GL/GH Series

GENTLE AIR UNIT COOLERS

Installation and Operation Manual

Part Number: E104493_M

Products that provide lasting solutions.

BEFORE YOU BEGIN

Read the safety information completely and carefully.

The precautions and use of the procedures described herein are intended to use the product correctly and safely. Comply with the precautions described below to protect you and others from possible injuries. Relative to their potential danger, the relevant matters are divided into four parts as defined by ANSI Z535.5

ANSI Z535.5 DEFINITIONS

- **DANGER** – Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** – Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** – Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE** – *Not related to personal injury* – Indicates[s] situations, which if not avoided, could result in damage to equipment.

* *

Environmental Concerns

Hussmann recommends responsible handling of refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those that contain Hydrogen, Chlorine, Fluorine, and Carbon (HCFCs). Only certified technicians may handle these refrigerants. All technicians must be aware and follow the requirements set forth by the Federal Clean Air Act (Section 608) for any service procedure being performed on this equipment that involves refrigerant. Additionally, some states have other requirements that must be adhered to for responsible management of refrigerants.

⚠ WARNING

PERSONAL PROTECTION EQUIPMENT (PPE)

Only qualified personnel should install and service this equipment. Personal Protection Equipment (PPE) is required whenever servicing this equipment. Wear safety glasses, gloves, protective boots or shoes, long pants, and a long-sleeve shirt as required when working with this equipment. Observe all precautions on tags, stickers, labels and literature attached to this equipment.

⚠ CAUTION

Contractors shall strictly adhere to specifications provided by the Engineer of Record (EOR), as well as US Environmental Protection Agency regulations, OSHA regulations, and all other federal, state and local codes. This work should only be done by qualified, licensed contractors. There are numerous hazards, not limited to, but including: burns due to high temperatures, high pressures, toxic substances, electrical arcs and shocks, very heavy equipment with specific lift points and structural constraints, food and product damage or contamination, public safety, noise, and possible environmental damage. Never leave operating compressors unattended during the manual soft-start process. Always power rocker switches off when unattended.

⚠ WARNING

Proper Field Wiring and Grounding Required! Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

⚠ WARNING

— LOCK OUT / TAG OUT —

To avoid serious injury or death from electrical shock, always disconnect the electrical power at the main disconnect when servicing or replacing any electrical component. This includes, but is not limited to, such items as controllers, electrical panels, condensers, lights, fans, heaters.

FOR CALIFORNIA INSTALLATIONS ONLY:

⚠ WARNING:

Cancer and Reproductive Harm
www.P65Warnings.ca.gov

August 31, 2018 3069378

⚠ CAUTION

This manual was written in accordance with originally prescribed equipment that is subject to change. Hussmann reserves the right to change all or part of the equipment for future stores such as, but not limited to, controllers, valves and electrical specifications. It is the installers responsibility to reference the refrigeration drawings supplied for each installation, as directed by the Engineer of Record.

This warning does not mean that Hussmann products will cause cancer or reproductive harm or is in violation of any product-safety standards or requirements. As clarified by the California State government, Proposition 65 can be considered more of a 'right to know' law than a pure product safety law. When used as designed, Hussmann believes that our products are not harmful. We provide the Proposition 65 warning to stay in compliance with California State law. It is your responsibility to provide accurate Proposition 65 warning labels to your customers when necessary. For more information on Proposition 65, please visit the California State government website.

⚠ WARNING

This equipment is prohibited from use in California with any refrigerants on the "List of Prohibited Substances" for that specific end-use, per California Code of Regulations, title 17, section 95374.

Use in other locations is limited to refrigerants permitted by country, state, or local laws and is the responsibility of the installer/end-user to ensure only permitted refrigerants are used.

This disclosure statement has been reviewed and approved by Hussmann and Hussmann attests, under penalty of perjury, that these statements are true and accurate.

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CHARTS

FIGURES

1 RECEIPT OF EQUIPMENT

1.1 *INSPECTION*

All equipment should be carefully checked for damage or shortages as soon as it is received. Each shipment should be carefully checked against the bill of lading. If any damage or shortage is evident, a notation must be made on the delivery receipt before it is signed, and a claim should then be filed against the freight carrier.

1.2 *LOSS OF GAS HOLDING CHARGE*

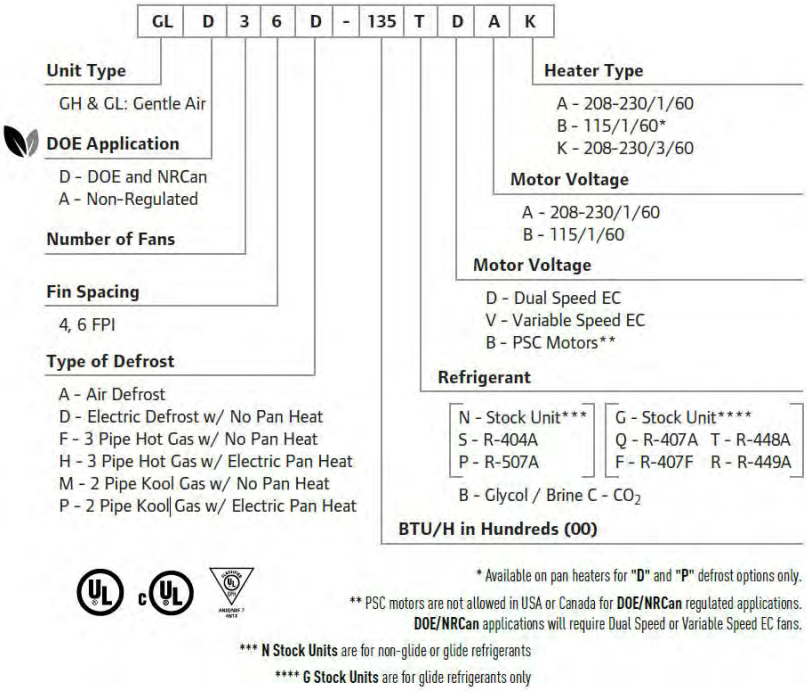
Each unit cooler is leak tested, evacuated to remove moisture and then shipped with a gas holding charge. Absence of this charge may indicate a leak has developed in transit. The system should not be charged with refrigerant until it is verified that there is no leak, or the source of the leak is located.

2 UNIT INFORMATION AND DIMENSIONS

2.1 *MODELS COVERED*

GL Series Low Silhouette Unit Coolers.
GH Series High Silhouette Unit Coolers

The GL and GH series are designed for medium temperature low air circulation application in spaces above 20°F (-6.7°C). GL/GH unit coolers blow air uniformly through twin coils creating a low velocity "umbrella" air distribution. Also known as GA series GL/GH has three defrost options – air, electric and hot gas. The GA series is designed to be installed level and tight to ceiling.



Glide Refrigerants	
Dewpoint to bubble	TD
R-401A	9.8
R-401B	9.4
R-407A	10.5
R-407F	10.6
R-407H	11.4
R-409A	14.8
R-409B	13.5
R-417A	7.6
R-422A	7
R-422D	7
R-438A	10.8
R-448A	10.5
R-449A	9.7

Non-glide refrigerants	
Dewpoint to bubble	TD
R-134a	0
R-22	0
R-402A (HP80)	2.6
R-402B	3.1
R-404A	1
R-408A	0.7
R-410A	0.2
R-502	0
R-507A	0
R-513A	0.1

Additional refrigerants are shown in the TABLE classified as Glide and Non-Glide for selection of dual speed or variable speed motors to meet DOE/NRCan regulations.

2.2 *UNIT DIMENSIONS*

FIGURE 1: UNIT DIMENSIONS

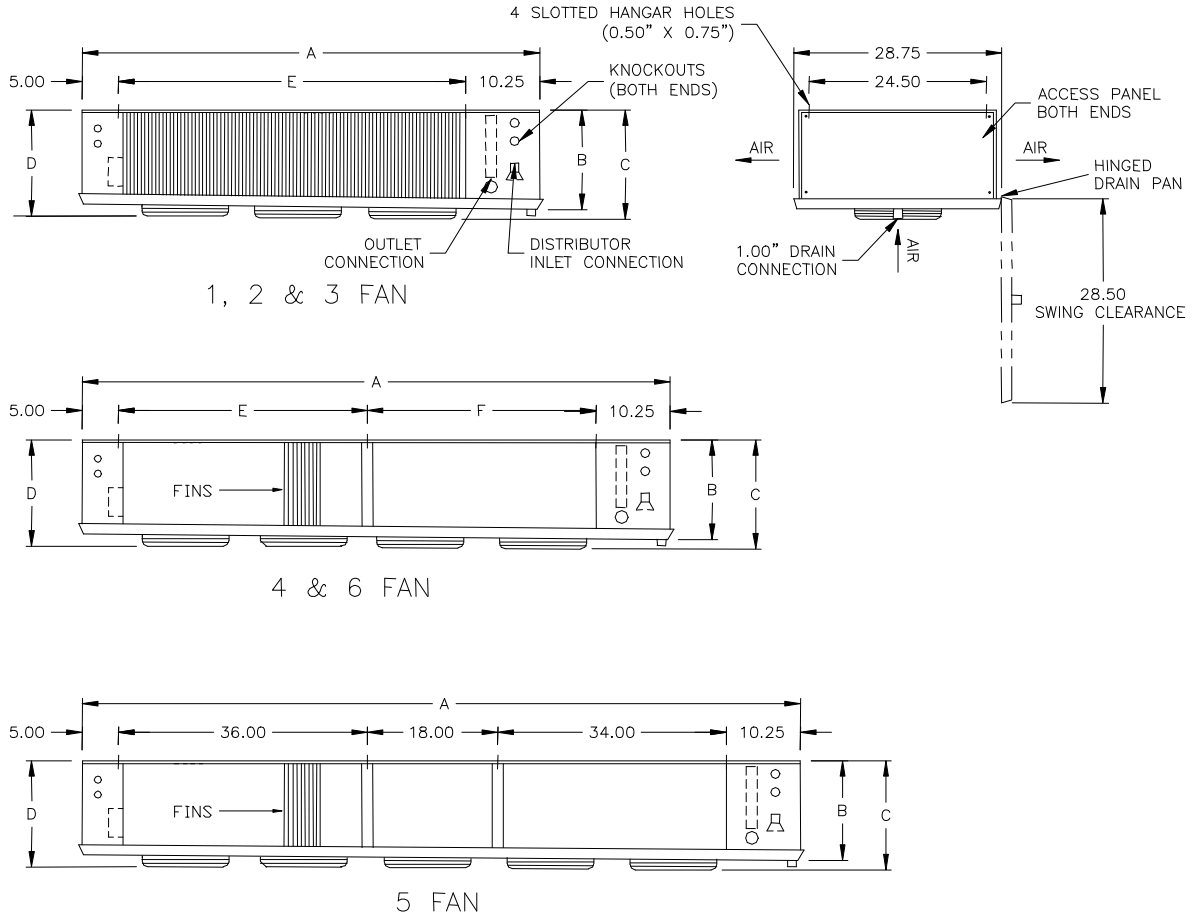


TABLE 1: UNIT DIMENSIONS

MODEL	A	B	C	D	E	F
GL-1	31.75	10.50	12.25	11.38	16.00	-
GL-2	49.75	10.50	12.25	11.38	34.00	-
GL-3	67.75	10.50	12.25	11.38	52.00	-
GL-4	85.75	10.50	12.25	11.38	36.00	34.00
GL-5	103.75	10.50	12.25	11.38	-	-
GL-6	121.75	10.50	12.25	11.38	54.00	52.00
GH-1	31.75	16.50	18.25	17.38	16.00	-
GH-2	49.75	16.50	18.25	17.38	34.00	-
GH-3	67.75	16.50	18.25	17.38	52.00	-
GH-4	85.75	16.50	18.25	17.38	36.00	34.00
GH-5	103.75	16.50	18.25	17.38	-	-
GH-6	121.75	16.50	18.25	17.38	54.00	52.00

3 UNIT LOCATION AND MOUNTING

3.1 *UNIT LOCATION*

Unit coolers must be located to provide good air circulation to all areas of the cooler. The unit cooler should be positioned to allow for even airflow on both sides of the coil. Light fixtures, shelving, and product boxes must be located so that they do not block the air intake or air discharge from the unit cooler.

