

INSTALLATION INSTRUCTIONS

MODELS

42HPQ, 48HPQ2, 60HPQ4

SPLIT HEAT PUMP UNIT
OUTDOOR SECTIONS

FOR USE WITH:

MODELS BC48A AND BC60A
INDOOR BLOWER COIL UNITS AND
MODELS H4AQ1 AND H5AQ1 COIL ONLY ADD ON UNITS

APPLICATION AND INSTALLATION INSTRUCTIONS
FOR SPLIT SYSTEM HEAT PUMP UNITS

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. NESCA 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.

GENERAL

These instructions explain the recommended method to install the air cooled split type heat pump, the interconnected refrigerant tubing, and the electrical wiring required for both unit power and control circuit.

These units are to be used in conjunction with the matching indoor coil sections as shown on the specification sheet. Only those combinations as shown are authorized or recommended.

These instructions and any instructions packaged with any separate equipment required to make up the entire heat pump system should be carefully read before beginning the installation. Note particularly 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.

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.

SETTING THE UNIT

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 in 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. Refer to 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. 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.

WIRING - Main Power

Refer to the unit serial 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. Each unit and/or unit wiring diagram is also marked "Use Copper Conductors Only," meaning that the terminations are not suitable for aluminum wiring. Refer to the National Electrical Code for complete current carrying capacity data on the various insulation grades of wiring material.

The unit rating plate lists a "Maximum Time Delay Fuse" that is to be used with the equipment. The correct size fuse 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 motor.

WIRING - Control Circuit

Since the same outdoor unit can in most cases be matched with more than one indoor unit, the appropriate control circuit wiring diagrams are included with the indoor coil section installation instructions. These control circuit wiring diagrams cover all the available wiring options required in the various geographic areas of the country.

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.

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.
42HPQ/BC48A	1540	58-60	64-66
42HPQ/H4AQ1	1625	63-65	70-72
48HPQ2/BC48A	1650	59-61	65-67
48HPQ2/H4AQ1	1625	61-63	66-68
60HPQ4/BC60A	1800	56-58	65-67
60HPQ4/H5AQ1	1800	57-59	65-67

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.

DEFROST CYCLE

The defrost cycle is controlled by time and temperature. The 240 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 contact 3-5 and defrost relay contact 7-9 in series.

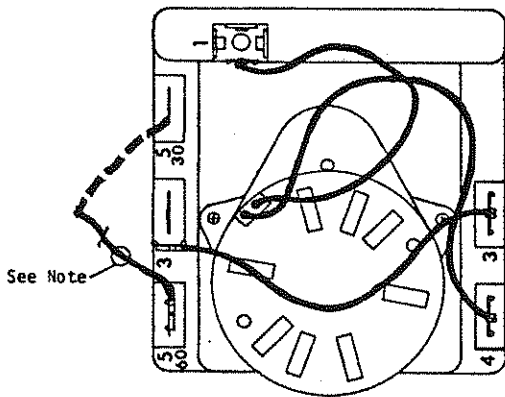
During the defrost mode, the refrigerant cycle switches back to the cooling cycle, the outdoor motor stops, electric heaters are energized, and hot gas passing through the outdoor coil melts any accumulated frost. When the temperature rises to approximately 57°F, the defrost thermostat opens, de-energizing 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.

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.

DEFROST TIMER WIRING



NOTE: All models are connected to 5/60 terminal (60 minute). Any model can be changed from 60 minutes to 30 minutes by unplugging from 5/60 terminal and reconnecting to 5/30 terminal as shown by dotted line.

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.

IMPORTANT INSTALLER NOTES:

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

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 three phase units utilize a wraparound type of crankcase heater that warms the compressor oil from the outside.

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.

