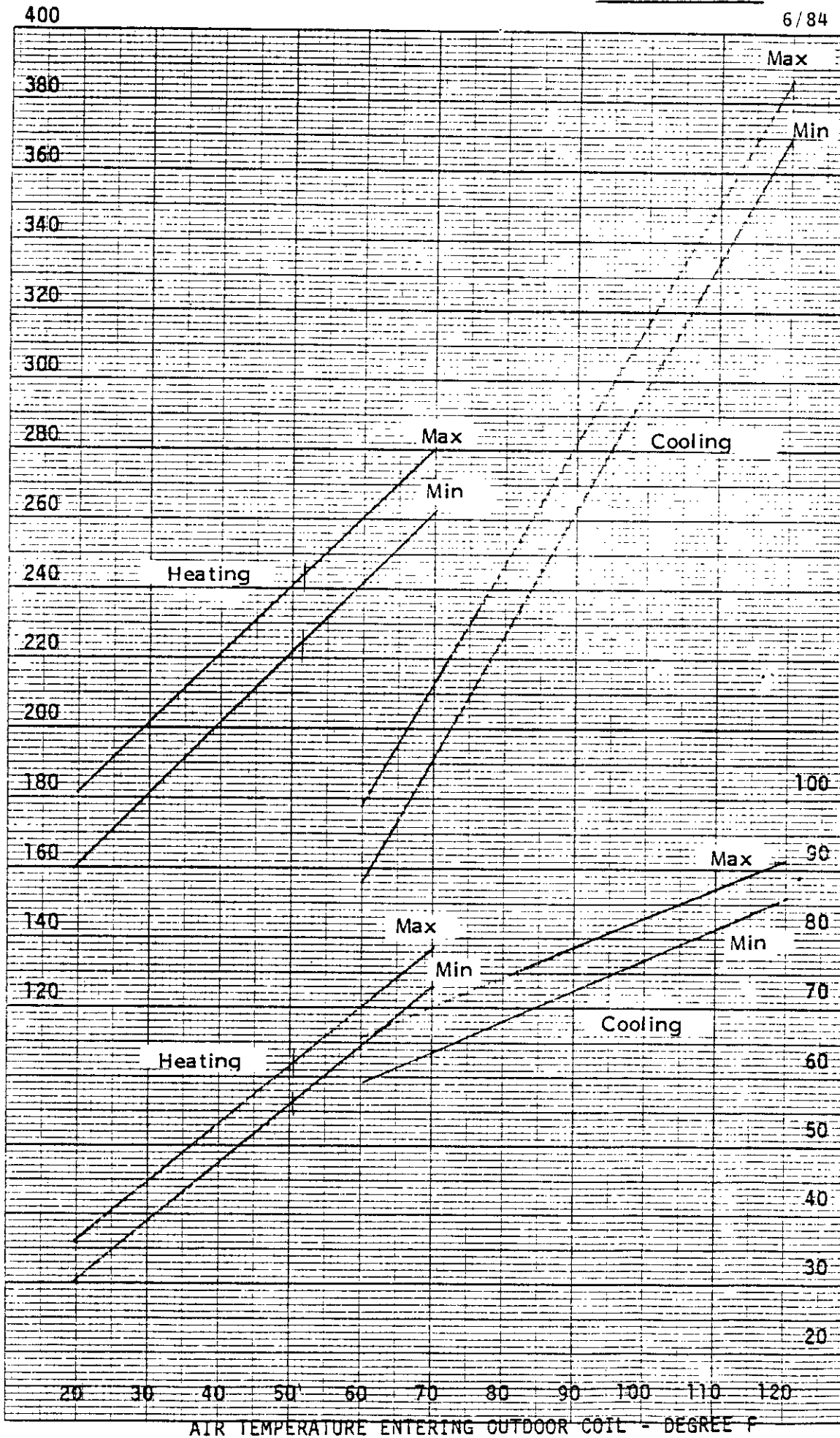


⚠ A separate metal flashing should be installed around wood curbing. Caulk and seal all joints and weather-proof.

ROOF HOOD MODEL	UNIT MODEL	E
RHE24	P24A2 PH24-2	34-7/8

6/84

HIGH SIDE (DISCHARGE LINE) PRESSURE -- PSIG



ing curves are based upon 80DB, 67WB R.A. Temp. and Rated FM (air) across the evaporator coil and should be used for reference purposes only. Specific information can be found in section titled "Refrigerant Charge" elsewhere in manual. If there is any doubt as to correct operating charge being in the system, the charge should be removed, system evacuated, and recharged according to serial plate instructions. Heating curves are based upon 70DB R.A. Temp.