IMPORTANT:
The coil face must be located a minimum of 12" from walls.

3.2 *MOUNTING*

The unit cooler should be suspended with 3/8" diameter hanger rods or flush mounted against the ceiling using 3/8" minimum lag screws with flat washers. Rods should have double nuts on the top and bottom. Adequate support must be provided to hold the weight of the unit.

The unit must be level in all directions to ensure proper drainage of the condensate. Where N.S.F. requirements must be met, unit cooler must be flush and sealed to ceiling.

4 PIPING INSTALLATION

4.1 *DRAIN LINE*

The drain line should be as short and as steeply pitched as possible with a minimum of ¼" drop per running foot. A drain line trap should be installed to prevent warm moist air from migrating through the drain line. Where multiple units are installed and share a common drain line but are defrosted independently from one another, each unit should have its own trap before it enters the common drain line.

If the temperature surrounding the drain line and trap is below freezing (32°F) it must be wrapped with a drain line heater and insulation. Be sure to also wrap the drain pan coupling. The drain line heater must be energized continuously. Be sure to follow the manufacturer's recommendation when installing the drain line heat tape.

A union at the drain connection in the drain pan 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.

4.2 *REFRIGERATION PIPING*

System design must conform to all local and national 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 for installation and operation 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 cooler toward the compressor. Vertical suction risers may require a trap at the bottom of the riser for proper oil return.

When connecting multiple unit coolers in series using a common suction line, the branch suction lines must enter the top of the common suction line. The branch lines must be sized for the evaporator capacity and the common suction line to be sized for the total system capacity.

For Food Service installations – seal any joint between unit cooler and cooler wall with a sealant Listed by the National Sanitation Foundation.

Special Instructions for Units Using Carbon Dioxide (R-744)

These unit coolers are intended to utilize carbon dioxide only in a secondary loop or a cascade system. As such, unit installation must comply with the following instructions:

A. If the refrigeration system is de-energized, venting of the R-744 through the pressure regulating relief valves on the refrigeration system can occur. In such cases, the system may need to be recharged with R-744, but in any case, the pressure regulating relief valve(s) are not to be defeated or capped. The relief setting shall not be altered.
B. Sufficient number of pressure relief and pressure regulating relief valves may need to be provided based on the system capacity and located such that no stop valve is provided between the relief valves and the parts or section of the system being protected.

To properly protect and control systems using pumped liquid overfeed R-744, the solenoid, isolation, and pressure relief valves shall be arranged as shown in either FIGURE 2 or 3, according to the solenoid valve arrangement. To handle the requirements of liquid R-744 high pressure solenoid valves are to be used.

FIGURE 2: MULTIPLE UNIT COOLERS CONTROLLED BY A SINGLE SOLENOID

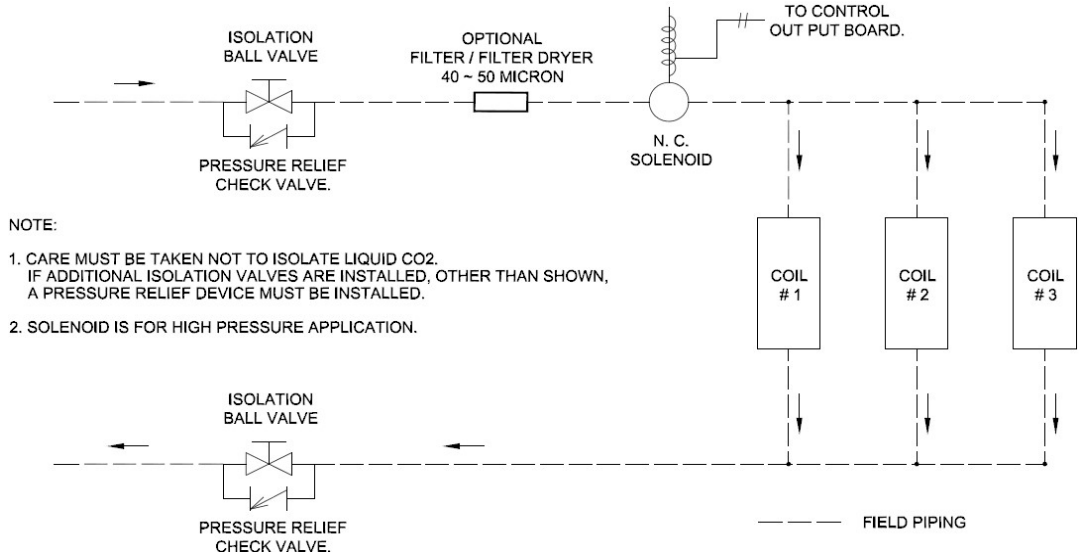
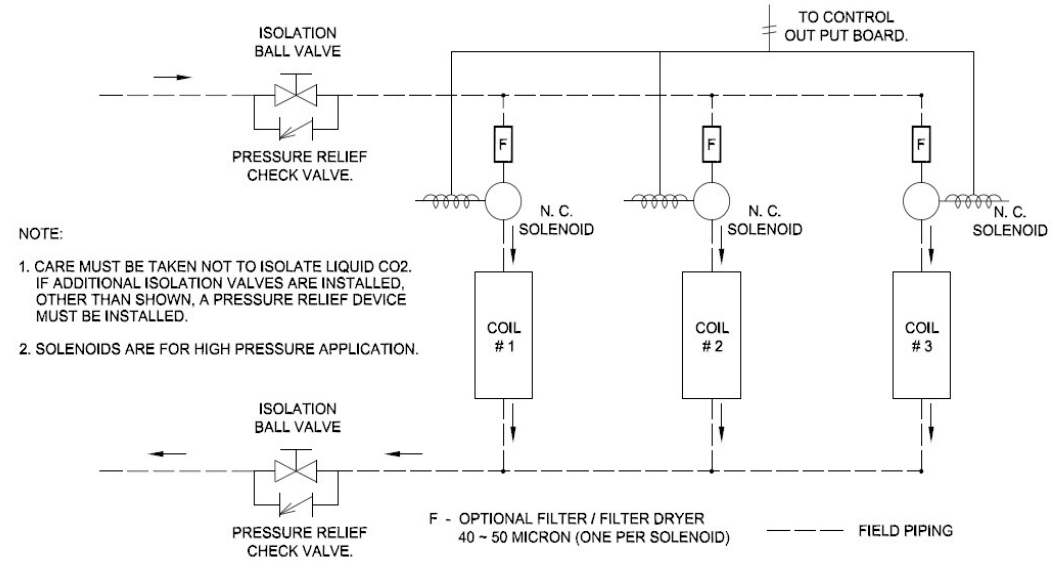


FIGURE 3: MULTIPLE UNIT COOLERS CONTROLLED BY MULTIPLE SOLENOIDS



For units with hot gas defrost refer to section 4.4 and FIGURE's 4 and 5 for piping arrangement.
Refer to section 4.5 for refrigerant distributor nozzle selection.
Refer to section 4.6 for expansion valve selection.

4.3 *EVACUATION AND LEAK TEST*

When all refrigeration connections have been completed, the entire system must be tested for leaks and then evacuated. Refer to the instructions provided with your systems condensing unit for information on performing the leak test and evacuation.

4.4 *GL/GH HOT GAS DEFROST PIPING*

FIGURE 4: F (HG) & H (HGE) 3 PIPE HOT GAS DEFROST COIL

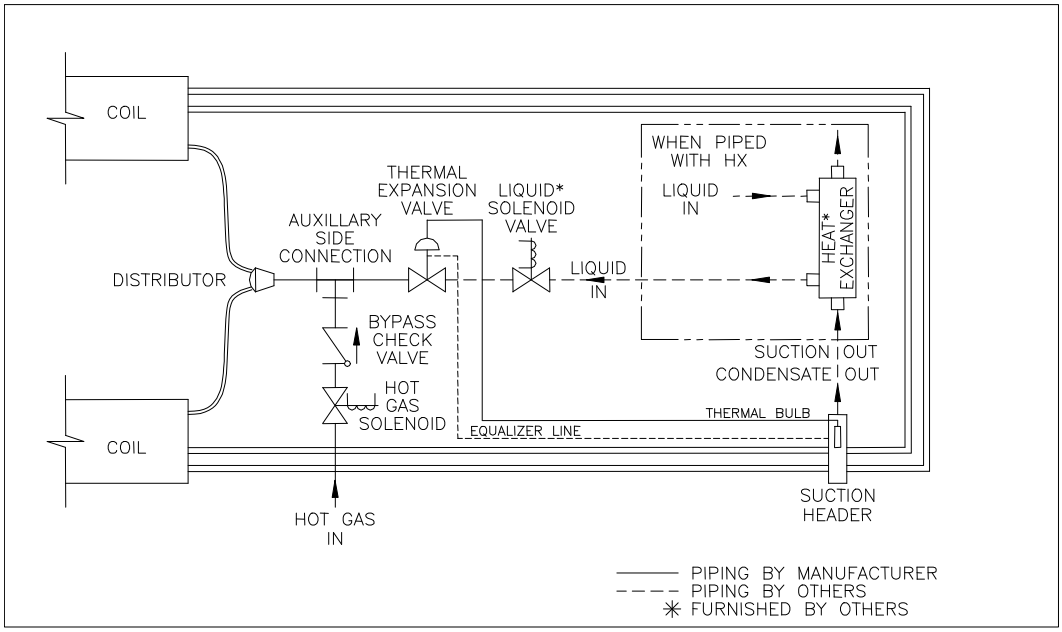


FIGURE 5: M (KG) & P (KGE) 2 PIPE REVERSE CYCLE HOT GAS DEFROST

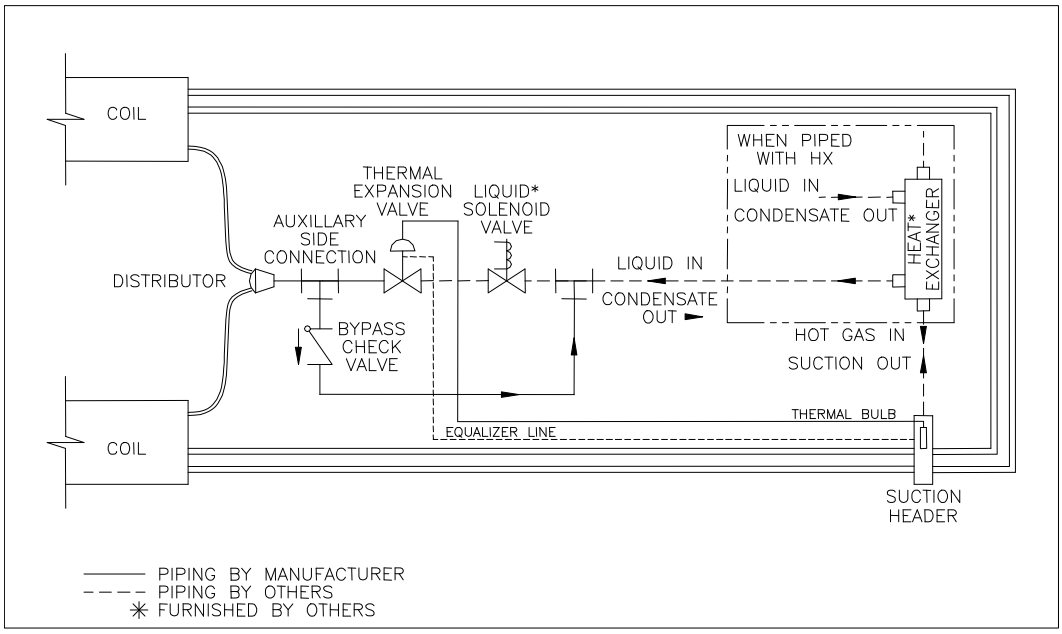


TABLE 2: SUCTION CONNECTIONS

MODEL	NO. OF CIRCUITS	
GL-1/2/3	1 & 2 CIRCUIT	0.875"
GL-4/5/6	4 CIRCUIT	1.125"
GH-1/2	6 CIRCUIT	0.875"
GH-3/4	2 CIRCUIT	1.125"
GH-5/6	4 CIRCUIT	1.375"