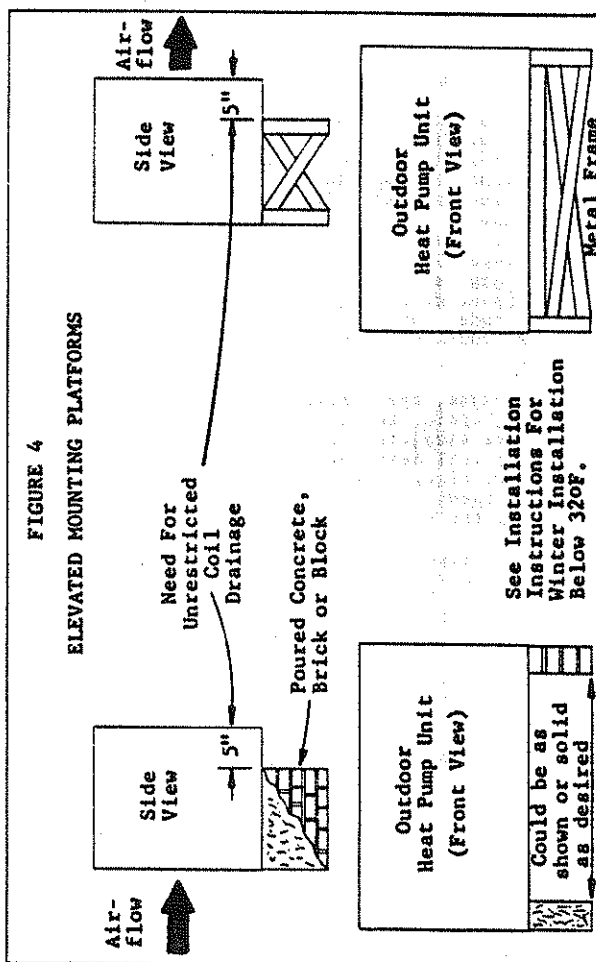
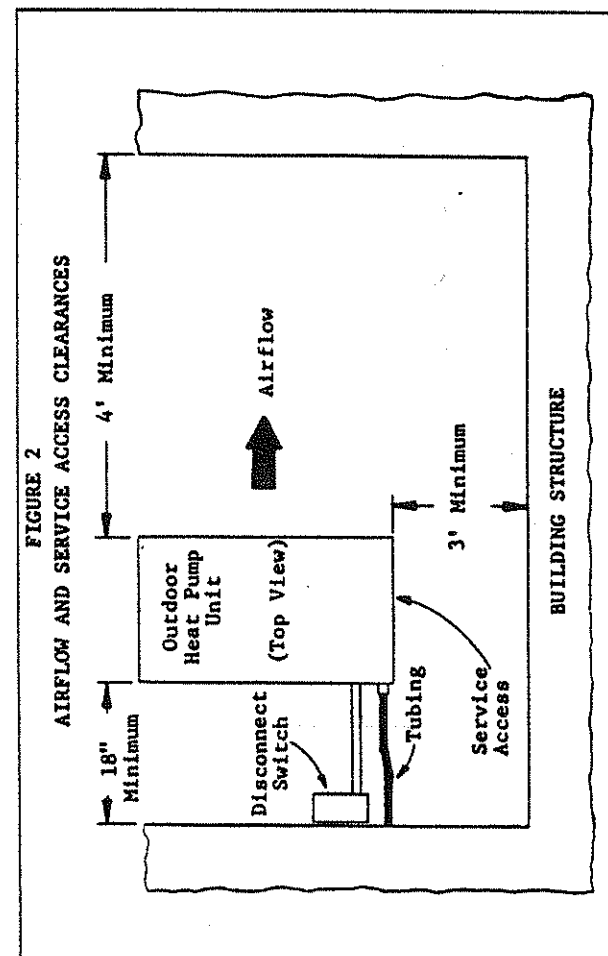
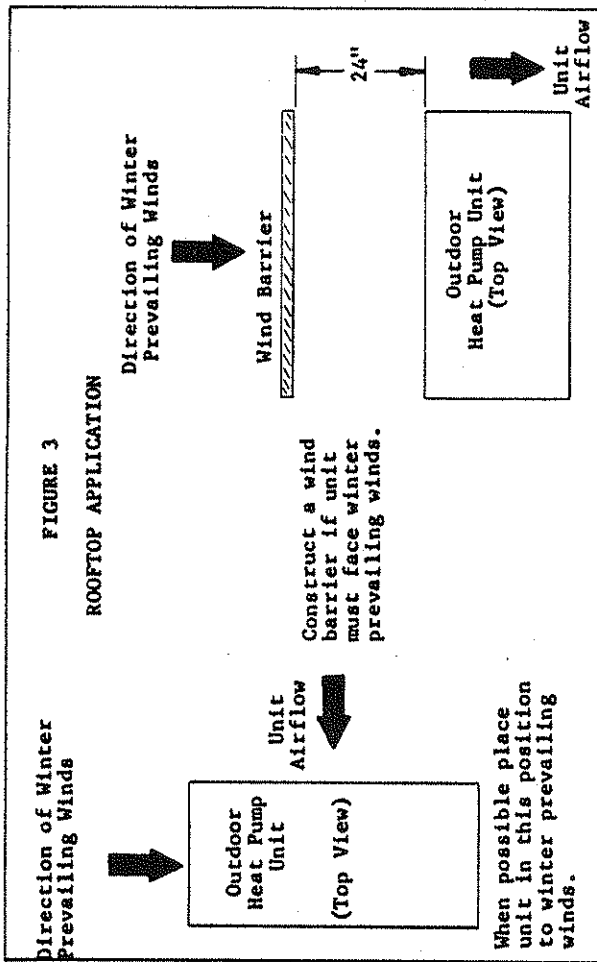
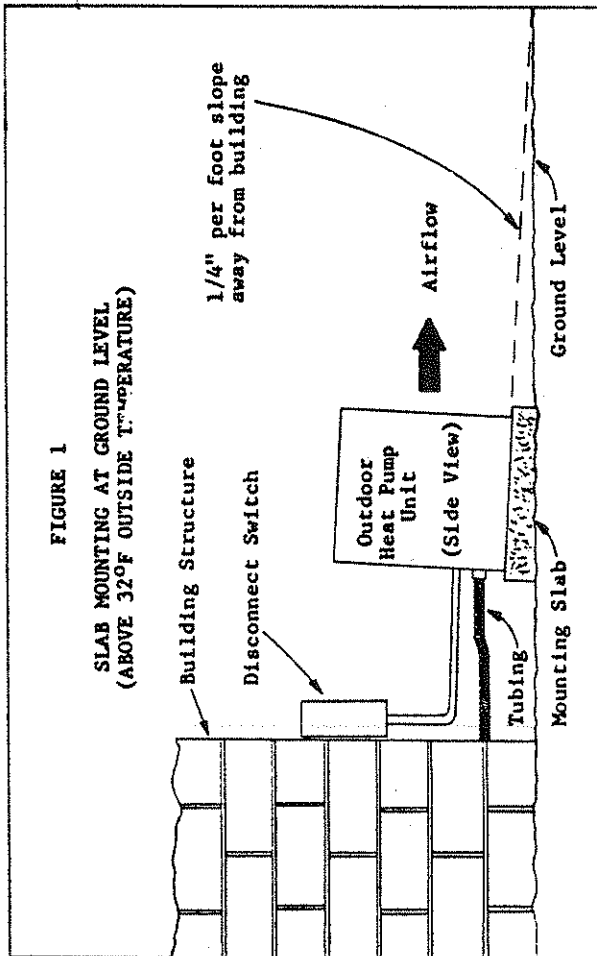
IMPORTANT

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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INSTALLING REFRIGERANT TUBING

PRE-CHARGED TUBING - Examine carefully the two lengths of pre-charged tubing furnished with the Unit. The larger is the suction line. The smaller is the liquid line. The end of the tubing with the hex nut and gauge port is to be attached to the Condensing Unit.

Unroll the tubing, being careful not to kink, and install it between the Condensing Unit and the Evaporator Coil.

CAUTION: Be careful not to tear the insulation when pushing it through holes in masonry or frame walls.

When sealing tube opening in house wall use a soft material to prevent tube damage and vibration transmission.

Before fastening either end, use a tubing bender to make any necessary bends in the tubing. (AVOID EXCESSIVE BENDING IN ANY ONE PLACE TO AVOID KINKING).

Start connecting the tubing at the Evaporator coil end, first remove the protective caps and plugs from the quick-connect fittings on the Evaporator Coil and the pre-charged tubing. Inspect fittings and clean if necessary, making sure they are clear of foreign materials. If you clean the fittings, lubricate them with refrigeration oil. Connect both tubes to the fittings on the coil and draw up by hand.

When necessary to bend the insulated tube, suction line, cut the insulation around its circumference at a distance far enough beyond the point of the bend so as to clear the tubing bender.

Slip the insulation back together and vapor seal the joint with tape.

NOTE: The maximum distance for pre-charge tubing between the Condenser and the Evaporator is 45 feet.

CAUTION: Prior to connecting the pre-charged tubing to the Evaporator Coil or Condensing Unit, be sure all bends have been made, then coil any excess tubing in a horizontal plane, with the slope of the tubing toward the Condensing Unit.

CAUTION: Be sure to hold the coupling firmly to prevent movement of the coupling and tubing. Failure to do so could tear out the diaphragm causing a blockage of the system.

CAUTION: After starting to tighten up the fitting never try to back it off or take it apart.

For connecting the tubing at the condensing unit end, first remove the protective caps and plugs from the quick-connect fittings on the condensing unit and the pre-charged tubing. Inspect fittings and clean if necessary, making sure they are clear of foreign materials. If you clean the fittings, lubricate them with refrigeration oil. Connect both tubes to the fittings on the coil and draw up by hand.

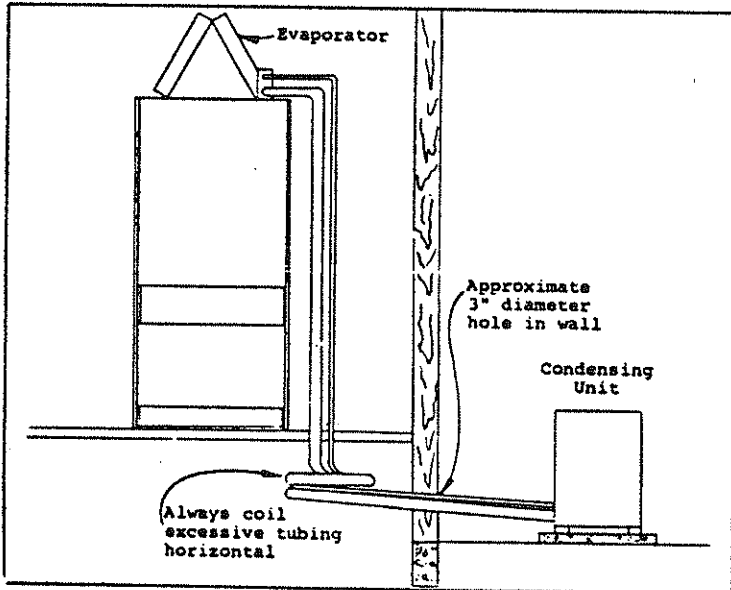
Locate the Gauge Port in a 45° angle from a vertical up position so as to be accessible for gauge connections.

