

# **OPERATING & INSTALLATION INSTRUCTIONS**

## **Model HC Electric Defrost Unit Coolers**

### **1. LOCATION RECOMMENDATIONS**

Electric defrost unit coolers must have proper air flow to maintain a uniform room temperature and have a complete defrost.

These units are draw thru design thus drawing air thru the cooling coil and discharging it into the room via the unit fans. For best performance it is desirable to arrange the air discharge toward the door of the cooler to minimize the entrance of warm moist air when the door is open. The unit must be at least 12 inches from the wall to assure proper air intake.

### **2. UNIT MOUNTING**

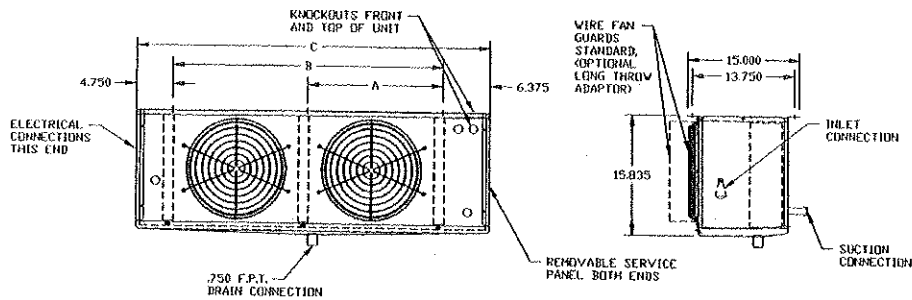
The unit cooler may be suspended with 3/8" diameter hanger rods or flush mounted to the ceiling using 5/16 minimum lag screws with flat washers. Rods should be double nutted top and bottom.

The unit must be level in all directions to insure proper drainage of condensate. Suspended units must have sufficient clearance above for cleaning the top.

Table 1 lists mounting dimensions and sizes of suction, liquid and drain connections.

TABLE 1

| MODEL NUMBERS | DIMENSIONS |     |         | CONNECTIONS |           |
|---------------|------------|-----|---------|-------------|-----------|
|               | A          | B   | C       | LIQUID      | SUCTION   |
| HC4E-042      |            | 18  | 29-1/8  | 1/2 ODS     | 5/8 ODS   |
| HC4E-068      |            | 27  | 38-1/8  | 1/2 ODS     | 7/8 ODS   |
| HC4E-084      |            | 36  | 47-1/8  | 1/2 ODS     | 7/8 ODS   |
| HC4E-099      |            | 54  | 65-1/8  | 1/2 ODS     | 7/8 ODS   |
| HC4E-126      |            | 54  | 65-1/8  | 1/2 ODS     | 7/8 ODS   |
| HC4E-133      | 36         | 72  | 83-1/8  | 1/2 ODS     | 1-1/8 ODS |
| HC4E-168      | 36         | 72  | 83-1/8  | 1/2 ODS     | 1-1/8 ODS |
| HC4E-210      | 54         | 90  | 101-1/8 | 1/2 ODS     | 1-1/8 ODS |
| HC4E-252      | 54         | 108 | 119-1/8 | 5/8 ODS     | 1-1/8 ODS |
| HC6E-039      |            | 18  | 29-1/8  | 1/2 ODS     | 5/8 ODS   |
| HC6E-063      |            | 27  | 38-1/8  | 1/2 ODS     | 7/8 ODS   |
| HC6E-094      |            | 36  | 47-1/8  | 1/2 ODS     | 7/8 ODS   |
| HC6E-117      |            | 54  | 65-1/8  | 1/2 ODS     | 7/8 ODS   |
| HC6E-140      |            | 54  | 65-1/8  | 1/2 ODS     | 1-1/8 ODS |
| HC6E-156      | 36         | 72  | 83-1/8  | 1/2 ODS     | 1-1/8 ODS |
| HC6E-187      | 36         | 72  | 83-1/8  | 1/2 ODS     | 1-1/8 ODS |
| HC6E-234      | 54         | 90  | 101-1/8 | 5/8 ODS     | 1-1/8 ODS |
| HC6E-281      | 54         | 108 | 119-1/8 | 5/8 ODS     | 1-3/8 ODS |



### 3. DRAIN LINE

The drain line should be as short and as steeply pitched as possible with a minimum of 1/4" drop per running foot. Any traps in the drain line must be located in an ambient above freezing. If the temperature surrounding the trap or drain line is below freezing it must be wrapped with a drain line heater. Be sure to also wrap the unit drain coupling. Cover the drain line, drain coupling and heat tape with insulation. Be sure to follow the manufacturer's recommendation when installing the drain line heat tape.