4.5 *REFRIGERANT DISTRIBUTOR NOZZLES*

Unit coolers are piped using a refrigerant distributor with a changeable nozzle design to equally distribute refrigerant to each circuit of the evaporator coil. Distributor nozzles are included and are packed in individual plastic envelopes along with a retainer ring and instruction card. The instruction card provides information on nozzle used based on refrigerant. There may be one, two, or three envelopes with nozzles located near the distributor.

The nozzles provided with the unit have been selected for design conditions of 10°F T.D. and 95°F liquid refrigerant at the expansion valve inlet. If the unit will be operated at conditions that are substantially different from these conditions, it may be necessary to select a different size nozzle. Consult factory for additional information.

The nozzle must be installed in the distributor or the auxiliary side connector before installing the expansion valve. There are nozzle identification numbers stamped on one side of the nozzle. Ensure the numbers are visible (for identification information) when inserting the nozzle into the distributor. The nozzle is held in place by a retainer ring that is easily inserted or removed with a pair of needle nose pliers. Nozzle selections are listed in TABLES 3 and 4.

TABLE 3: GL MEDIUM TEMPERATURE NOZZLES

Air defrost distributor nozzle selections are based on +25°F suction temperature, 10°F T.D., and 95°F liquid temperature.

MODEL	NOZZLE R404A	NOZZLE R407A	NOZZLE R448A
GLD16A-45[ ]{ }	L - 1/2	L - 1/3	L - 1/3
GLD26A-90[ ]{ }	L - 1	L - 3/4	L - 3/4
GLD36A-135[ ]{ }	L - 1 - 1/2	L - 1	L - 1
GLD46A-180[ ]{ }	L - 2	L - 1 - 1/2	L - 1 - 1/2
GLD56A-225[ ]{ }	L - 2 - 1/2	L - 2	L - 2
GLD66A-268[ ]{ }	L - 3	L - 2 - 1/2	L - 2 - 1/2
GLD14A-35[ ]{ }	L - 1/3	L - 1/4	L - 1/4
GLD24A-70[ ]{ }	L - 3/4	L - 3/4	L - 3/4
GLD34A-105[ ]{ }	L - 1	L - 3/4	L - 3/4
GLD44A-140[ ]{ }	L - 1 - 1/2	L - 1	L - 1
GLD54A-175[ ]{ }	L - 2	L - 1 - 1/2	L - 1 - 1/2
GLD64A-210[ ]{ }	L - 2	L - 2	L - 2

- **If R-449A is used, use the same Nozzle as R-448A**
- **If R-407F is used, use the same Nozzle as R-407A**
- **If R-507 is used, Use the same Nozzle as R-404A**

All air defrost are DOE/NRCan compliant when applied with Dual Speed (D) or Variable Speed (V) motor codes AND any refrigerant.

[ ] Location for the refrigerant letter code.
{ } Include motor code as either 'D' for Dual Speed or 'V' for variable speed EC motor to be used.
Example full Model : GHD34A-150TDA is DOE/NRCan with R-404A, Dual Speed EC motor and includes the additional letter 'A' for 208V single phase.

TABLE 4: GH MEDIUM TEMPERATURE NOZZLES

MODEL	NOZZLE R404A	NOZZLE R407A	NOZZLE R448A
GHD16A-60[ ]{ }	L - 3/4	L - 1/2	L - 1/2
GHD26A-130[ ]{ }	L - 1-1/2	L - 1	L - 1
GHD36A-198[ ]{ }	L - 2	L - 1-1/2	L - 1-1/2
GHD46A-270[ ]{ }	L - 3	L - 2-1/2	L - 2
GHD56A-340[ ]{ }	J - 4	J - 2-1/2	J - 2-1/2
GHD66A-410[ ]{ }	J - 5	J - 4	J - 4
GHD14A-50[ ]{ }	L - 1/2	L - 1/3	L - 1/3
GHD24A-100[ ]{ }	L - 1	L - 3/4	L - 3/4
GHD34A-150[ ]{ }	L - 1-1/2	L - 1-1/2	L - 1-1/2
GHD44A-200[ ]{ }	L - 2	L - 1-1/2	L - 1-1/2
GHD54A-250[ ]{ }	J - 2 -1/2	J - 2	J - 2
GHD64A-300[ ]{ }	J - 3	J - 2 -1/2	J - 2 -1/2

Distributor nozzle selections are based on +25°F suction temperature, 10°F T.D. and 95°F liquid temperature.

- **If R-449A is used, use the same Nozzle as R-448A**
- **If R-407F is used, use the same Nozzle as R-407A**
- **If R-507 is used, Use the same Nozzle as R-404A**

****All air defrost are DOE/NRCan compliant when applied with Dual Speed (D) or Variable Speed (V) motor codes AND any refrigerant.***
[ ] Location for the refrigerant letter code.
{ } Include motor code as either 'D' for Dual Speed or 'V' for variable speed EC motor to be used.
Example full Model : GHD34A-150TDA is DOE/NRCan with R-404A, Dual Speed EC motor and includes the additional letter 'A' for 208V single phase.

4.6 *EXPANSION VALVE*

Before mounting the unit, install the expansion valve and connect the equalizer tube. The expansion valve should be installed directly to the distributor body or as close as possible with no elbows or bends. Locate the expansion valve bulb on a horizontal length of suction line as close to the suction header as possible. Position the bulb in a 3, 4, 8, or 9 o'clock position (do not position on the bottom side of the pipe). Clamp the bulb down flush and tightly against the pipe and insulate. Never locate the bulb in a trap or downstream from a trap.

Expansion valves may be required depending on application. It is important that the operation of the expansion valve be checked 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 counterclockwise. 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.

Expansion valve recommendations are listed in TABLES 5 and 6.

TABLE 5: GL SERIES - AIR DEFROST

MODEL	TXV R404A	TXV R407A	TXV R448A
GLD16A-45[ ]{ }	SBFSE-AA-C EGSE-1/4-C	SBFNE-AAA-C EGNE-1/3-C	SBFDE-AAA-C EGDE-1/4-C
GLD26A-90[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-AA-C EGNE-3/4-C	SBFDE-AA-C EGDE-1/2-C
GLD36A-135[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-C	SBFDE-A-C EGDE-1-C
GLD46A-180[ ]{ }	SBFSE-B-C EGSE-1-1/2-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C
GLD56A-225[ ]{ }	SBFSE-B-C EGSE-1-1/2-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-B-C EGDE-1-1/2-C
GLD66A-268[ ]{ }	SBFSE-B-C EGSE-2-C	SBFNE-B-C EGNE-2-C	SBFDE-B-C EGDE-1-1/2-C
GLD14A-35[ ]{ }	SBFSE-AAA-C EGSE-1/6-C	SBFNE-AAA-C EGNE-1/3-C	SBFDE-AAA-C EGDE-1/4-C
GLD24A-70[ ]{ }	SBFSE-A-C EGSE-1/2-C	SBFNE-AA-C EGNE-3/4-C	SBFDE-AA-C EGDE-1/2-C
GLD34A-105[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-C	SBFDE-A-C EGDE-1/2-C
GLD44A-140[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-C	SBFDE-A-C EGDE-1-C
GLD54A-175[ ]{ }	SBFSE-B-C EGSE-1-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C
GLD64A-210[ ]{ }	SBFSE-B-C EGSE-1-1/2-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C

TXV selections are based on +25°F suction temperature, 10°F T.D. and 95°F liquid temperature, 105°F Ambient temperature and high side pressure drop of 10PSIG

All air defrost are DOE/NRCan compliant when applied with Dual Speed (D) or Variable Speed (V) motor codes AND any refrigerant.
[ ] Location for the refrigerant letter code.
{ } Include motor code as either 'D' for Dual Speed or 'V' for variable speed EC motor to be used.
Example full Model : GHD34A-150TDA is DOE/NRCan with R-404A, Dual Speed EC motor and includes the additional letter 'A' for 208V single phase.

- **If R-507 is used, change 'S' to 'P' in the R-404A TXV. For example, SBF S E-B-C (R-404A) to SBF P E-B-C and EG S E-2-C becomes EG P E-2-C (R-507)**
- **If R-449A is used, use the same TXV as R-448A**
- **If R-407F is used, use the same TXV as R-407A**

TABLE 6: GH SERIES - AIR DEFROST

MODEL	TXV R404A	TXV R407A	TXV R448A
GHD16A-60[ ]{ }	SBFSE-AA-C EGSE-1/2-C	SBFNE-AA-C EGNE-1/2-C	SBFDE-AA-C EGDE-1/3-C
GHD26A-130[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-C	SBFDE-A-C EGDE-1-C
GHD36A-198[ ]{ }	SBFSE-B-C EGSE-1-1/2-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C

GHD46A-270[ ]{ }	SBFSE-B-C EGSE-2-C	SBFNE-B-C EGNE-2-C	SBFDE-B-C EGDE-1-1/2-C
GHD56A-340[ ]{ }	SBFSE-C-C EGSE-2-C	SBFNE-B-C EGNE-3-C	SBFDE-B-C EGDE-2-1/2-C
GHD66A-410[ ]{ }	SBFSE-C-C EGSE-2-C	SBFNE-C-C EGNE-3-C	SBFDE-B-C EGDE-2-1/2-C
GHD14A-50[ ]{ }	SBFSE-AA-C EGSE-1/2-C	SBFNE-AA-C EGNE-1/2-C	SBFDE-AA-C EGDE-1/3-C
GHD24A-100[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-AAA-C EGNE-3/4-C	SBFDE-A-C EGDE-1/2-C
GHD34A-150[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C
GHD44A-200[ ]{ }	SBFSE-B-C EGSE-1-1/2-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C
GHD54A-250[ ]{ }	SBFSE-B-C EGSE-2-C	SBFNE-B-C EGNE-2-C	SBFDE-B-C EGDE-1-1/2-C
GHD64A-300[ ]{ }	SBFSE-C-C EGSE-2-C	SBFNE-B-C EGNE-3-C	SBFDE-B-C EGDE-1-1/2-C

TXV selections are based on +25°F suction temperature, 10°F T.D., and 95°F liquid temperature, 105°F Ambient temperature and high side pressure drop of 10 PSIG.