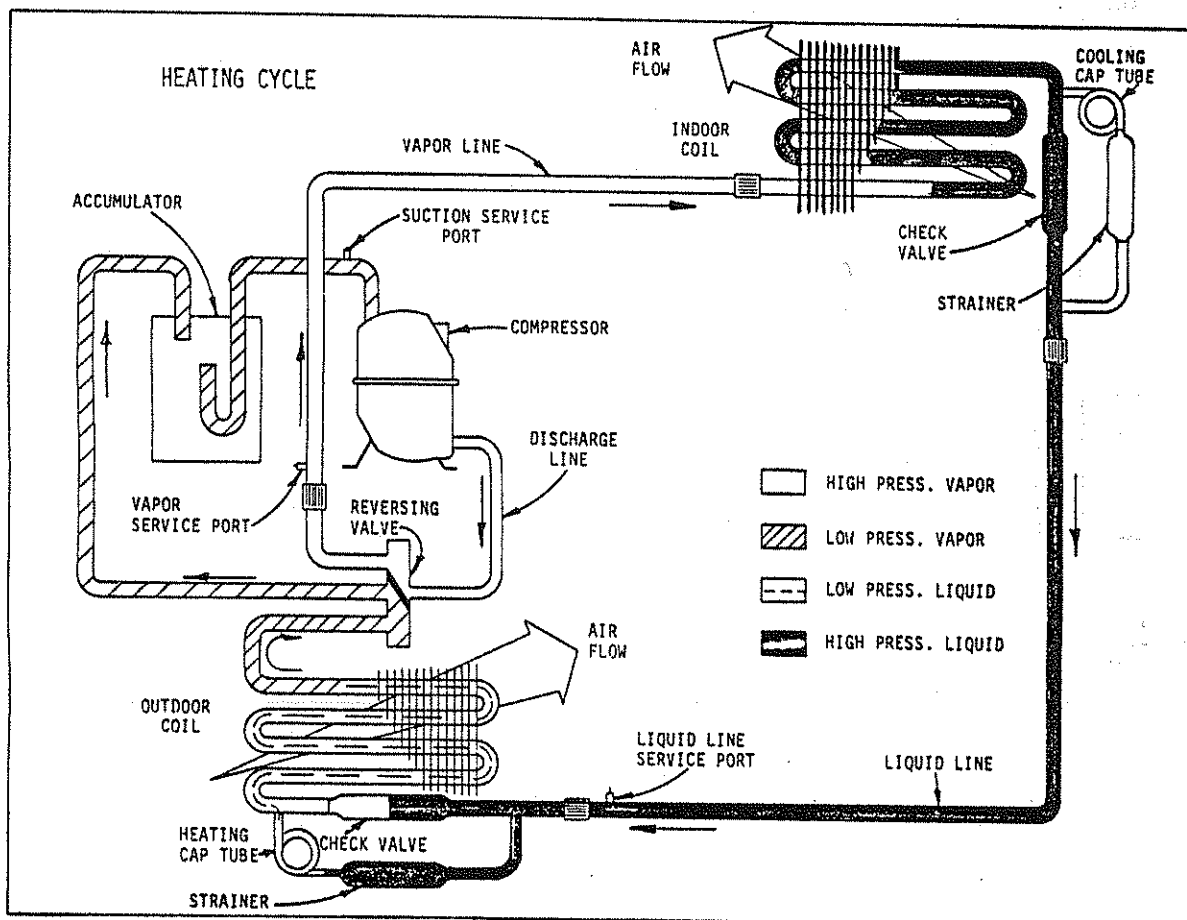
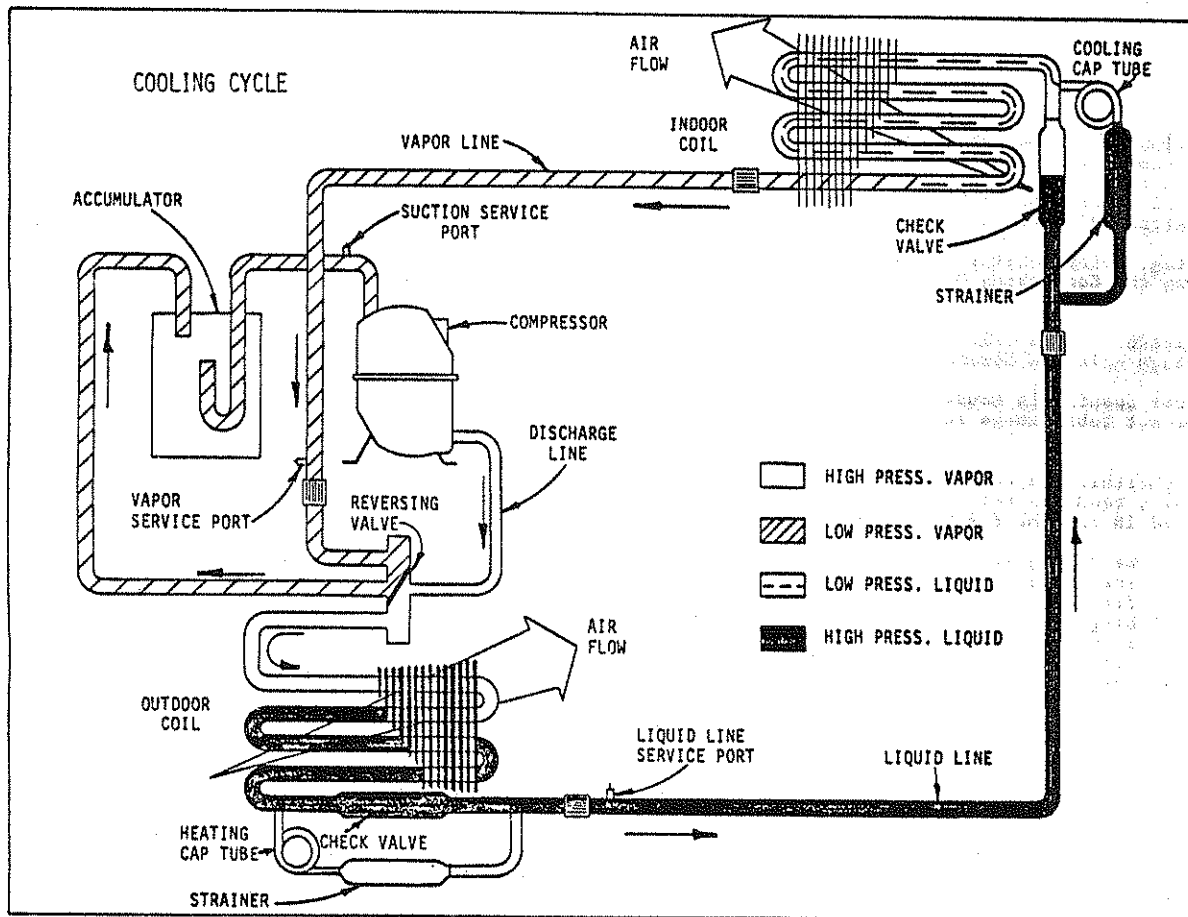
Use a wrench on the hex nut of the female fitting backing up the fitting with another wrench to keep tube from turning. Tighten the fittings together until they bottom out then tighten for an additional 1/4 turn so that coupling will seat properly.