A union is recommended for ease of installation and future servicing. The union should be located as close to the drain pan as possible. Use two wrenches when tightening to prevent the drain fitting from twisting and damaging the unit.

Long runs of drain line, i.e. more than a few feet, should be supported by hangers to avoid damage to the drain pan.

#### 4. REFRIGERATION PIPING

System design must conform to all codes, laws and regulations applying to the site of installation. In addition the safety code for mechanical refrigeration, ASME B31.5, should be followed as a guide to safe practice.

Refrigerant line sizes and piping techniques should be obtained from the ASHRAE Guide or equivalent reference. Under no circumstances should the refrigerant connection size of the unit be used as the basis for sizing the lines.

The horizontal suction line should slope away from the unit toward the compressor. Vertical suction risers may require a trap at the bottom of the riser for proper oil return.

#### 5. REFRIGERANT DISTRIBUTOR

Distributor nozzles are included using a refrigerant distributor with a changeable nozzle design. The nozzle(s) are packed in individual plastic envelopes along with a retainer ring and instruction card. The instruction card tells what refrigerant the nozzle is to be used with. There may be 1, 2 or 3 envelopes with nozzles located near the distributor.

The nozzles provided with the unit have been selected for design conditions of 9°F to 11°F T.D. and 90°F liquid refrigerant at the expansion valve inlet. If the unit will be operated at conditions which are substantially different from these conditions it may be necessary to select a different size nozzle. Contact the factory for advice.

The nozzle must be installed before the expansion valve is installed. There are nozzle identification numbers stamped on one side of the nozzle. Be sure to insert the nozzle into the distributor with these numbers visible in case identification is required later. The nozzle is held in place by a retainer ring which is easily inserted or removed with a pair of needle nose pliers.

The standard distributor nozzles provided with the units are listed in Table 2.

TABLE 2

| MODEL NUMBERS | DISTRIBUTOR NOZZLE SELECTIONS |              |
|---------------|-------------------------------|--------------|
|               | R-22                          | R-404A/R-507 |
| HC4E-042      | L-1/3                         | L-3/4        |
| HC4E-068      | L-3/4                         | L-1          |
| HC4E-084      | L-3/4                         | L-1-1/2      |
| HC4E-099      | L-1                           | L-2          |
| HC4E-126      | L-1                           | L-2          |
| HC4E-133      | L-1-1/2                       | L-2-1/2      |
| HC4E-168      | L-1-1/2                       | L-3          |
| HC4E-210      | L-2                           | L-4          |
| HC4E-252      | J-2-1/2                       | J-4          |
| HC6E-039      | L-1/3                         | L-3/4        |
| HC6E-063      | L-1/2                         | L-1          |
| HC6E-094      | L-1                           | L-1-1/2      |
| HC6E-117      | L-1                           | L-2          |
| HC6E-140      | L-1-1/2                       | L-2-1/2      |
| HC6E-156      | L-1-1/2                       | L-3          |
| HC6E-187      | L-2                           | L-3          |
| HC6E-234      | J-2-1/2                       | J-4          |
| HC6E-281      | J-3                           | J-5          |

Distributor nozzle selections are based on -20°F suction temperature, 10°F T.D. and 85°F liquid temperature

## 6. EXPANSION VALVE

Expansion valve recommendations are listed in Table 3.