All air defrost are DOE/NRCan compliant when applied with Dual Speed (D) or Variable Speed (V) motor codes AND any refrigerant.
[ ] Location for the refrigerant letter code.
{ } Include motor code as either 'D' for Dual Speed or 'V' for variable speed EC motor to be used.
Example full Model: GHD34A-150TDA is DOE/NRCan with R-404A, Dual Speed EC motor and includes the additional letter 'A' for 208V single phase.

- **If R-507 is used, change 'S' to 'P' in the R-404A TXV. For example, SBF S E-B-C (R-404A) to SBF P E-B-C and EG S E-2-C becomes EG P E-2-C (R-507)**
- **If R-449A is used, use the same TXV as R-448A**
- **If R-407F is used, use the same TXV as R-407A**

TABLE 7: REFRIGERANT CHARGE AT 25% LIQUID IN COIL FOR 25ºF R-404A

MODEL	REFRIGERANT CHARGE (LBS)	MODEL	REFRIGERANT CHARGE (LBS)
GL-1	2	GH-1	3
GL-2	3	GH-2	4
GL-3	4	GH-3	6
GL-4	5	GH-4	8
GL-5	5	GH-5	9
GL-6	6	GH-6	11

CORRECTION FACTOR FOR R-22 = 1.11
CORRECTION FACTOR FOR R-507 = 1.01

5 ELECTRICAL

5.1 *FIELD WIRING*

WARNING: All power supply to the unit must be shut off before opening any compartments, cleaning, or performing maintenance.

Field wiring should comply with NEC and local codes. The power supply voltage, phase, and frequency must match what is shown on the unit cooler data plate.

The field-wiring compartment is constructed as part of the unit cooler enclosure. The wiring diagram for each unit is located on the inside of the electrical panel door. 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 TABLES 8 and 9 for unit amps.

Special consideration must be taken when wiring single-phase fan motors and defrost heaters. If the total amp draw of the motors or heaters exceeds the amp rating of the fan delay or heater safety switch, then a contactor must be installed.

5.2 *ELECTRICAL DATA*

TABLE 8: GA MOTOR AMPS

MODEL	FANS	PSC Motor (Type B)		EC Motor (Type V & D)	
		115/60/1	208-230/60/1	115/60/1	208-230/60/1
GL	1	0.6	0.3	0.9	0.6
	2	1.2	0.6	1.8	1.2
	3	1.8	0.9	2.7	1.8
	4	2.4	1.2	3.6	2.4
	5	3.0	1.5	4.5	3.0
	6	3.6	1.8	5.4	3.6
GH	1	0.6	0.3	0.9	0.6
	2	1.2	0.6	1.8	1.2
	3	1.8	0.9	2.7	1.8
	4	2.4	1.2	3.6	2.4
	5	3.0	1.5	4.5	3.0
	6	3.6	1.8	5.4	3.6

TABLE 9: GA COIL D (ED), DRAIN PAN H (HGE) / P (KGE) HEATER AMPS

MODEL	D(ED) AMP			H(HGE), P(KGE) AMP		
	230/1	230/3	WATTS	115/1	230/1	WATTS
GL-1	3.5	3.0	800	3.5	1.7	400
GL-2	7.0	6.0	1600	5.2	2.6	600
GL-3	10.4	9.0	2400	7.0	3.5	800
GL-4	13.9	12.0	3200	8.7	4.3	1000
GL-5	17.4	15.1	4000	10.4	5.2	1200
GL-6	20.9	18.1	4800	12.2	6.1	1400
GH-1	7.0	4.6	1600	3.5	1.7	400
GH-2	13.9	9.2	3200	5.2	2.6	600
GH-3	20.9	13.8	4800	7.0	3.5	800
GH-4	27.8	18.4	6400	8.7	4.3	1000
GH-5	34.8	23.0	8000	10.4	5.2	1200
GH-6	41.7	27.6	9600	12.2	6.1	1400

5.3 *AIR DEFROST SEQUENCE OF OPERATION*

SEQUENCE OF OPERATION

1. The unit cooler fan motors are energized, and the fans operate continually.
2. The room thermostat calls for cooling. The liquid solenoid valve opens allowing liquid to flow to the unit cooler. The suction pressures rises and starts the compressor.
3. When the room temperature is satisfied, the thermostat opens and closes the liquid solenoid. The compressor continues to run until the suction pressure reaches the low-pressure cutout setting and shuts off the compressor.
4. The fan circulates air over the coil and frost melts.
5. **Note: For the air defrost to work properly, the compressor run time should not exceed 40 minutes per hour.**

5.4 *ELECTRIC DEFROST SEQUENCE OF OPERATION*

The electric defrost cycle is time clock initiated and temperature terminated with a timer and or high temperature override. For systems with multiple unit coolers and a single defrost time clock, the defrost termination thermostat must be wired in series. Reference FIGURES 8, 9,10 and 11 for electric defrost wiring diagrams.

SEQUENCE OF OPERATION

STEP A: Normal Refrigeration Cycle

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

STEP B: Defrost Cycle

The timer starts defrosting of the evaporator coil at predetermined intervals. A typical setting would be two defrost periods per 24-hour day. Systems using Carbon Dioxide (R-744) should defrost at least twice per day.

1. Upon initiation of the defrost cycle, the timer mechanically disconnects power to terminal "4" thus closing the liquid line solenoid valve and shutting off the fan motors. Simultaneously power is connected to terminal "3" which allows current to flow to the defrost heaters.
2. 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.
3. As the frost melts, it drops into the heated drain pan and flows down the drain.
4. When the frost has completely melted from the coil, the coil temperature will start to rise above 32°F.
5. When the coil reaches the temperature setting of the defrost termination thermostat (75°F for fixed Klixon), the thermostat 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.
6. Due to power at terminal "4," the liquid line solenoid opens and the compressor restarts.
7. The evaporator fan motor(s) restart. The unit is now back in operation.
   The heater safety thermostat will only open if the defrost termination thermostat fails to close at its set temperature. The heater safety thermostat is set to open at 80°F. The timer also has a fail-safe (inner dial) timeout; the recommended setting is for 30 minutes.

5.5 *DUAL SPEED MOTOR SEQUENCE OF OPERATION –*

GH/GL uses Dual Speed EC motors for fans in DOE applications, default being the High speed, the second speed is set as Minimum speed. Fans will be in Min speed/Full speed or Off on below mentioned scenarios.

Minimum speed

- When the room temperature or the refrigeration setpoint is met, the fan will operate at half speed.

Full Speed

- When the room temperature or refrigeration setpoint Is not met and the fan will run at full speed

Fan off

- For EL/Gas defrost evaporators, during defrost fans will turn off

A field control option is available for this motor to run at minimum speed and another option is available for an installed room thermostat to operate this as a dual speed motor. When using the installed room thermostat option, do not use the same thermostat to control the LLSV.

When using an installed thermostat, the SPDT switch of the thermostat will open when the room temperature is above the setpoint and will not supply voltage through the control harness to motor. When the room temperature is met, the SPDT switch of the thermostat will close and send the voltage through the control harness and make motor to run at minimum speed.

When using the field controller, the motor low speed is controlled through an output, the output may energize or de-energized based on room temperature input. Control harness should get voltage only when the controller energized or de-energized the connected output.

When using the field-installed thermostat, the same concept of installed thermostat will be applicable.

Wiring Connections –

Dual Speed motors will have three wires - Black, White, and Red. Black and white wires will be always wired to terminal pin 7 and 4 for fan power. The red wire, which is named as control harness, is connected to terminal 8. A voltage signal to terminal pin 8, will run in motors in low speed.

5.6 *VARIABLE SPEED MOTOR SEQUENCE OF OPERATION*

Variable speed motors require a 0-10V signal for fan speed control that provides 20 mA per fan. Control signal will be wired to terminal AO+ & AO-. A 0V or no signal will operate fans at full speed. Increasing the voltage signal will decrease fan speed with minimum speed operation with a 10V signal.