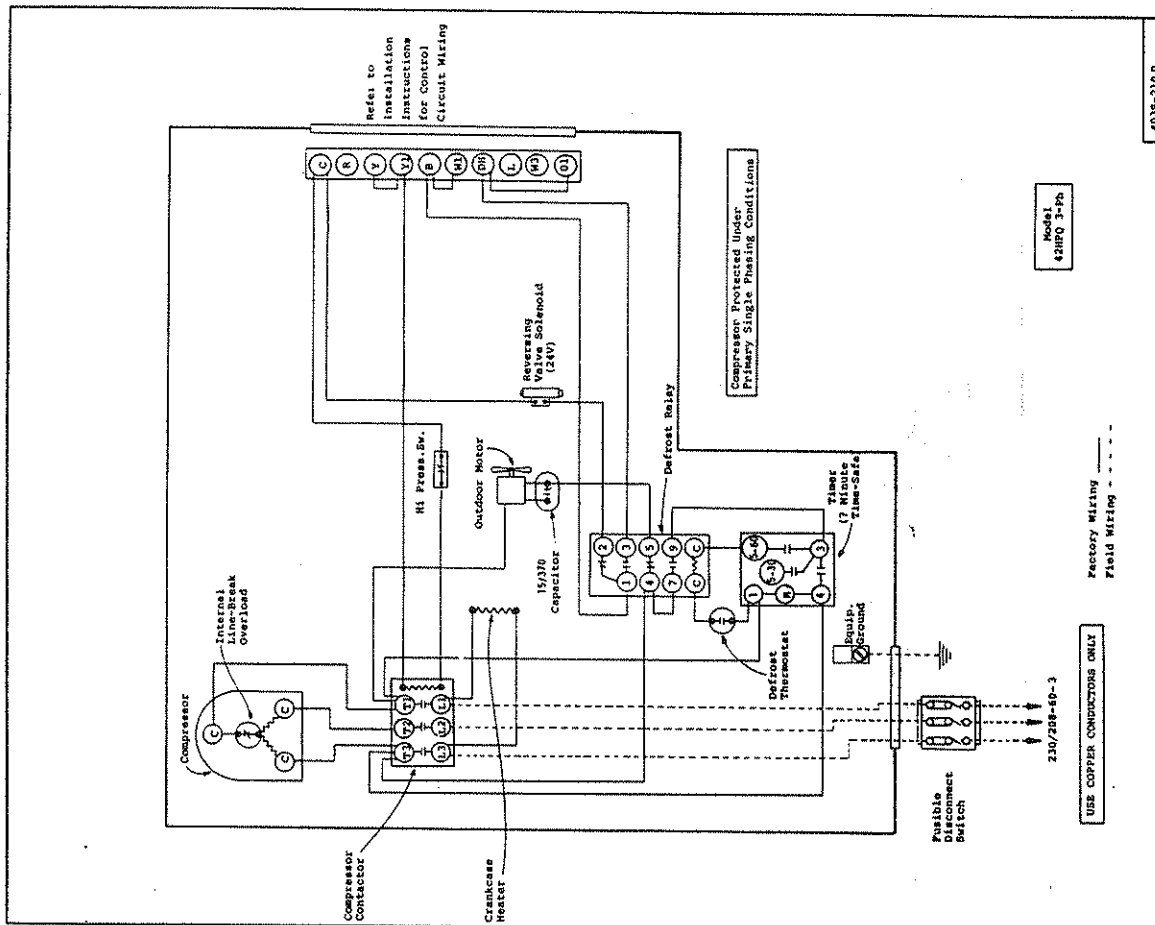
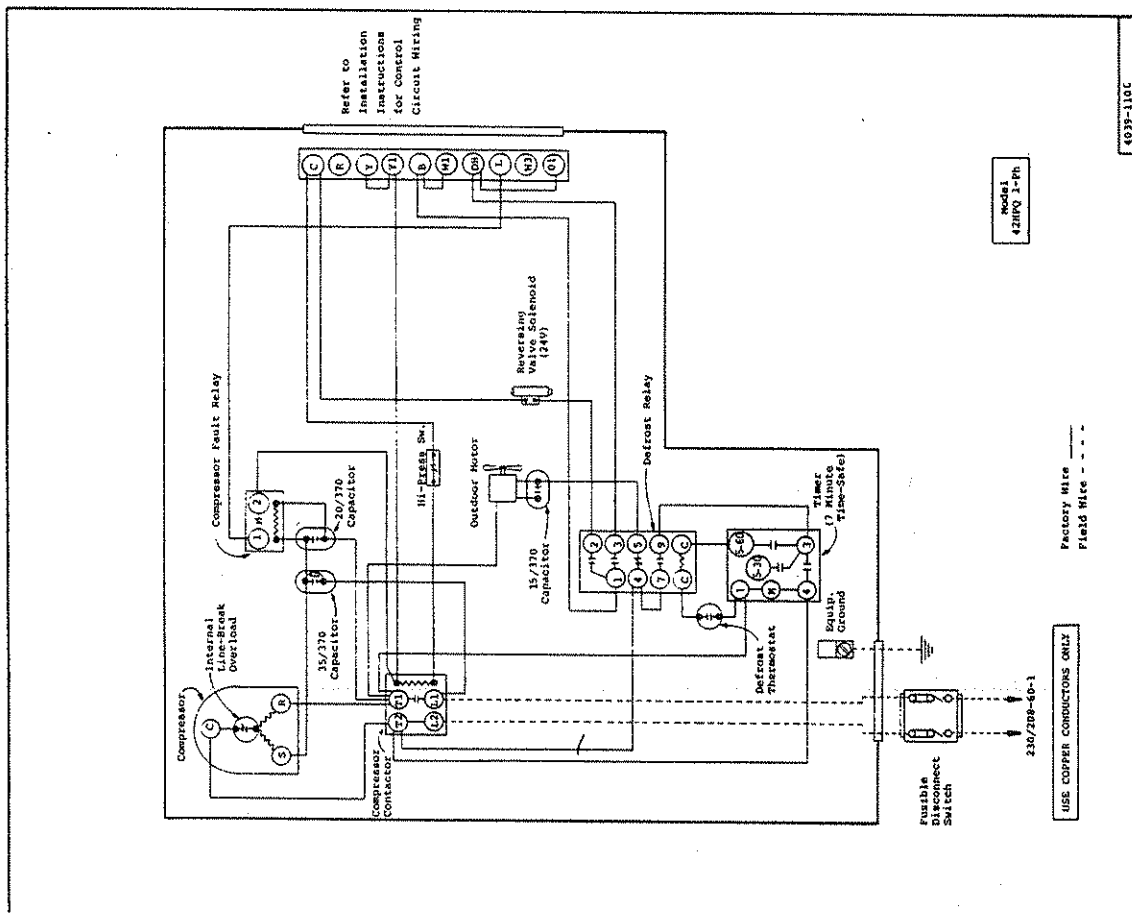
Check the gauge port cap to make sure it is tight. If loose, tighten, being careful not to tighten too much as it will damage the valve in the gauge port.