PARTS LIST
SINGLE PACKAGE HEAT PUMP

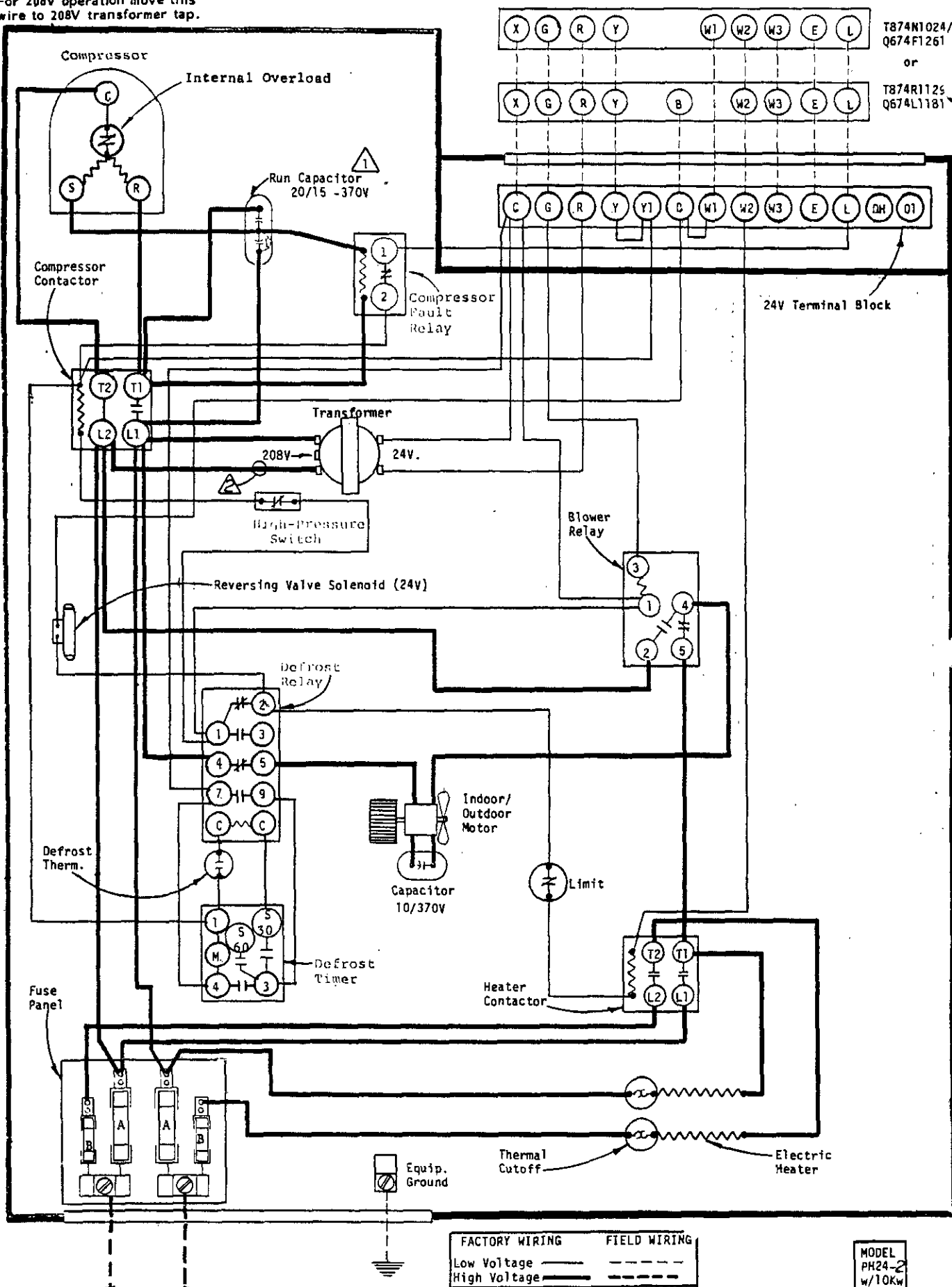
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PART NO.	DESCRIPTION	PH24-2
5202-003	Accumulator	x
5152-020	Blower Housing SI110-6AT	x
5152-009	Blower Wheel FE-1024-519 ccw	x
8552-007	Capacitor - Comp. 20/15 - 370V	x
8552-005	Capacitor - Blower 10/370V	x
5811-012	Cap Tube - Cool	(2)
5811-012	Cap Tube - Heat	(3)
5651-036	Check Valve	x
5051-030	Condenser Coil	x
8000-071	Compressor AB225HT-015-A4	x
8401-007	Contactors 1P25A	x
8401-006	Contactors - Heat 24V - 2P18	x
8408-004	Defrost Mounting Plate	x
8408-014	Defrost Thermostat	x
5060-027	Evaporator Coil	x
5151-024	Fan Blade A-1831-5	x
8614-006	Fuse 30A 10Kw	(2)
8614-022	Fuse 60A 10Kw	(2)
8614-017	Fuse Block 10Kw	x
7051-009	Grille - Condenser	x
7051-006	Grille - Inlet	(2)
8604-042	Heat Strip 240V 5Kw	x
8604-044	Heat Strip 240V 10Kw	x
8406-010	High Pressure Switch	x
8402-015	Limit Switch L130-2.0	x
8106-014	Fan Motor 1/2 hp	x
8201-009	Relay - Blower SPDT	x
8201-031	Relay - Compressor Fault	x
8201-047	Relay - Defrost	x
5650-009	Reversing Valve	x
5650-008	Reversing Valve Solenoid Coil 24V	x
5210-004	Strainer 3/8 x 2 cap	x
5210-003	Strainer 3/8 x 3 cap	x
8607-010	Terminal Board	x
8607-013	Terminal Block 2 pole	x
8402-026	Thermal Cutoff	x
8612-012	Timer 30/60 Min. w/7 Min time safe override	x
8407-035	Transformer 55VA	x

Minimum Net Billing \$15.00. Supersedes all previous lists.
Subject to change without notice.