5.7 *AIR DEFROST MODELS WIRING DIAGRAMS*

FIGURE 6A: AIR DEFROST WIRING DIAGRAM FOR MOTOR TYPE B

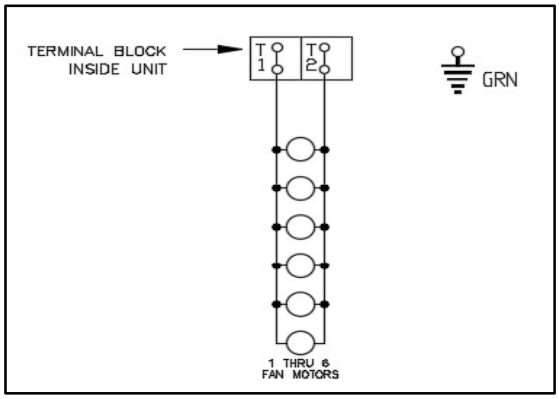


FIGURE 6B: AIR DEFROST WIRING DIAGRAM FOR MOTOR TYPE V

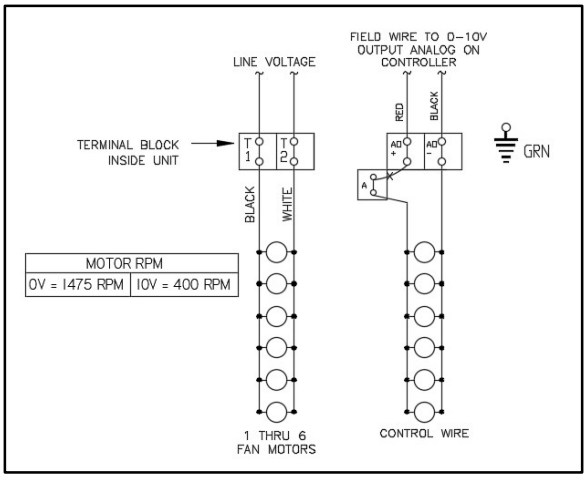


FIGURE 6C: AIR DEFROST WIRING DIAGRAM FOR MOTOR TYPE D

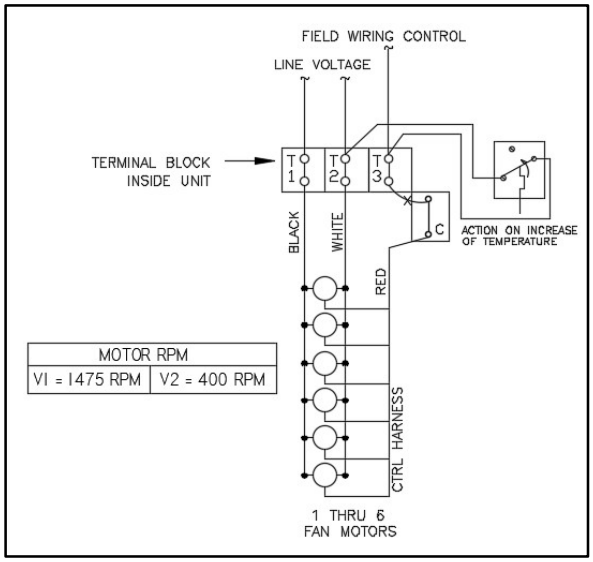


FIGURE 7A: AIR DEFROST WIRING DIAGRAM WITH TIMER - MOTOR TYPE B

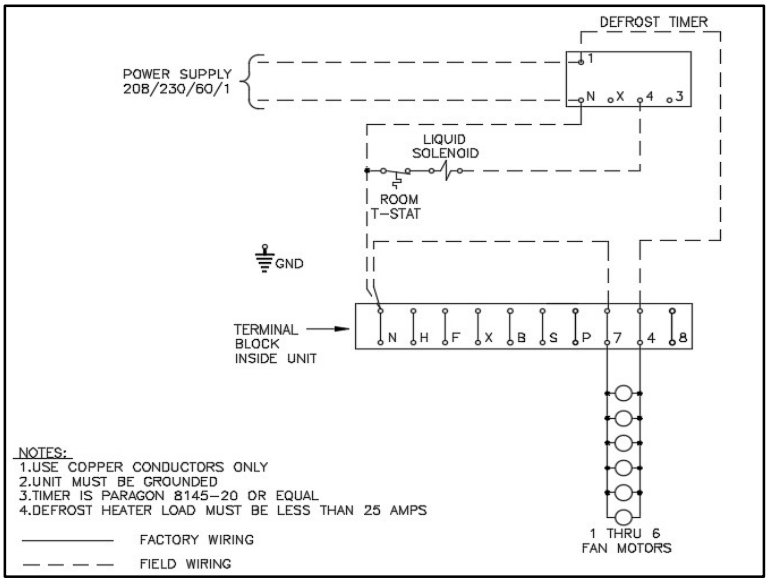


FIGURE 7B: AIR DEFROST WIRING DIAGRAM WITH TIMER - MOTOR TYPE V

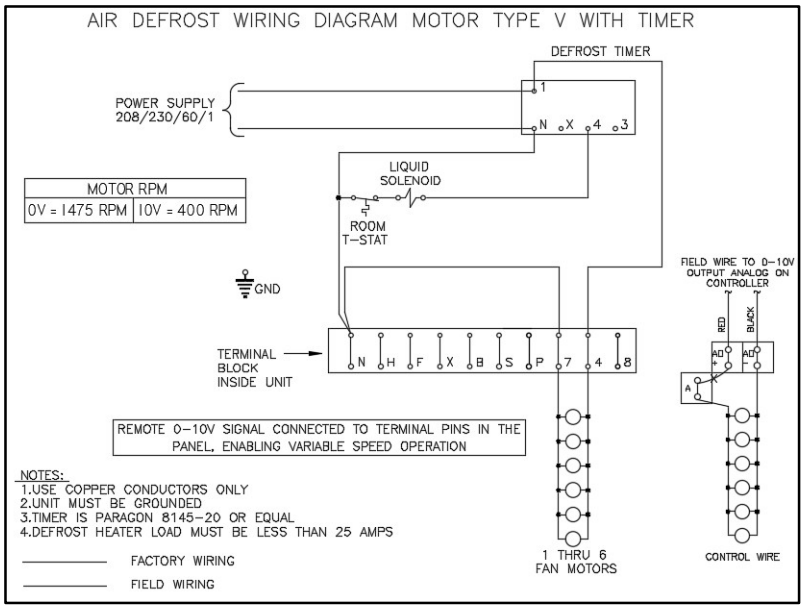
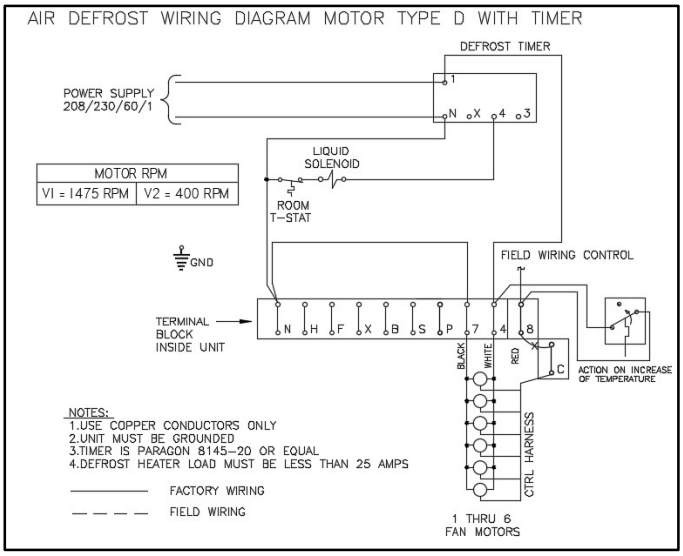