TABLE 3

| MODEL NUMBERS | BTUH@<br>10°F T.D. | -20°F SUCTION TEMPERATURE       |                             | BTUH@<br>10°F T.D. | +20°F SUCTION TEMPERATURE |                       |                           |
|---------------|--------------------|---------------------------------|-----------------------------|--------------------|---------------------------|-----------------------|---------------------------|
|               |                    | R-22                            | R-404A OR R-507             |                    | R-134A                    | R-22                  | R-404A*                   |
| HC4E-042      | 4,300              | SBFVE-AA-ZP40                   | SBFSE-AA-ZP                 | 4,850              | SBFJE-AA-C                | SBFVE-AA-C            | SBFSE-AA-C                |
| HC6E-039      | 4,000              | EGVE-1/2-ZP40                   | EGSE-1/2-ZP                 | 4,500              | EGJE-1/4-C                | EGVE-1/3-C            | EGSE-1/4-C                |
| HC6E-063      | 6,500              | SBFVE-AA-ZP40                   | SBFSE-A-ZP                  | 7,600              | SBFJE-A-C                 | SBFVE-AA-C            | SBFSE-A-C                 |
| HC4E-068      | 7,000              | EGVE-3/4-ZP40                   | EGSE-1/2-ZP                 | 8,100              | EGJE-1/2-C                | EGVE-3/4-C            | EGSE-1/2-C                |
| HC4E-084      | 8,600              | SBFVE-A-ZP40<br>EGVE-1-ZP40     |                             | 9,700              | SBFJE-A-C                 | SBFVE-A-C             | SBFSE-A-C                 |
| HC6E-094      | 9,600              |                                 |                             | 11,100             |                           |                       |                           |
| HC4E-099      | 10,200             | SBFVE-A-ZP40<br>EGVE-1-1/2-ZP40 | SBFSE-A-ZP<br>EGSE-1-ZP     | 11,700             | EGJE-1-C                  | EGVE-1-C              | EGSE-1-C                  |
| HC4E-126      | 12,900             |                                 |                             | 14,550             |                           |                       |                           |
| HC6E-117      | 12,000             | SBFVE-A-ZP40<br>EGVE-1-1/2-ZP40 | SBFSE-B-ZP<br>EGSE-1-1/2-ZP | 13,500             | SBFJE-B-C                 | EGVE-1-1/2-C          | SBFSE-B-C<br>EGSE-1-1/2-C |
| HC4E-133      | 13,600             |                                 |                             | 15,800             |                           |                       |                           |
| HC6E-140      | 14,400             | SBFVE-B-ZP40<br>EGVE-2-ZP40     | SBFSE-B-ZP<br>EGSE-1-1/2-ZP | 16,600             | EGJE-1-1/2-C              | SBFVE-B-C<br>EGVE-2-C | SBFSE-B-C<br>EGSE-1-1/2-C |
| HC4E-168      | 17,200             |                                 |                             | 18,500             |                           |                       |                           |
| HC6E-156      | 16,000             | SBFVE-B-ZP40<br>EGVE-2-ZP40     | SBFSE-B-ZP<br>EGSE-2-ZP     | 19,400             | SBFJE-C-C                 | SBFVE-B-C<br>EGVE-2-C | SBFSE-B-C<br>EGSE-1-1/2-C |
| HC6E-187      | 19,200             |                                 |                             | 22,200             |                           |                       |                           |
| HC4E-210      | 21,500             | SBFVE-B-ZP40<br>EGVE-3-ZP40     | SBFSE-C-ZP<br>SSE-3-ZP      | 24,250             | EGJE-2-C                  | SBFVE-B-C<br>EGVE-3-C | SBFSE-C-C<br>EGSE-2-C     |
| HC4E-252      | 25,800             |                                 |                             | 29,100             |                           |                       |                           |
| HC6E-234      | 24,000             | SBFVE-C-ZP40<br>EGVE-4-ZP40     |                             | 27,800             |                           |                       |                           |
| HC6E-281      | 28,800             |                                 |                             | 33,300             |                           |                       |                           |

\* If R507 is used, change S to P. Example: SBFSE-B-C (R-404A) becomes SBFPE-B-C (R-507).

Before installing the unit, install the expansion valve and connect the equalizer tube (not required on single fan units).

Expansion valves are adjusted at the factory prior to shipment. The setting will be okay for many applications, but in other applications adjustments may need to be made.

It is important that the operation of the expansion valve be checked out after the system has balanced out at the desired room temperature. If the coil is being starved it is necessary to reduce the superheat setting of the valve by turning the adjusting stem counter-clockwise. If the superheat is too low it is necessary to increase the superheat setting of the valve by turning the adjusting stem clockwise. It is recommended that for a 10°F to 12°F T.D. system, the valve should be adjusted to maintain 5°F to 6°F superheat.

To prevent overshooting the desired setting, only one turn of the stem should be made at a time. As much as 30 minutes may be required for the new balance to take place after an adjustment is made. Always tighten the adjusting stem packing nut and replace the seal cap tightly after the adjustment is complete.

**7. WIRING**

The electrical data for the unit is marked on the unit nameplate. Field wiring should comply with N.E.C. and local codes. The field wiring compartment is constructed as part of the unit cooler enclosure. Wiring connections are made at the terminal block(s) provided inside the unit on the end opposite the refrigerant connections. The unit must be grounded. Refer to Table 4 for unit amps.