⚠ Capacitor provides off-cycle crankcase heat.

⚠ For 208V operation move this wire to 208V transformer tap.



230/208-60-1

USE COPPER OR ALUMINUM WIRE

FACTORY WIRING	FIELD WIRING
Low Voltage	-----
High Voltage	-----

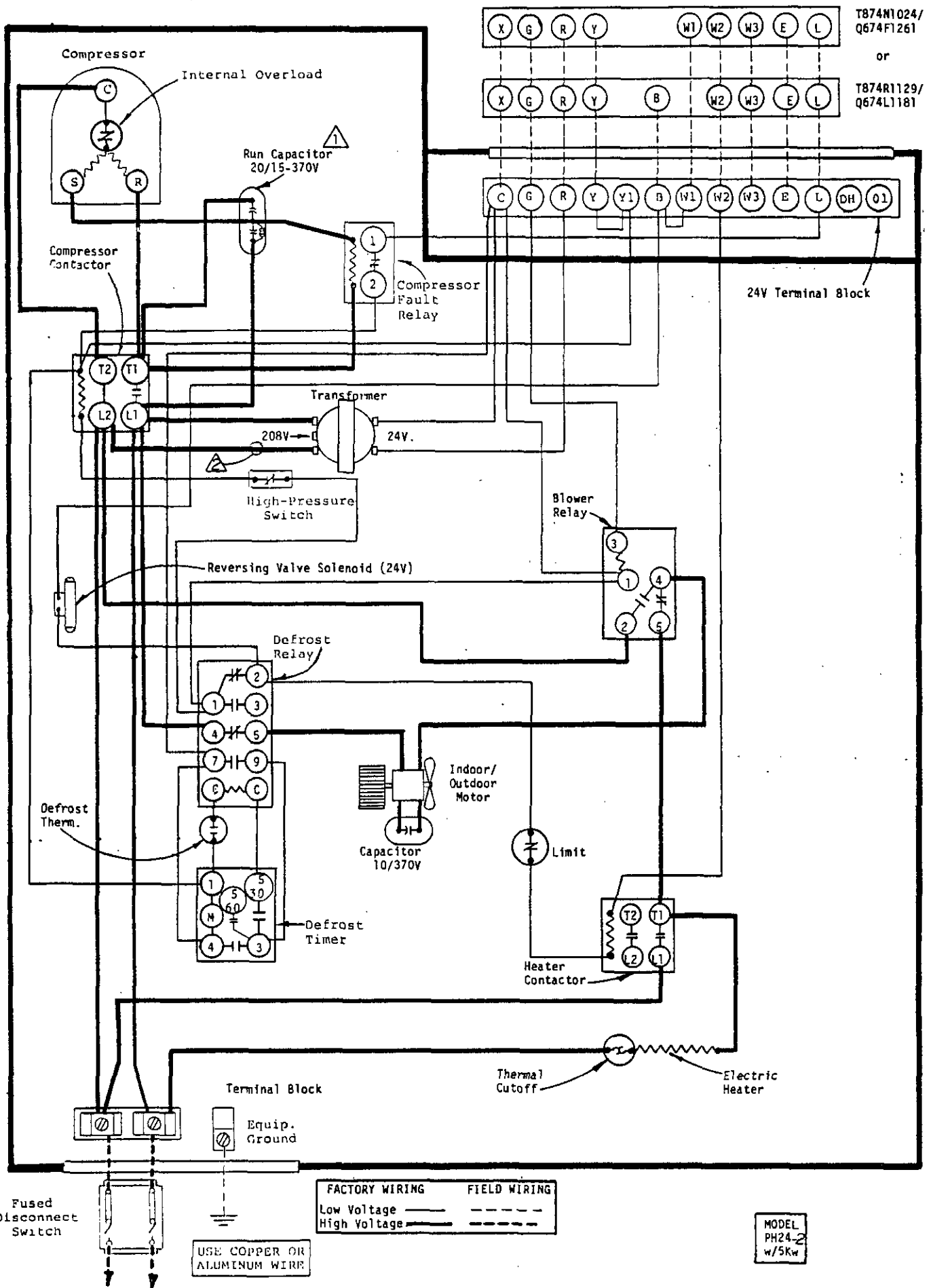
Fuse A - 60A Time Delay
Fuse B - 30A Standard

MODEL
PH24-2
w/10kw

4003-130G

Capacitor provides off-cycle crankcase heat.

For 208V operation move this wire to 208V transformer tap.



⚠ Capacitor provides off-cycle crankcase heat.

⚠ For 208V operation move this wire to 208V transformer tap.