FIGURE 7C: AIR DEFROST WIRING DIAGRAM WITH TIMER - MOTOR TYPE D



5.8 *ELECTRIC DEFROST MODELS WIRING DIAGRAMS*

FIGURE 8A: ELECTRIC DEFROST SYSTEM WITH TIMER WIRING - MOTOR TYPE B

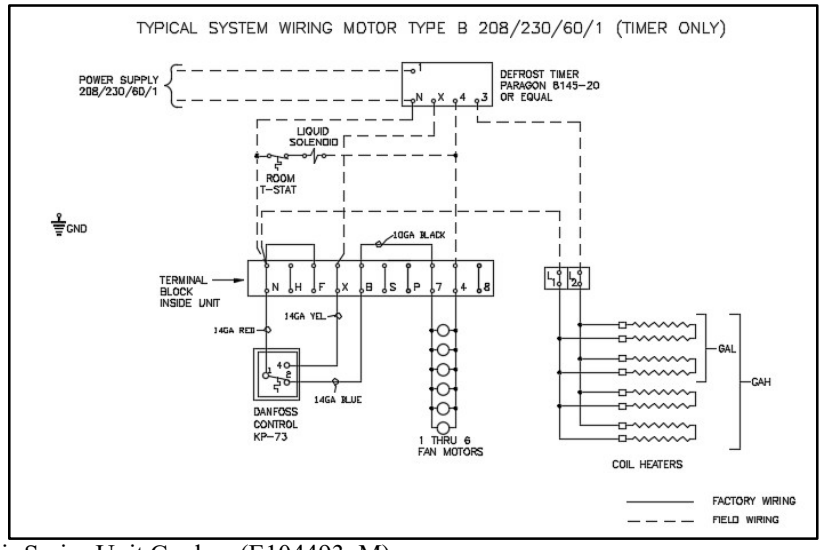


FIGURE 8B: ELECTRIC DEFROST SYSTEM WITH TIMER WIRING - MOTOR TYPE V

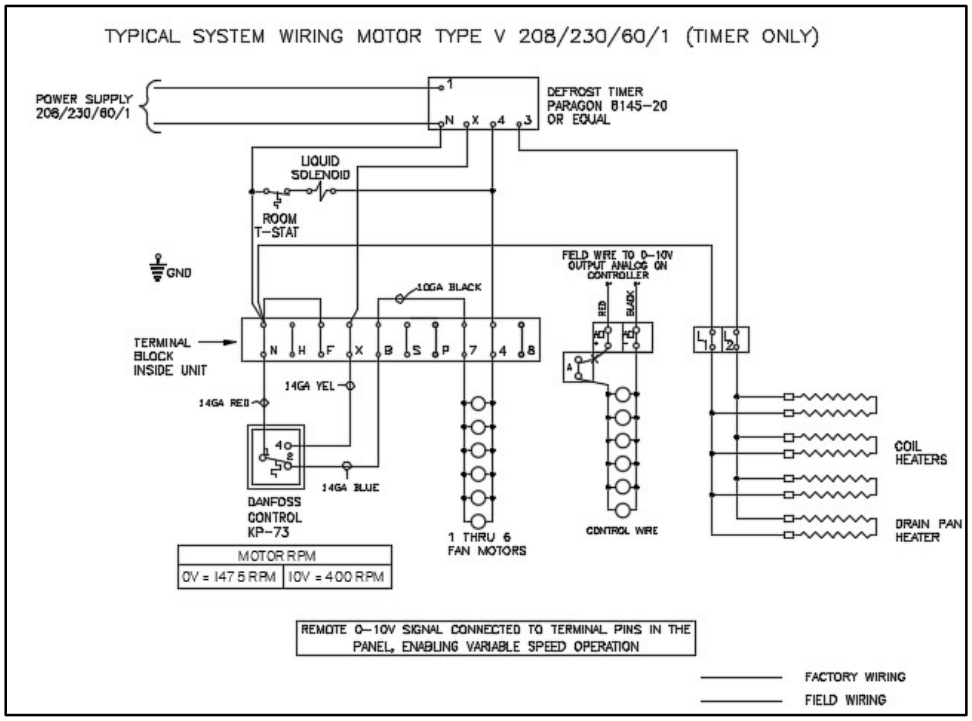


FIGURE 8C: ELECTRIC DEFROST SYSTEM WITH TIMER WIRING - MOTOR TYPE D

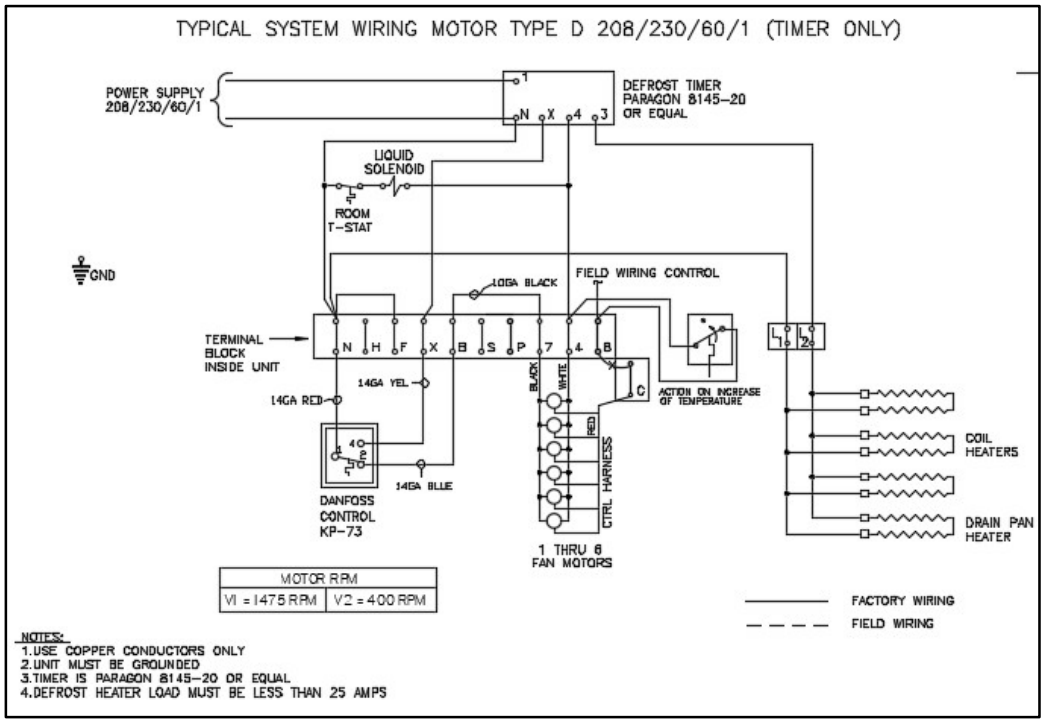


FIGURE 9A: ELECTRIC DEFROST WITH TIMER AND DEFROST CONTRACTOR WIRING - MOTOR TYPE B

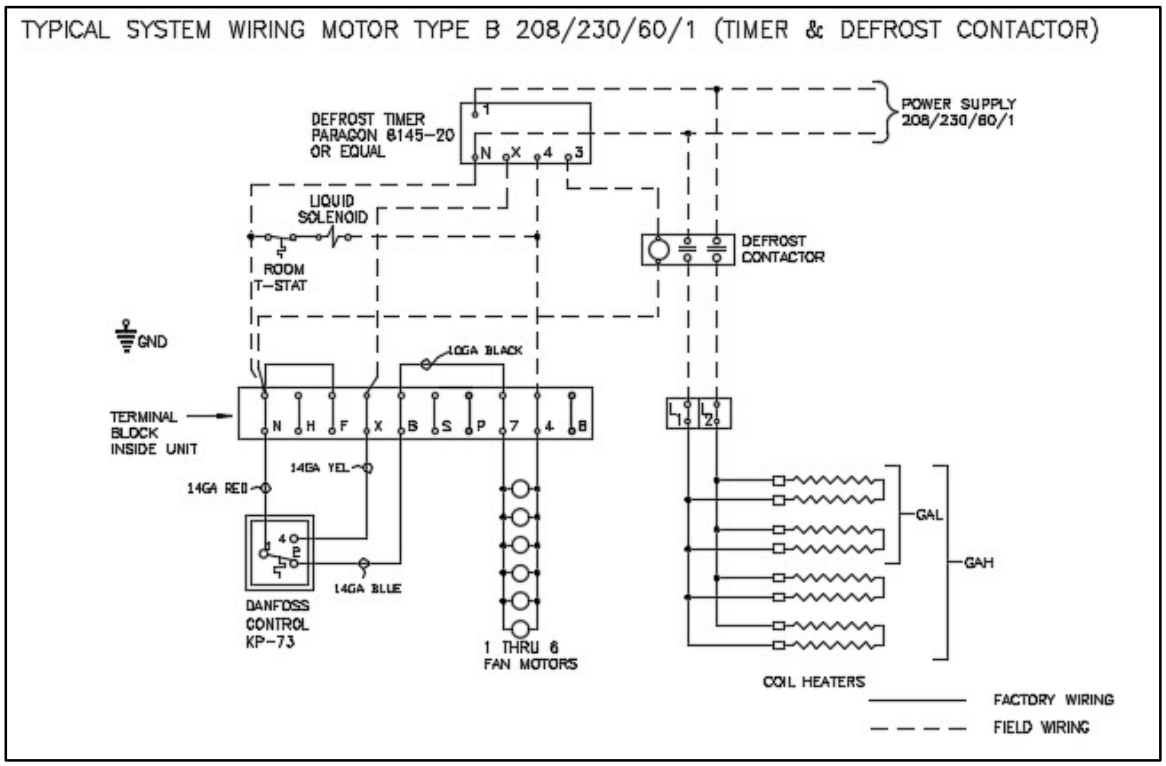


FIGURE 9B: ELECTRIC DEFROST WITH TIMER AND DEFROST CONTRACTOR WIRING - MOTOR TYPE V