**TABLE 4**

| MODEL NUMBERS | TOTAL FAN MOTOR AMPS |          |              |                 | DEFROST HEATER AMPS |              |          |
|---------------|----------------------|----------|--------------|-----------------|---------------------|--------------|----------|
|               | STANDARD MOTORS      |          | PSC MOTORS   | HEATER<br>WATTS | 208/230/60/1        | 208/230/60/3 | 460/60/1 |
|               | 208/230/60/1         | 460/60/1 | 208/230/60/1 |                 |                     |              |          |
| HC4E-042      | 1.1                  | 0.6      | 0.4          | 1000            | 4.4                 | 2.9          | 2.2      |
| HC6E-039      | 1.1                  | 0.6      | 0.4          | 1000            | 4.4                 | 2.9          | 2.2      |
| HC6E-063      | 2.2                  | 1.2      | 0.8          | 1600            | 7.0                 | 4.6          | 3.5      |
| HC4E-068      | 2.2                  | 1.2      | 0.8          | 1600            | 7.0                 | 4.6          | 3.5      |
| HC4E-084      | 2.2                  | 1.2      | 0.8          | 2000            | 8.8                 | 5.8          | 4.4      |
| HC6E-094      | 2.2                  | 1.2      | 0.8          | 2000            | 8.8                 | 5.8          | 4.4      |
| HC4E-099      | 3.3                  | 1.8      | 1.2          | 3000            | 13.2                | 8.7          | 6.6      |
| HC4E-126      | 3.3                  | 1.8      | 1.2          | 3000            | 13.2                | 8.7          | 6.6      |
| HC6E-117      | 3.3                  | 1.8      | 1.2          | 3000            | 13.2                | 8.7          | 6.6      |
| HC4E-133      | 4.4                  | 2.4      | 1.6          | 4000            | 17.6                | 11.6         | 8.8      |
| HC6E-140      | 3.3                  | 1.8      | 1.2          | 3000            | 13.2                | 8.7          | 8.8      |
| HC4E-168      | 4.4                  | 2.4      | 1.6          | 4000            | 17.6                | 11.6         | 8.8      |
| HC6E-156      | 4.4                  | 2.4      | 1.6          | 4000            | 17.6                | 11.6         | 8.8      |
| HC6E-187      | 4.4                  | 2.4      | 1.6          | 4000            | 17.6                | 11.6         | 8.8      |
| HC4E-210      | 5.5                  | 3.0      | 2.0          | 5000            | 22.0                | 14.5         | 11.0     |
| HC4E-252      | 6.6                  | 3.6      | 2.4          | 6000            | 26.4                | 17.4         | 13.2     |
| HC6E-234      | 5.5                  | 3.0      | 2.0          | 5000            | 22.0                | 14.5         | 11.0     |
| HC6E-281      | 6.6                  | 3.6      | 2.4          | 6000            | 26.4                | 17.4         | 13.2     |

Figure 1 illustrates the wiring for a single unit with the defrost heaters wired for 208/230/60/1 operation.

Figure 2 illustrates the wiring for a single unit with the defrost heaters wired for 208/230/60/1 operation controlled by a defrost contactor.

Figure 3 illustrates the wiring for a single unit with the defrost heaters wired for 208/230/60/3 operation.

Figure 4 illustrates the wiring for multiple units with the defrost heaters wired for 208/230/60/3 operation.

Figure 5 illustrates the wiring for a single unit with the defrost heaters wired for 460/60/1 operation.

When defrosting two or more units at one time with a single time clock the defrost termination thermostats must be wired in series as shown in Figure 4.

## 8. SEQUENCE OF OPERATION

### Step A. Normal Refrigeration Cycle

1. Power is supplied to "N" and "4" terminals by the timer.
2. The heater safety thermostat is closed. The fan delay thermostat is closed and the defrost termination thermostat is off.
3. The unit fans operate continually and the defrost heaters are off.
4. The compressor operates in accordance with the demand of the room thermostat. Frost slowly builds up on the evaporator fins.