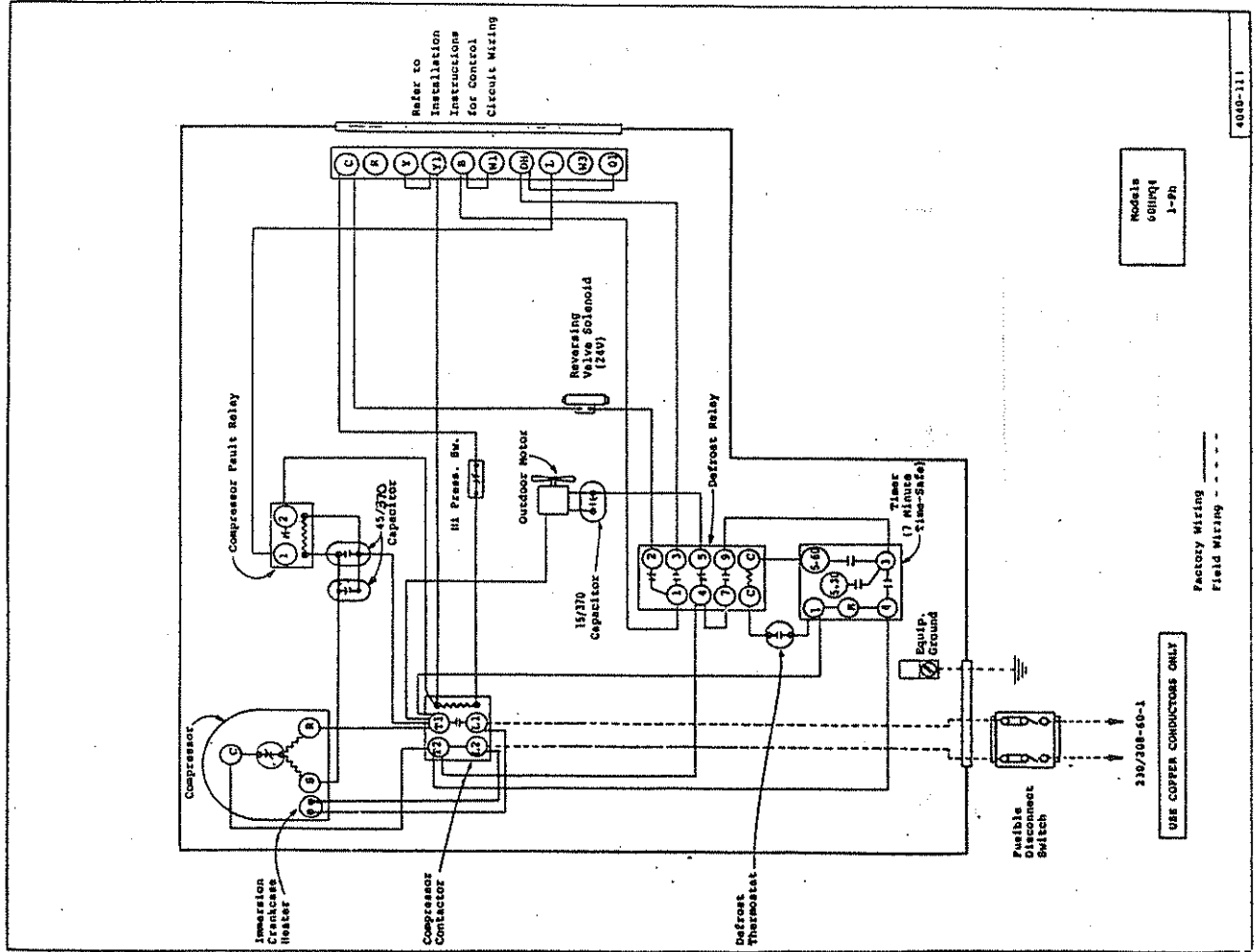
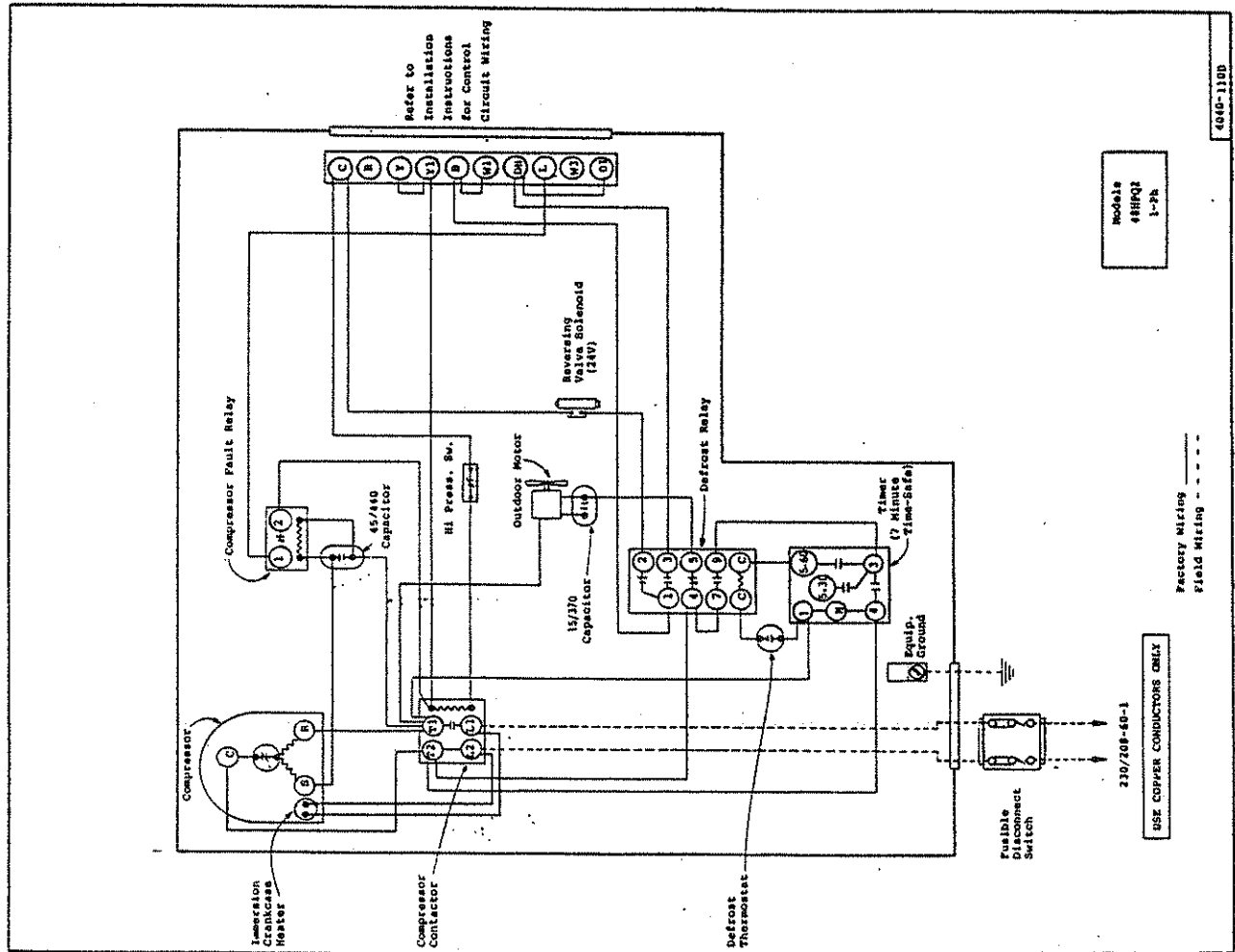
Leak test all connections using an Electronic Leak Detector or a Halide Torch.