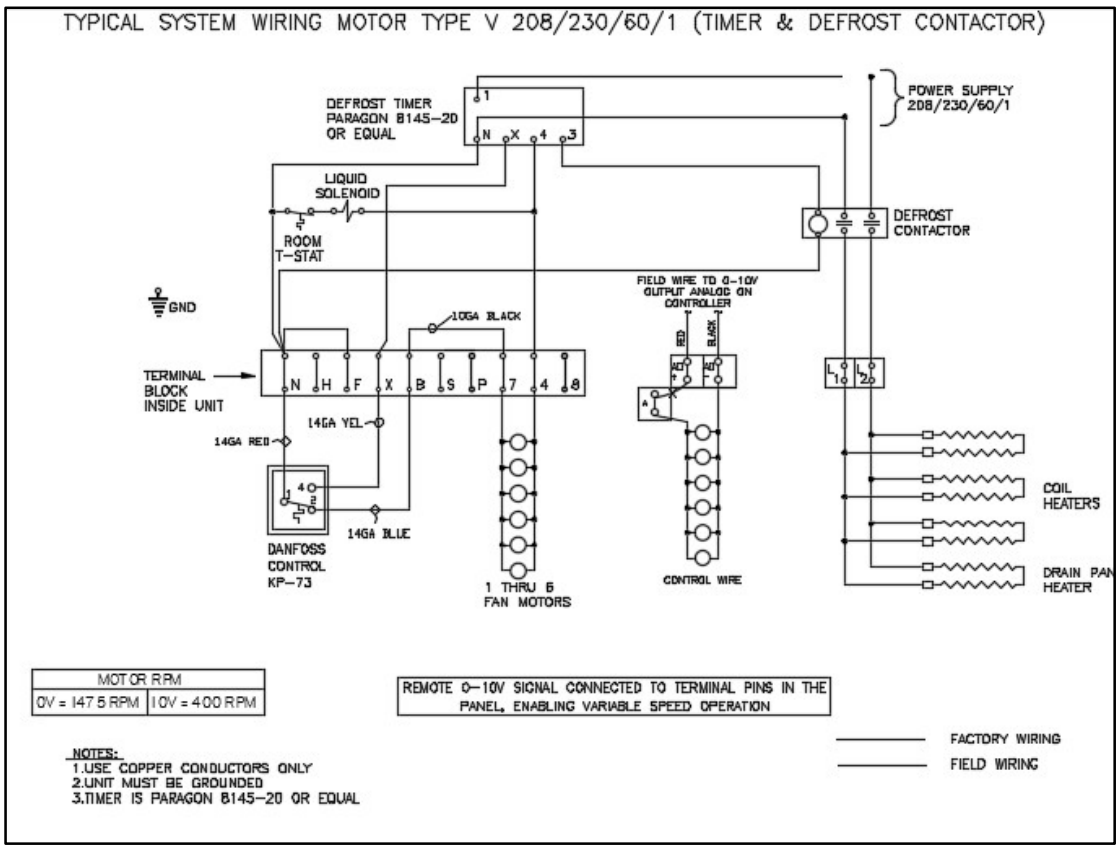


FIGURE 9C: ELECTRIC DEFROST WITH TIMER AND DEFROST CONTRACTOR WIRING - MOTOR TYPE D

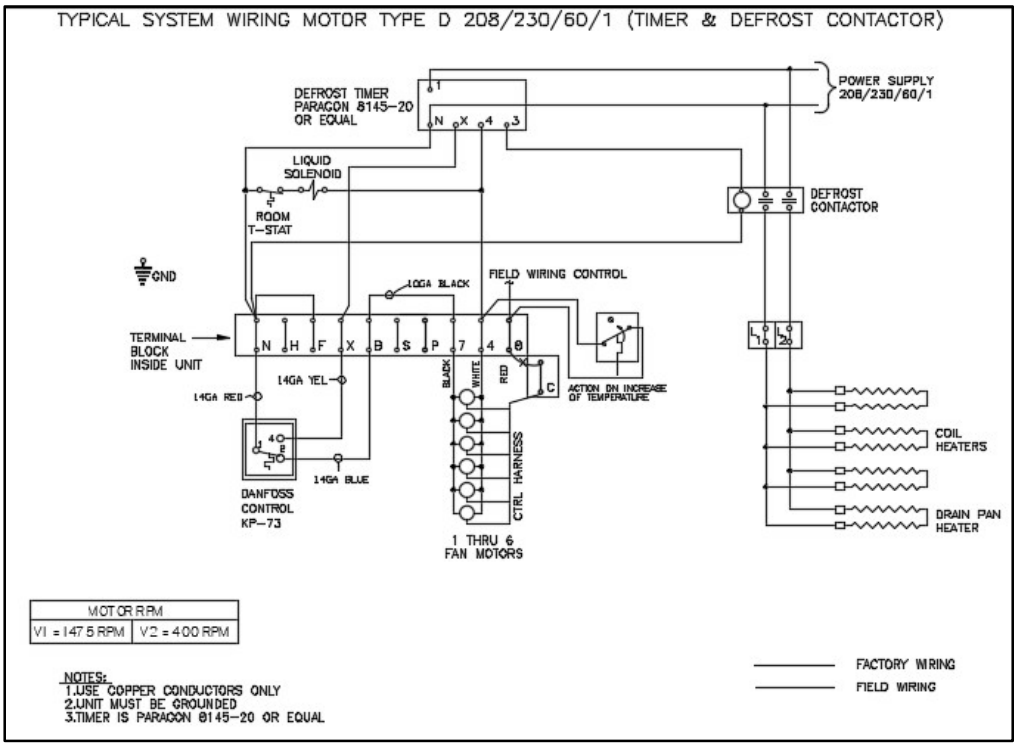


FIGURE 10A. ELECTRIC DEFROST SYSTEM WIRING MOTOR TYPE B - 3 PHASE HEATERS

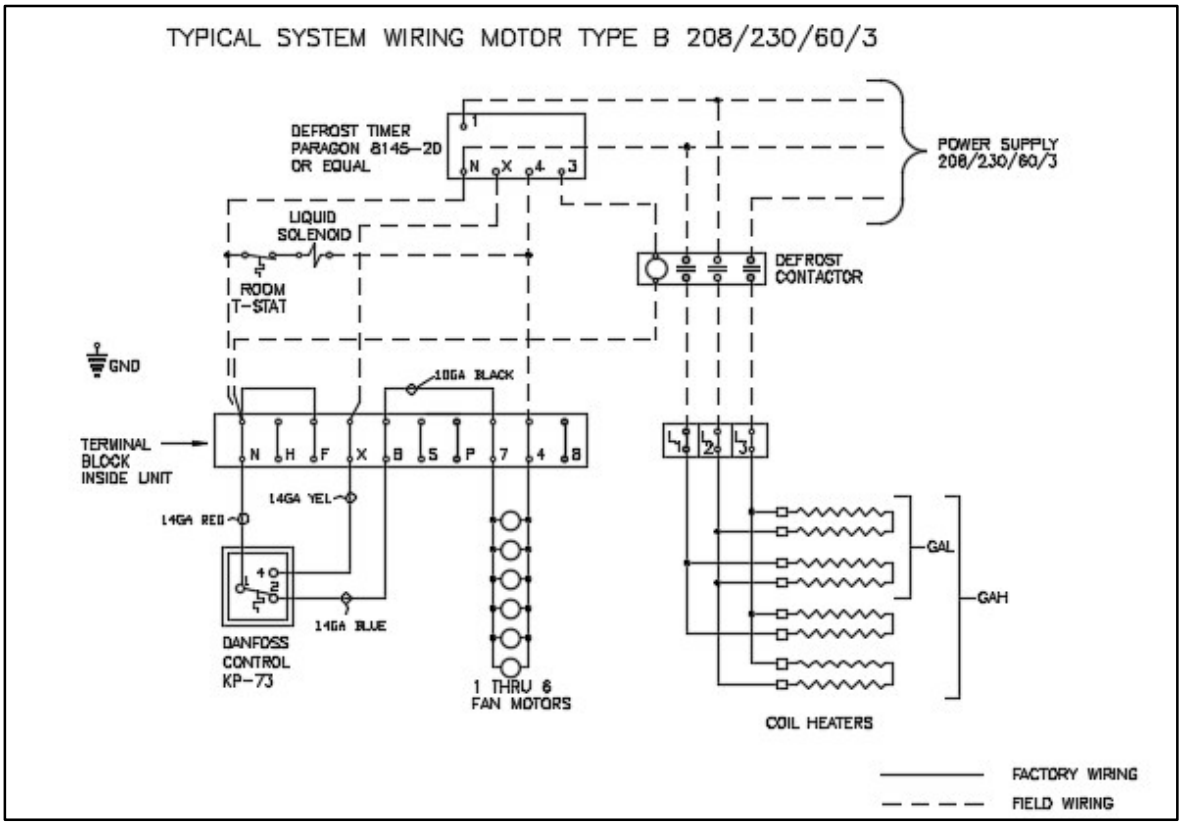


FIGURE 10B: ELECTRIC DEFROST SYSTEM WIRING MOTOR TYPE V - 3 PHASE HEATERS

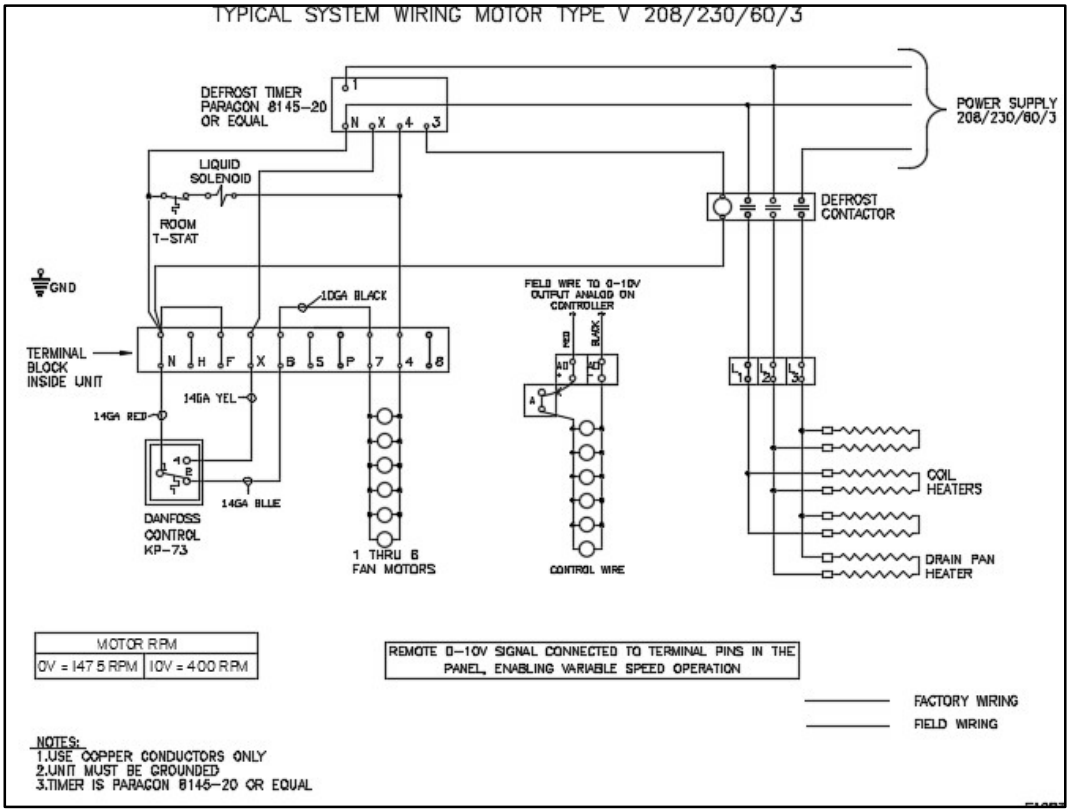


FIGURE 10C: ELECTRIC DEFROST SYSTEM WIRING MOTOR TYPE D MOTOR - 3 PHASE HEATERS

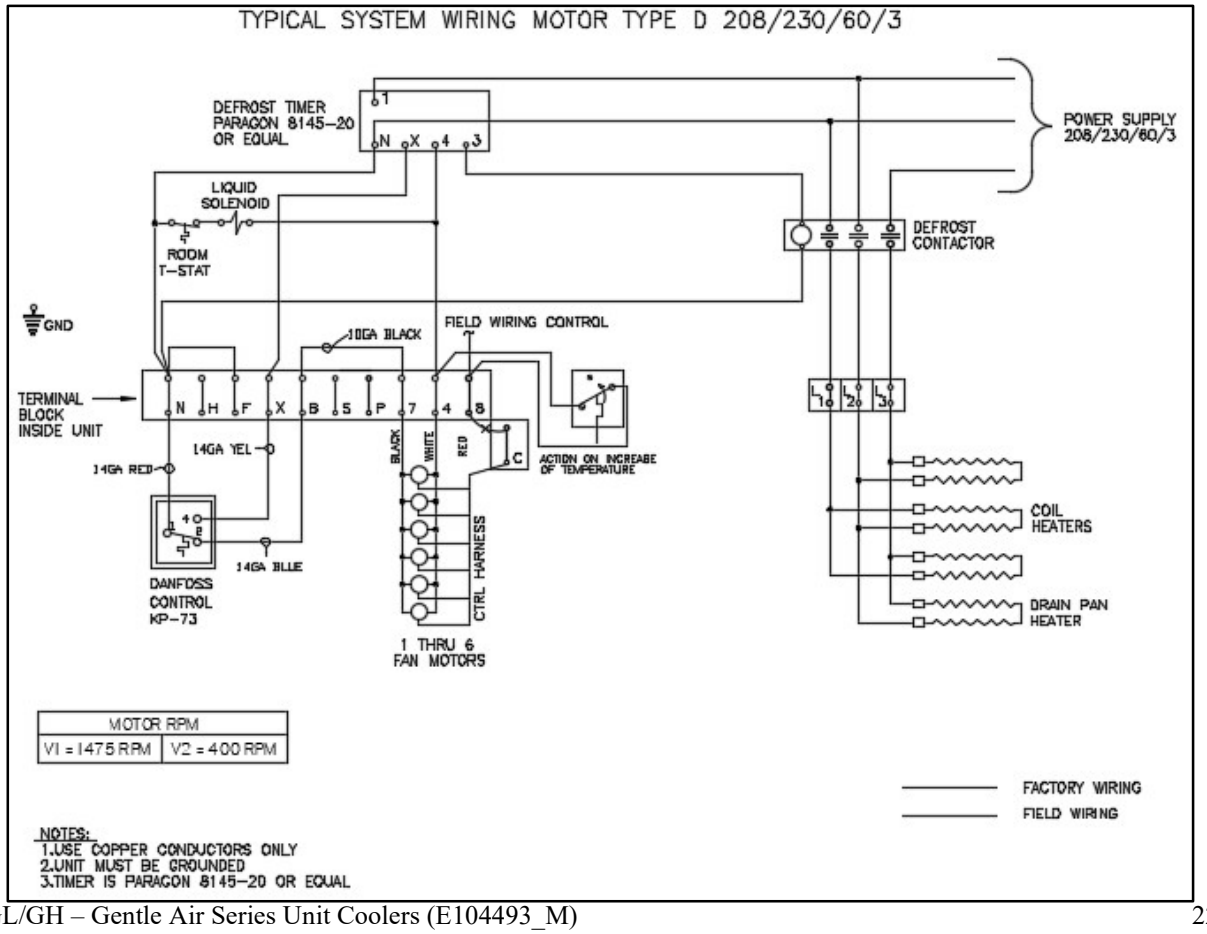


FIGURE 11A: ELECTRIC DEFROST SYSTEM WIRING MOTOR TYPE B – MULTIPLE EVAPORATORS

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 5C below.