### Step B. Defrost Cycle

1. Defrosting of the evaporator is started by the timer at predetermined intervals – Typical settings of the timer would be two defrost periods per 24 hour day.
2. The timer mechanically disconnects power to terminal "4" thus closing the liquid line solenoid valve and shutting off the evaporator fan motors. Simultaneously power is connected to timer terminal "3" which allows current to flow to the defrost heaters.
3. The heaters, embedded in slots in the coil face, give up heat directly to the evaporator fins. This heat raises the coil temperature to 32°F causing the frost to melt.
4. As the frost melts it drips into the heated drain pan and flows down the drain.
5. When the frost has completely melted from the coil (typical cycle length is 20 to 25 minutes) the coil continues to warm up above 32°F.
6. When the coil reaches the temperature setting of the defrost termination thermostat, it closes which allows current to flow to terminal "X" on the timer which energizes the switching solenoid in the timer. The timer disconnects power to terminal "3" thus turning off the defrost heaters. At the same instant power is connected to terminal "4" of the timer. The heater safety thermostat may open but under normal conditions it will remain closed. The heater safety thermostat would open only if the defrost termination thermostat fails to close. The timer has a fail safe (inner dial) which should be set for 30 minutes.

### Step C. Return to Normal Refrigeration Cycle

1. Because there is power at terminal "4" the liquid line solenoid opens and the compressor restarts.
2. The evaporator fan motor(s) remain off because the fan delay thermostat is open. This prevents warm air from being blown into the refrigerated area.
3. The evaporator coil cools down approaching operating temperature.
4. When the coil temperature reaches 25°F (approximately 2 to 3 minutes after defrost termination) the fan delay thermostat closes, thus allowing the fan motors to restart. The unit is now back in operation.

**NOTE:** On systems where the room temperature is above +25°F the fan delay thermostat may not close for an extended period of time. If the fan delay time is too long, it is permissible to install a jumper wire between terminals "F" and "B" at the unit. This allows the fans to turn on immediately after the defrost period.

## 9. PRE-STARTUP

Check fan set screws, electrical terminals and all other fasteners for tightness. Be sure the thermostatic expansion valve bulb is properly located and strapped.

Check the defrost timer to see that it is set for the correct time of day and the starting pins have been installed (normally two per day) and the fail safe (inner) dial has been set at 30 minutes.

When the system is first started up, the box temperature is typically above the opening temperature of the fan delay thermostat. The fans may remain off for a lengthy period of time. To prevent this it is permissible to install a temporary jumper wire between terminals "F" and "B". Once the box temperature is below +25°F the jumper wire should be removed.

## 10. REPLACEMENT PARTS

Listed below are the major replacement parts. When ordering parts it is imperative that you obtain the complete model and serial number of the unit.

|   | <u>Part #</u> |
|---|---------------|
| Fan Blade                                     | E206483       |
| Fan Guard                                     | E103789       |
| Motor Mount                                   | E206443       |
| Standard Shaded Pole Motor (208-230V)         | E206445       |
| Standard Shaded Pole Motor (460V)             | E206446       |
| Optional PSC Motor (208-230V)                 | E206448       |
| Defrost Termination Control                   | E206100       |
| Fan Delay Control                             | E201818       |
| Heater Safety Control (2 Wire)                | 10956         |
| Heater Safety Control (3 Wire)                | E206465       |
| Defrost Heater & Drain Pan Heater             |               |
| Models HC4E-042, HC6E-039                     | E206455       |
| Models HC6E-063, HC4E-068                     | E206456       |
| Models HC4E-084, HC6E-094                     | E206457       |
| Models HC4E-099, HC4E-126, HC6E-117, HC6E-140 | E206458       |
| Models HC4E-133, HC4E-168, HC6E-156, HC6E-187 | E206459       |
| Models HC4E-210, HC6E-234                     | E206460       |
| Models HC4E-252, HC6E-281                     | E206461       |