When tubing is installed in attics or drop ceiling, insulate the quick connect fitting on the larger tube thoroughly with 3/8" wall thickness, closed cell sponge tube insulation or equivalent. Failure to insulate will result in water damage to ceiling since the fitting will "sweat" and drop water on the ceiling.



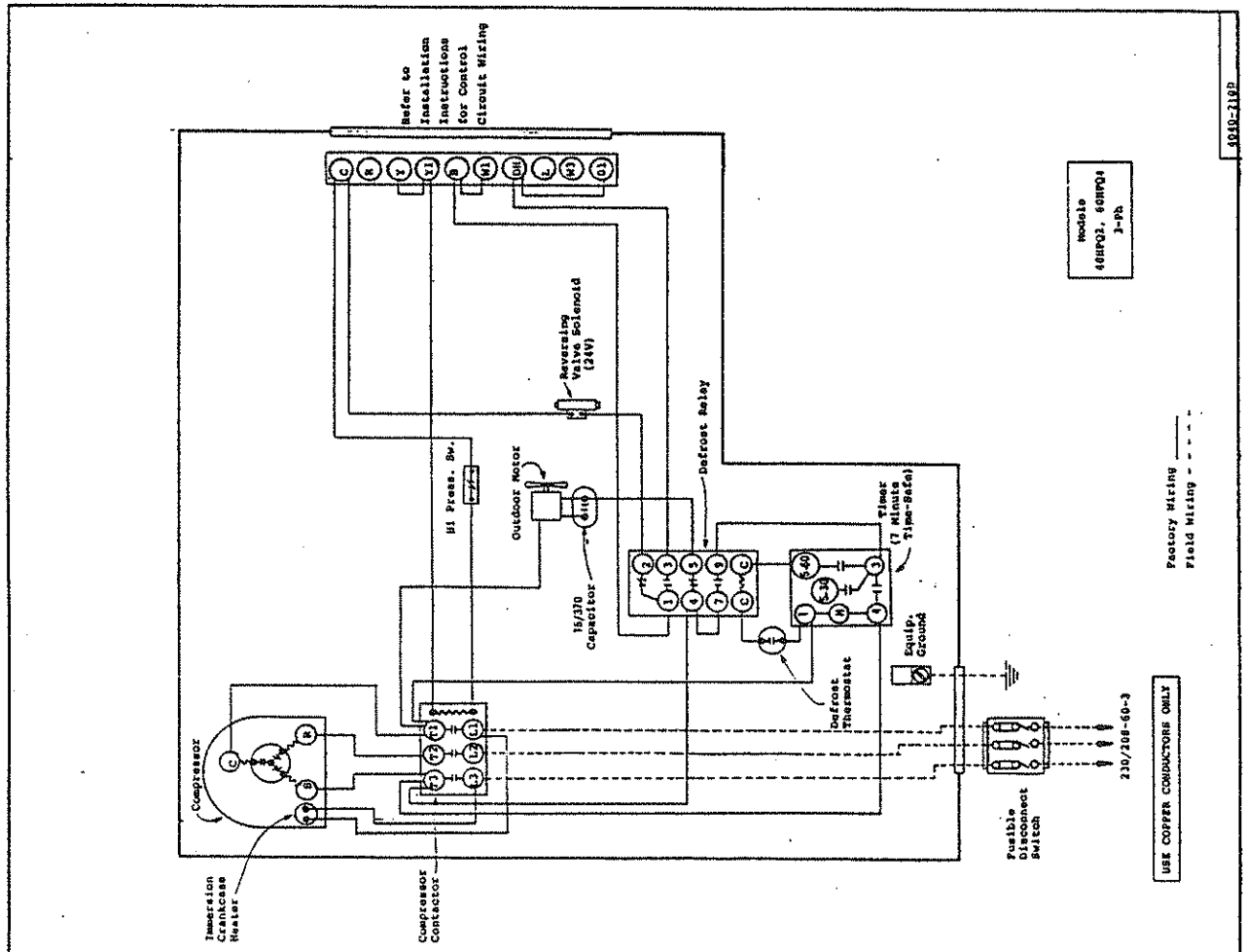
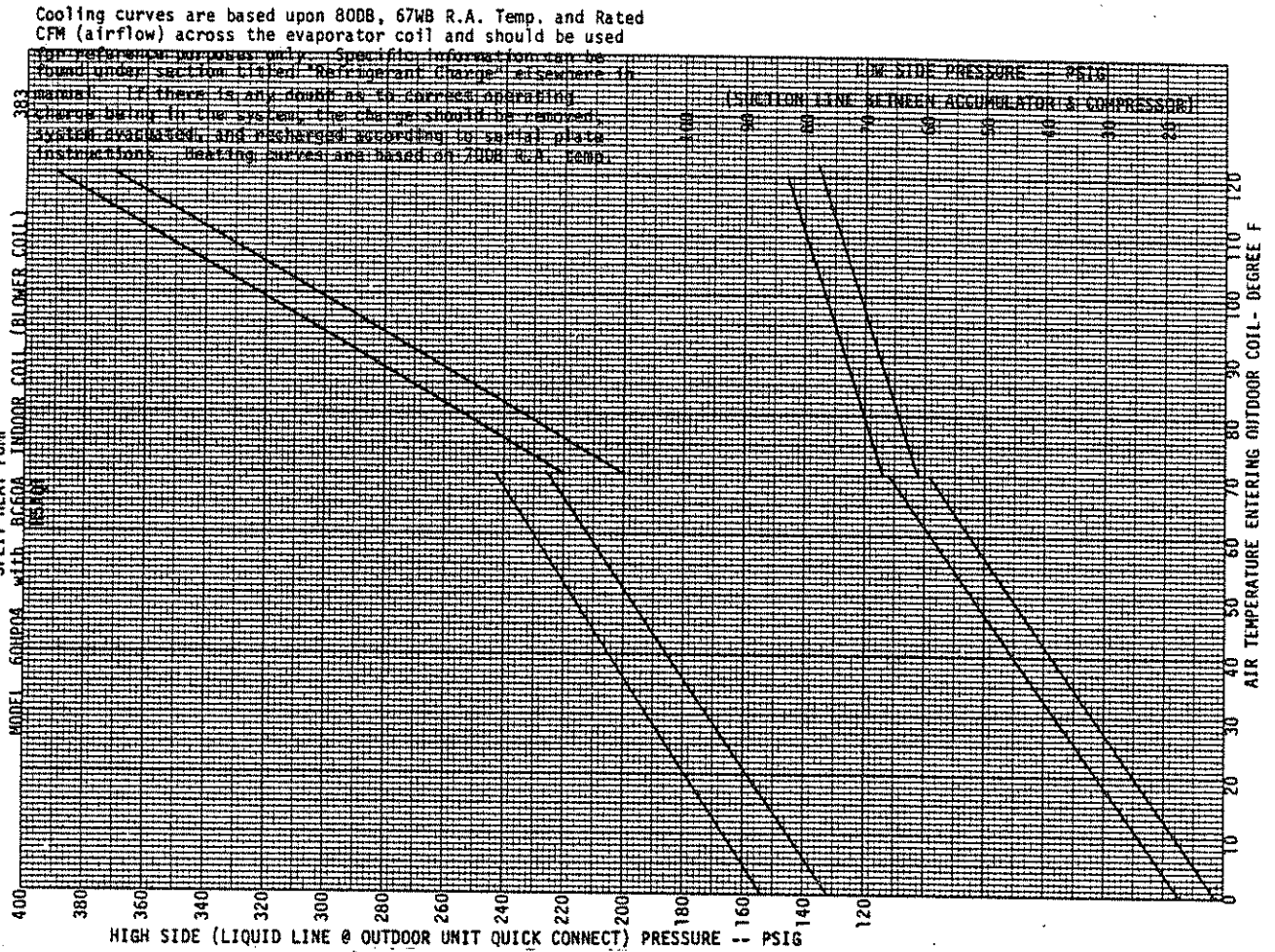