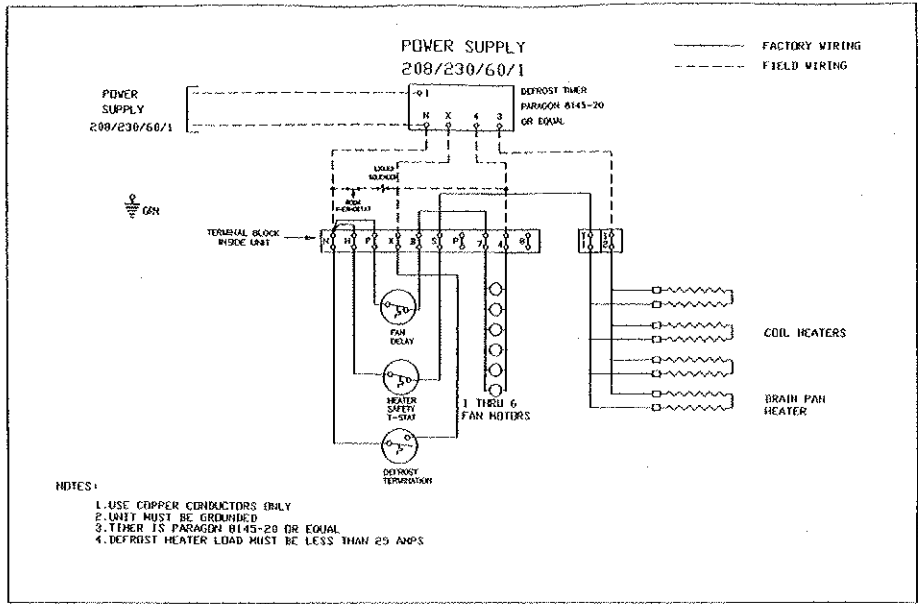


Figure 1 Typical System Wiring 208/230/60/1 (Timer Only)

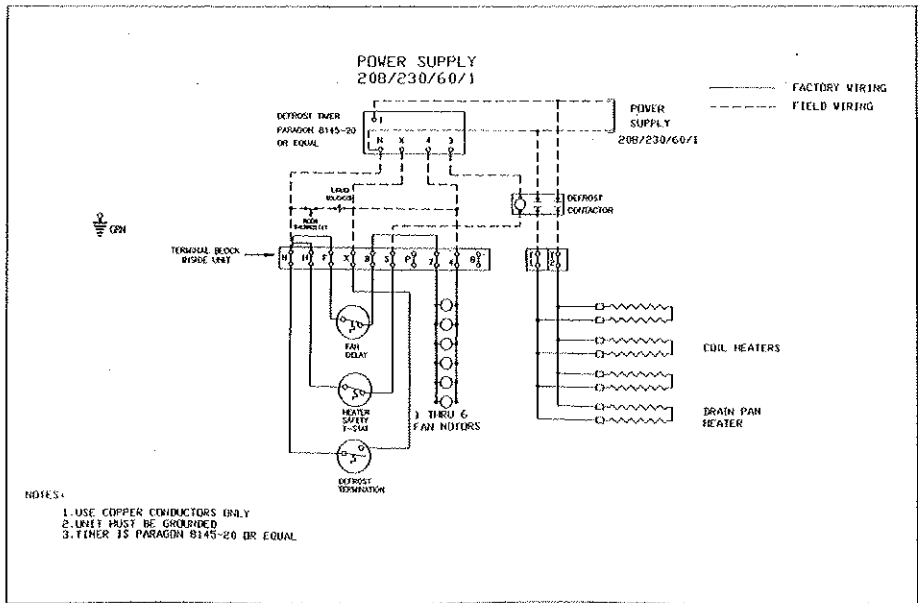


Figure 2 Typical System Wiring 208/230/60/1 (Timer & Defrost Contactor)