**BARD MANUFACTURING CO.
SPLIT HEAT PUMP**

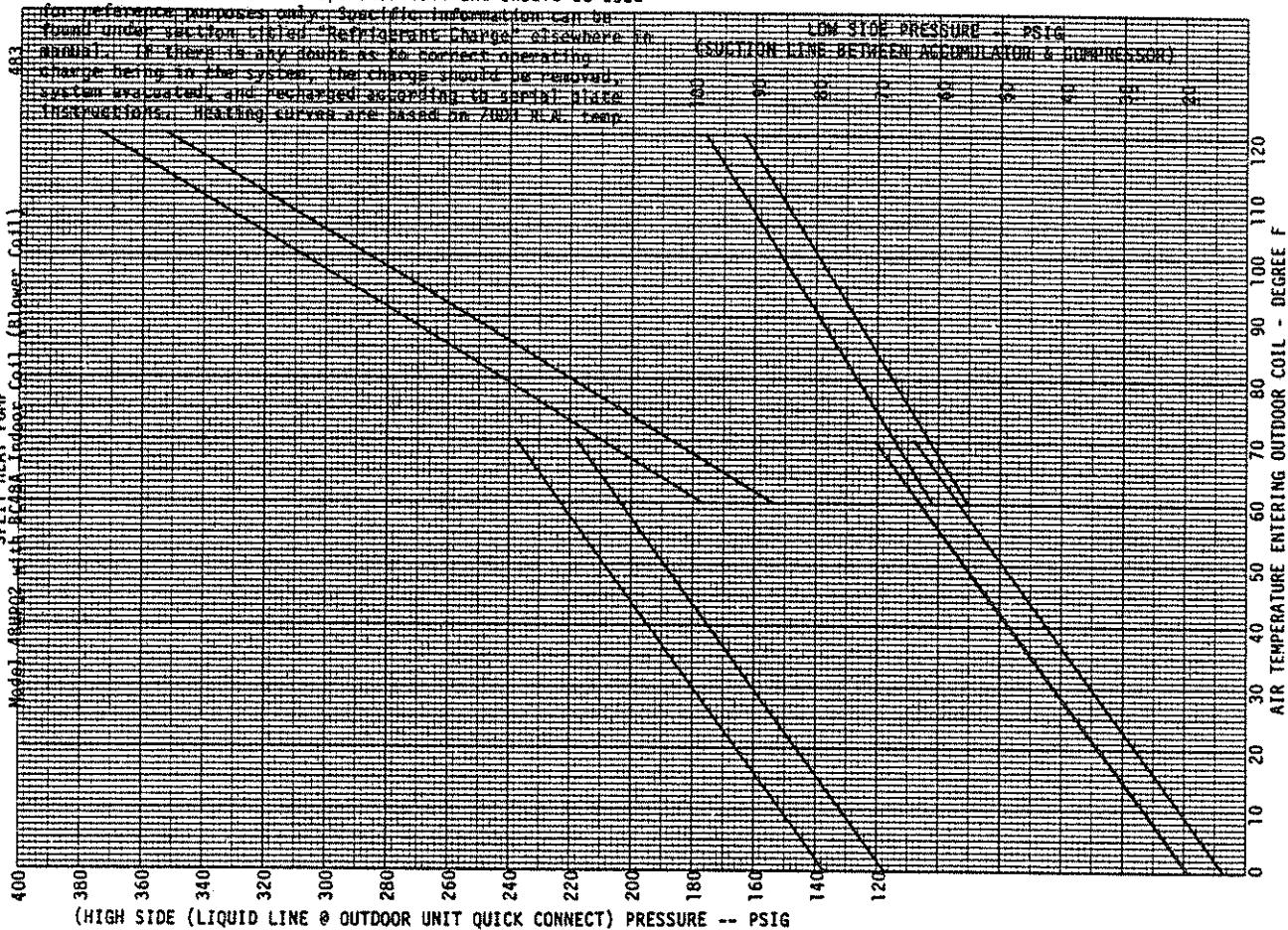
MODEL 60HPQ4 with RC504 INDOOR COIL (BLOWER COIL)



Cooling curves are based upon 80DB, 67WB R.A. Temp. and Rated CFM (airflow) across the evaporator coil and should be used

for reference purposes only. Specific information can be found under 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 on 70WB R.A. temp.