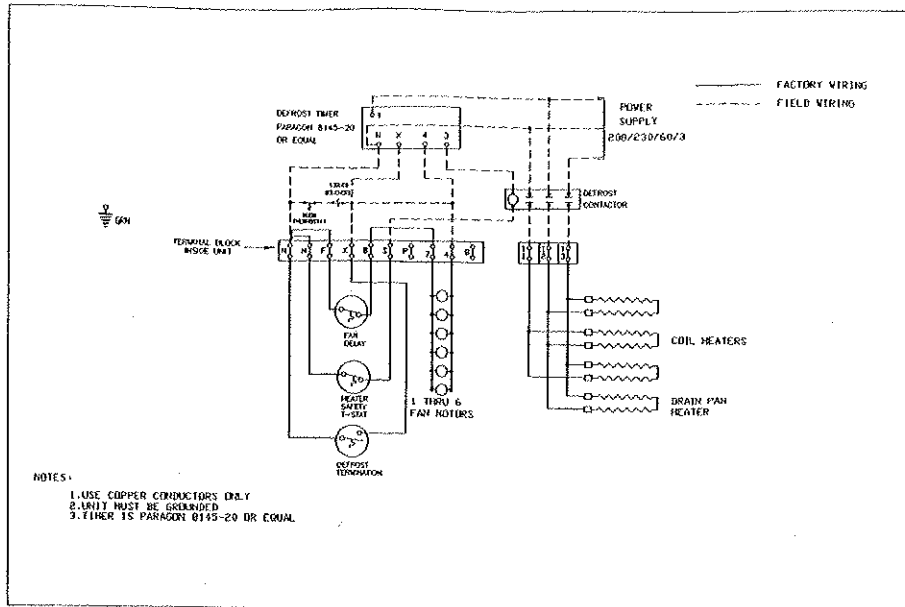


Figure 3 Typical System Wiring 208/230/60/3

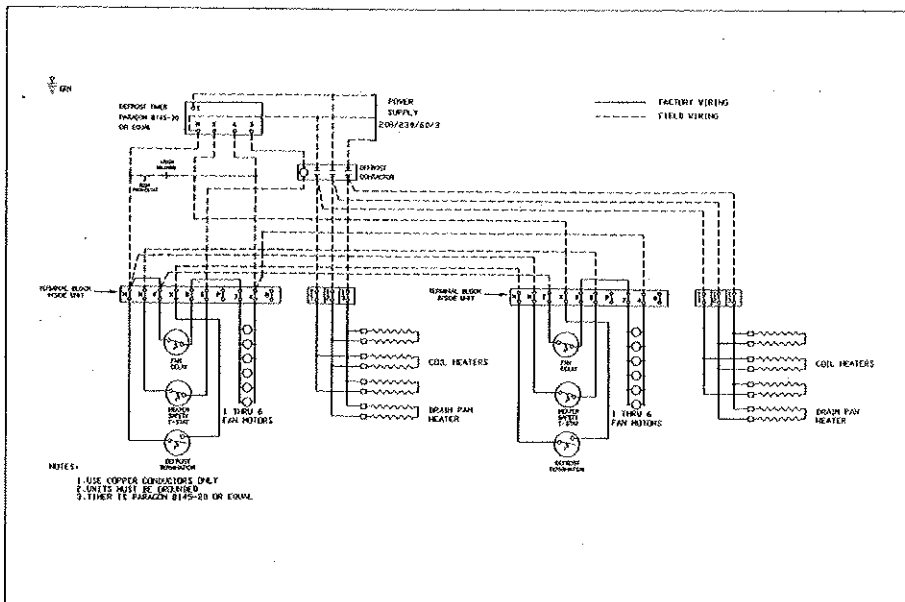


Figure 4 Typical System Wiring -- Multiple Evaporators 208/230/60/3

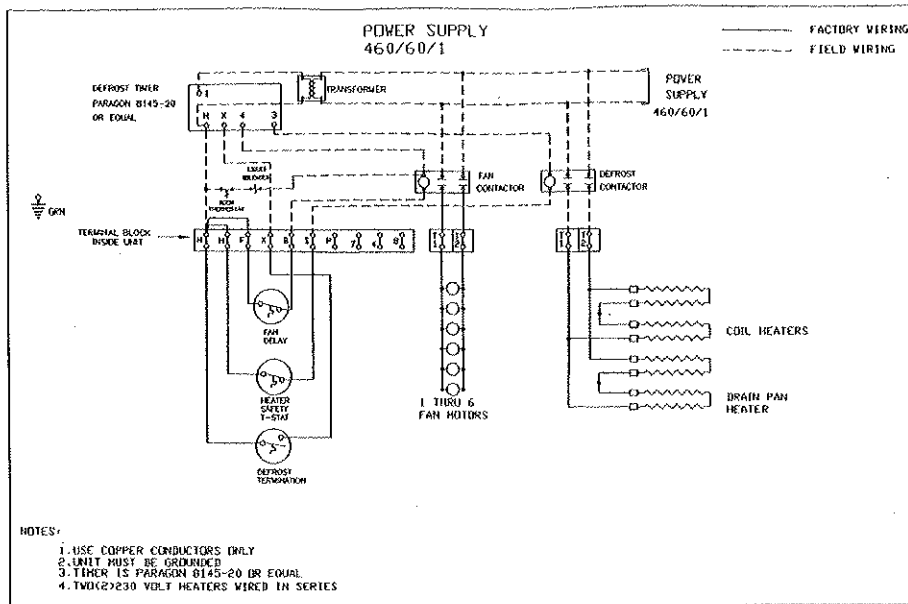


Figure 5 Typical System Wiring 460/60/1



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