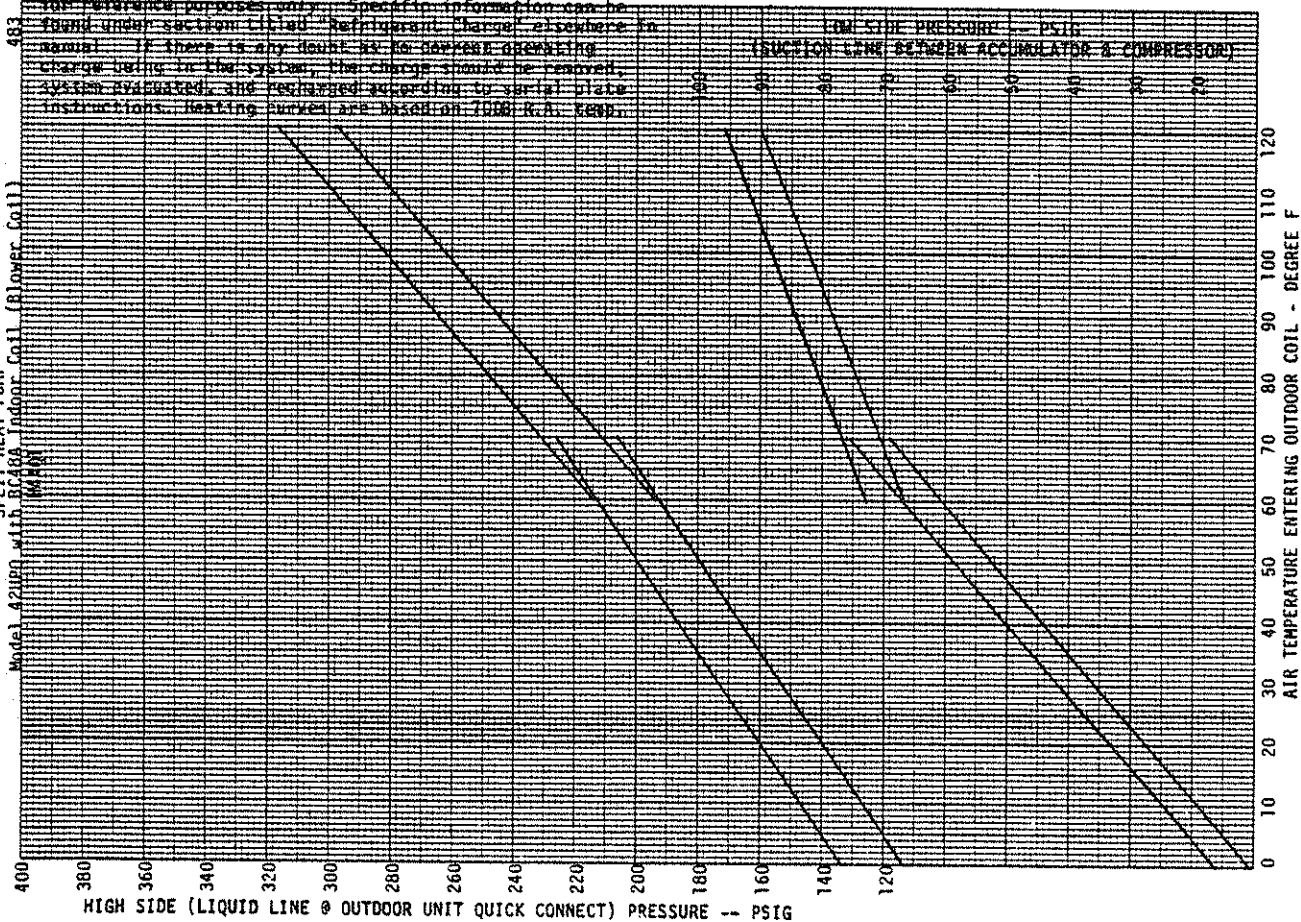
BARD MANUFACTURING CO.
SPLIT HEAT PUMP



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BARD MANUFACTURING CO.
SPLIT HEAT PUMP



PARTS LIST
SPLIT SYSTEM HEAT PUMPS

PART NO.	DESCRIPTION	18HPQ2	24HPQ2	30HPQ4	36HPQ4	36HPQ4-3	42HPQ	42HPQ-3	48HPQ2	48HPQ2-3	60HPQ4	60HPQ4-3	36HPQ-3	42HPQ-3	48HPQ2-3	48HPQ2-3	60HPQ4-3	460V	60HPQ4-3
8401-016	Contactor - Comp. 35A																		
8605-001	Crankcase Heater																		
8408-004	Defrost Mounting Plate																		
8408-002	Defrost Thermostat																		
5151-001	Fan Blade TF1839																		
5151-007	Fan Blade TP2029																		
5151-017	Fan Blade FA2430-4B																		
7051-009	Grille - Condenser																		
7051-010	Wire Grille - Inlet																		
7051-001	Grille - Condenser																		
7051-003	Wire Grille - Inlet																		
7051-005	Grille - Condenser																		
7051-004	Wire Grille - Inlet																		
8406-010	High Pressure Switch																		
8406-011	High Pressure Switch																		
8103-008	Motor - Fan 1/5																		
8103-009	Motor - Fan 1/5																		
8105-021	Motor - Fan 1/3																		
8200-001	Motor Mount - Fan																		
8200-004	Motor Mount - Fan																		
5220-008	Muffler - Discharge																		
8201-023	Relay - Defrost																		
8201-015	Relay - Emergency Heat																		
8201-024	Relay - Compressor Fault																		
5650-004	Reversing Valve																		
5650-005	Reversing Valve																		
5650-009	Reversing Valve																		
5650-006	Reversing Valve																		
5650-010	Reversing Valve																		
5650-008	Solenoid Coil																		
5210-002	Strainer																		
5210-005	Strainer																		
8607-007	Terminal Block																		
8607-011	Terminal Board																		
8612-008	Timer																		
8612-011	Timer																		
8407-003	Transformer - Stepdown																		

PARTS LIST
SPLIT SYSTEM HEAT PUMPS

PART NO.	DESCRIPTION	18HPQ2	24HPQ2	30HPQ4	36HPQ4	36HPQ4-3	42HPQ	42HPQ-3	48HPQ2	48HPQ2-3	60HPQ4	60HPQ4-3	36HPQ-3	42HPQ-3	48HPQ2-3	48HPQ2-3	60HPQ4-3	460V	60HPQ4-3
5202-001	Accumulator																		
5202-003	Accumulator																		
5202-004	Accumulator																		
5202-007	Accumulator																		
5202-005	Accumulator																		
8552-002	Capacitor 5/370V																		
8552-007	Capacitor 20/15-370V																		
8552-027	Capacitor 25/370V																		
8552-030	Capacitor 40/440V																		
8552-032	Capacitor 35/370V																		
8552-033	Capacitor 20/370V																		
8552-031	Capacitor 45/440V																		
8552-026	Capacitor 15/370V																		
8552-035	Capacitor 40/370V																		
8552-043	Capacitor 45/370V																		
5811-007	Capillary tube - Heat																		
5811-021	Capillary tube - Heat																		
5811-020	Capillary tube - Heat																		
5811-023	Capillary tube - Heat																		
5811-018	Capillary tube - Heat																		
5811-025	Capillary tube - Heat																		
5651-036	Check Valve																		
8000-061	Compressor RES3-0175-PFV-270																		
8000-071	Compressor AB225HT																		
8000-052	Compressor CRG1-0250-PFV-270																		
8000-072	Compressor AV144ET																		
8000-064	Compressor CRK1-0325-TF5																		
8000-045	Compressor H2EA413AB																		
8000-046	Compressor H2EA413DB																		
8000-026	Compressor AG5546E																		
8000-030	Compressor AG111RT																		
8000-074	Compressor AG134ET																		
8000-075	Compressor AG134RT																		
8000-065	Compressor CRK1-0325-TFD																		
8000-010	Compressor AH302TT																		
8000-047	Compressor AG111UT																		
8000-049	Compressor AG133UT																		
5051-008	Condenser Coil																		
5051-003	Condenser Coil																		
5051-021	Condenser Coil																		
5051-029	Condenser Coil																		
8401-007	Contactor - Comp. 25A																		
8401-003	Contactor - Comp. 30A																		
8401-002	Contactor - Comp. 25A																		
8401-011	Contactor - Comp. 30A																		

Minimum Net Billing \$15.00. Supersedes all previous lists.
Subject to change without notice. F.O.B. Bryan, Ohio