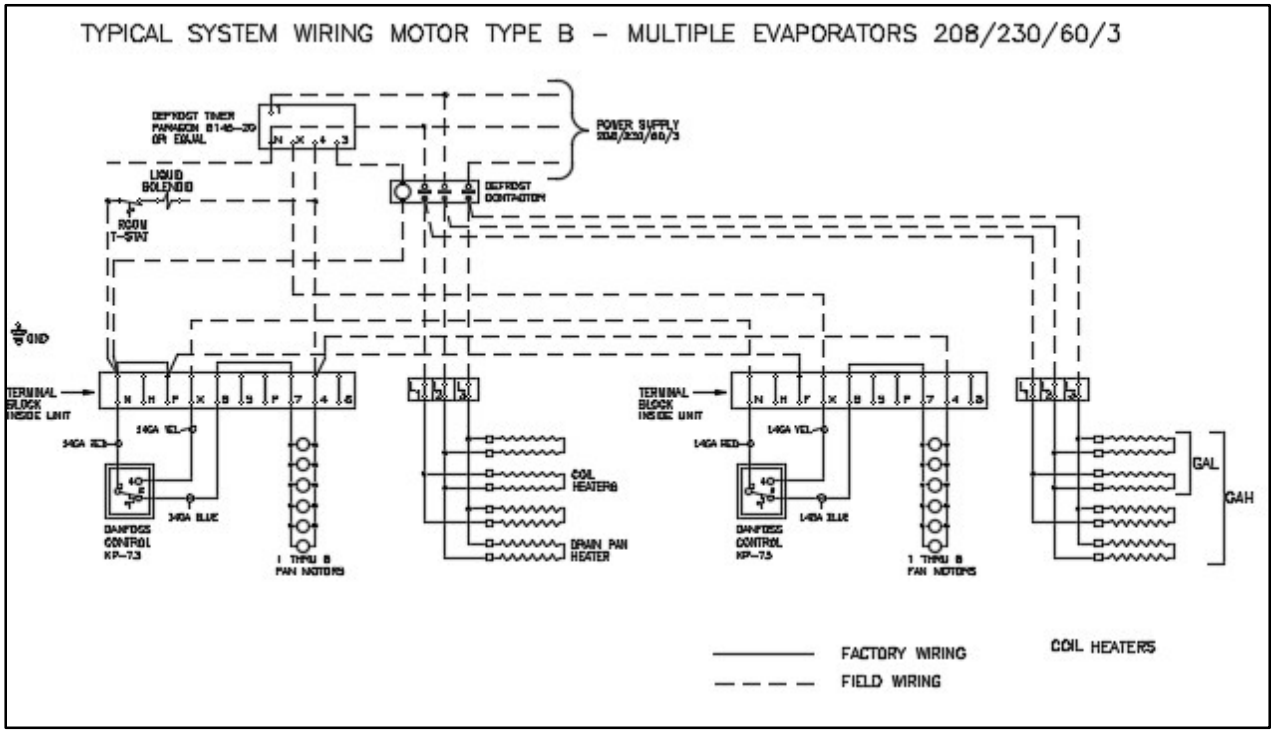


FIGURE 11B: ELECTRIC DEFROST SYSTEM WIRING MOTOR TYPE V – MULTIPLE EVAPORATORS

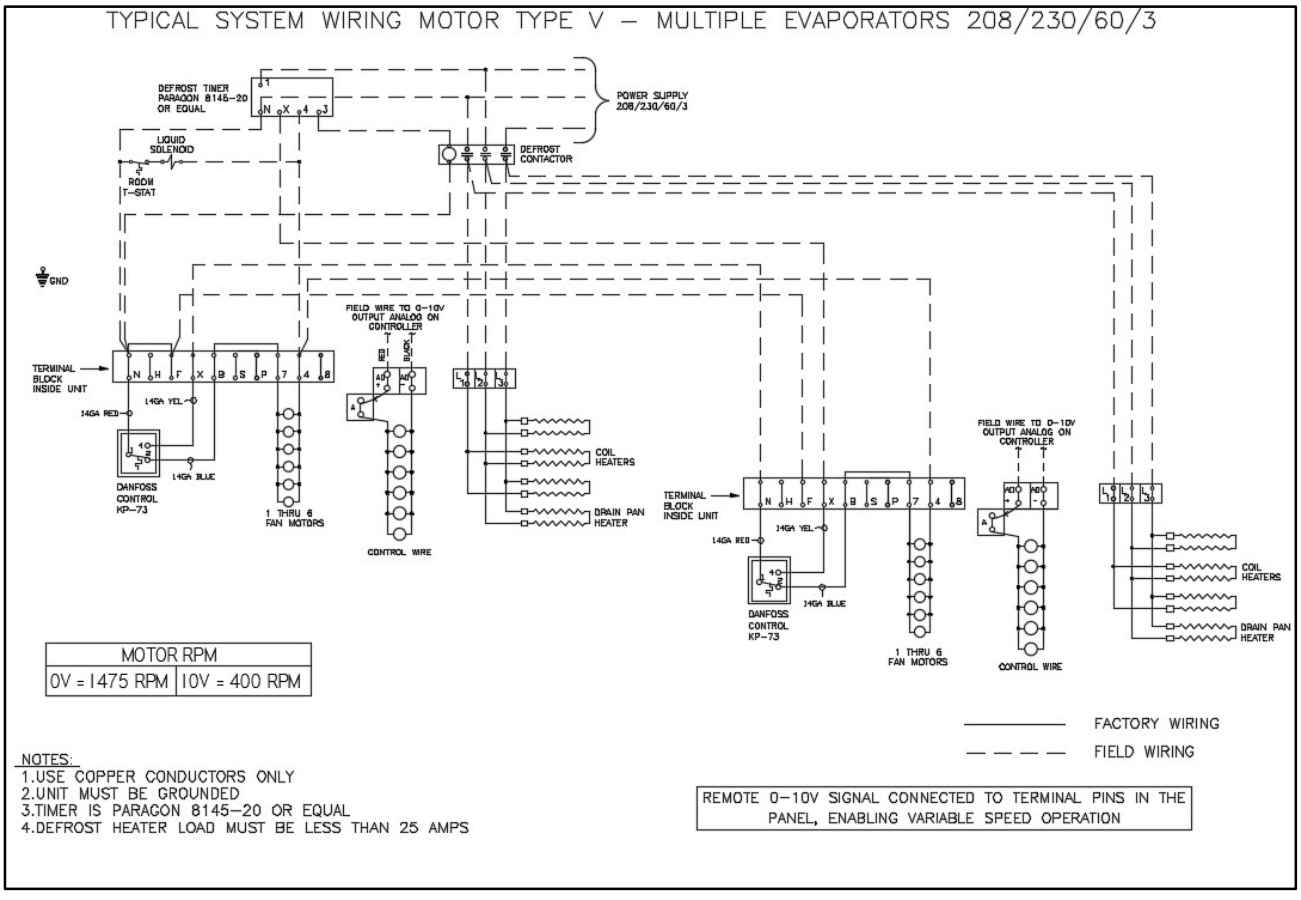
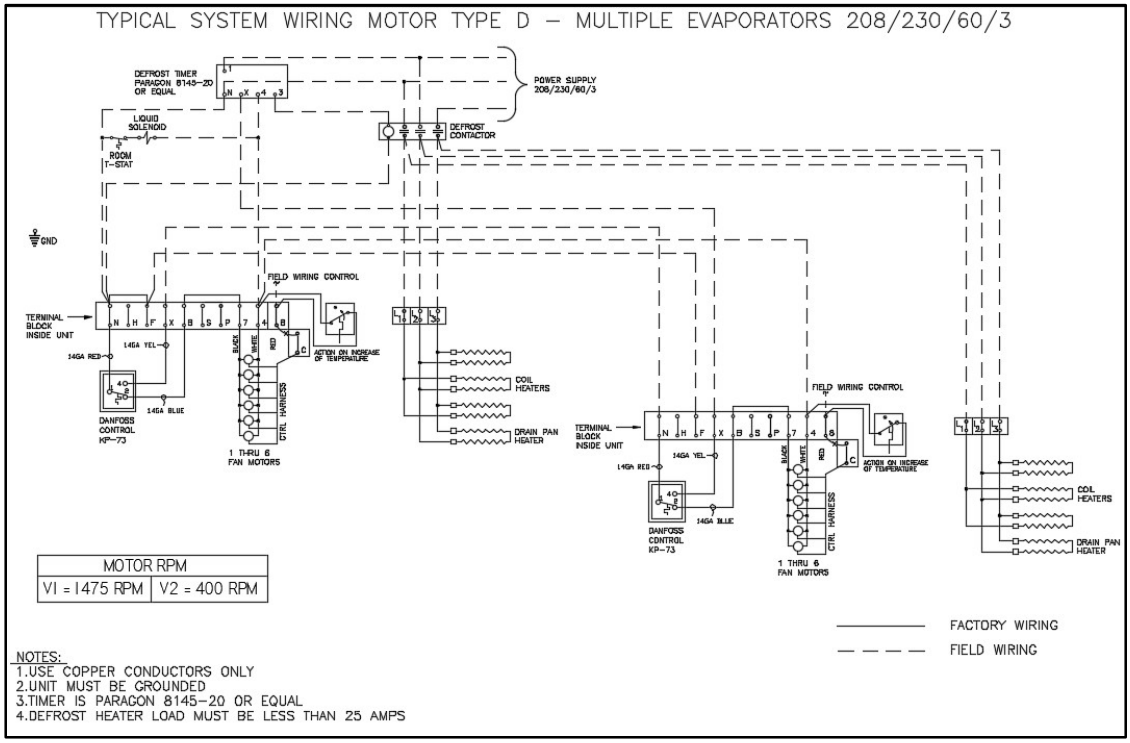
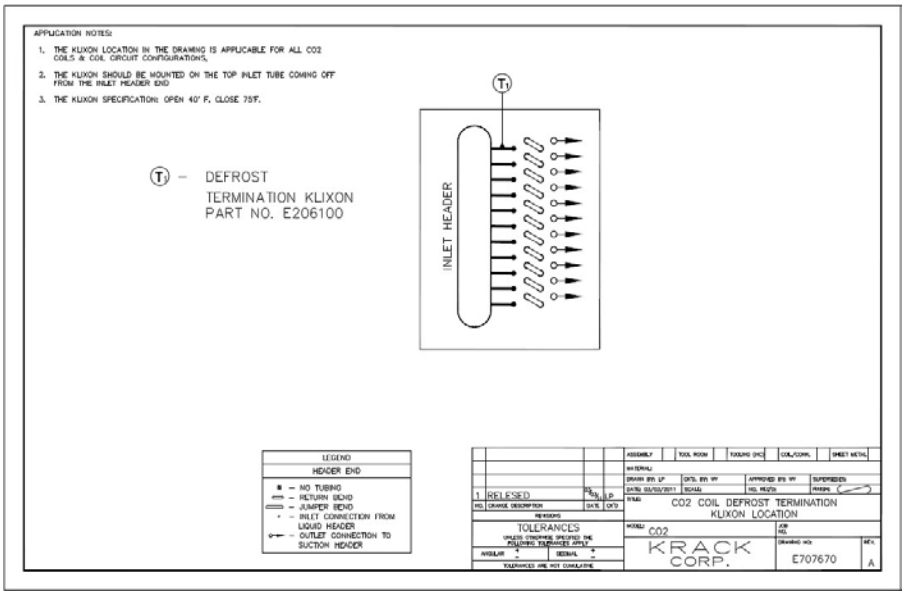


FIGURE 11C: ELECTRIC DEFROST SYSTEM WIRING MOTOR TYPE D – MULTIPLE EVAPORATORS



For units using Carbon Dioxide (R-744) the defrost termination thermostat is to be located on the topmost inlet tube from the inlet header as shown in FIGURE 7.

FIGURE 12: DEFROST TERMINATION THERMOSTAT LOCATION FOR CARBON DIOXIDE (R-744)



5.9 *GAS DEFROST SEQUENCE OF OPERATION*

Models H - 3 Pipe Hot Gas with Electric Pan Heat and P - 2 Pipe Kool Gas with Electric Pan Heat

Three pipe hot gas defrost system - Distribute compressor discharge gas through a separate hot gas line, controlled by a solenoid valve, through a check valve to the refrigerant distributor auxiliary side connection. Defrost condensate and gas vapor is evaporated in a re-evaporator prior to returning to the compressor through the suction line.

Two pipe cool gas defrost system - Distribute compressor discharge gas through the suction line during defrost. Defrost condensate flows through the refrigerant distributor auxiliary side connection and a check valve, bypassing the expansion valve and the liquid line solenoid valve into the liquid line which is reduced in pressure.

The defrost cycle is field controller initiated and terminated.

Step A

Power is supplied to the unit cooler continuously.

Step B

In Case of H defrost hot gas is supplied to the unit via liquid line and in Case of P defrost Kool Gas is supplied to the suction line. A factory mounted thermostat (KP73) senses a rise in the coil temperature. The SPDT control turns off the fan motors. If the unit has a drain pan heater, the other portion of the SPDT control is now closed and the drain pan heater is energized.

Step C

When the defrost is complete, the hot gas supply is stopped. The liquid line solenoid is energized, and the coil temperature begins to fall.

Step D

The factory mounted thermostat senses the drop in coil temperature. The SPDT thermostat opens the circuit to the drain pan heater (when supplied) and closes the circuit to the fan motors.

Recommended (SPDT) fan delay/drain pan heater thermostat settings:

Room Temperature	Range	Differential
0°F to +35°F	45°F	15°F
Below 0°F	20°F	10°F

(Note: Fan delay set point = Range – Differential)

A separate SPDT thermostat (KP73) is provided in the coil which can provide a digital defrost termination input.

FIGURE 13A: H - 3 PIPE HOT GAS WITH ELECTRIC PAN HEAT AND P - 2 PIPE KOOL GAS WITH ELECTRIC PAN HEAT – MOTOR TYPE B

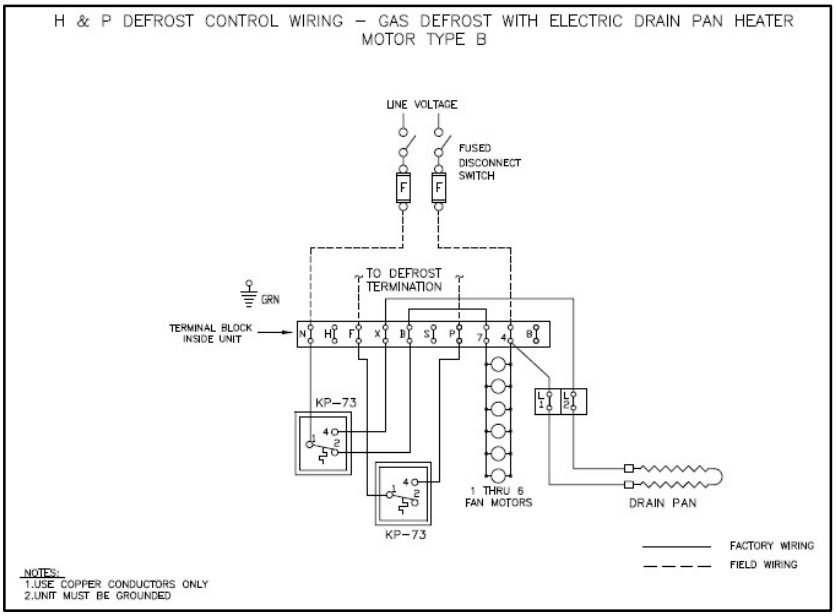


FIGURE 13B: H - 3 PIPE HOT GAS WITH ELECTRIC PAN HEAT AND P - 2 PIPE KOOL GAS WITH ELECTRIC PAN HEAT – MOTOR TYPE D

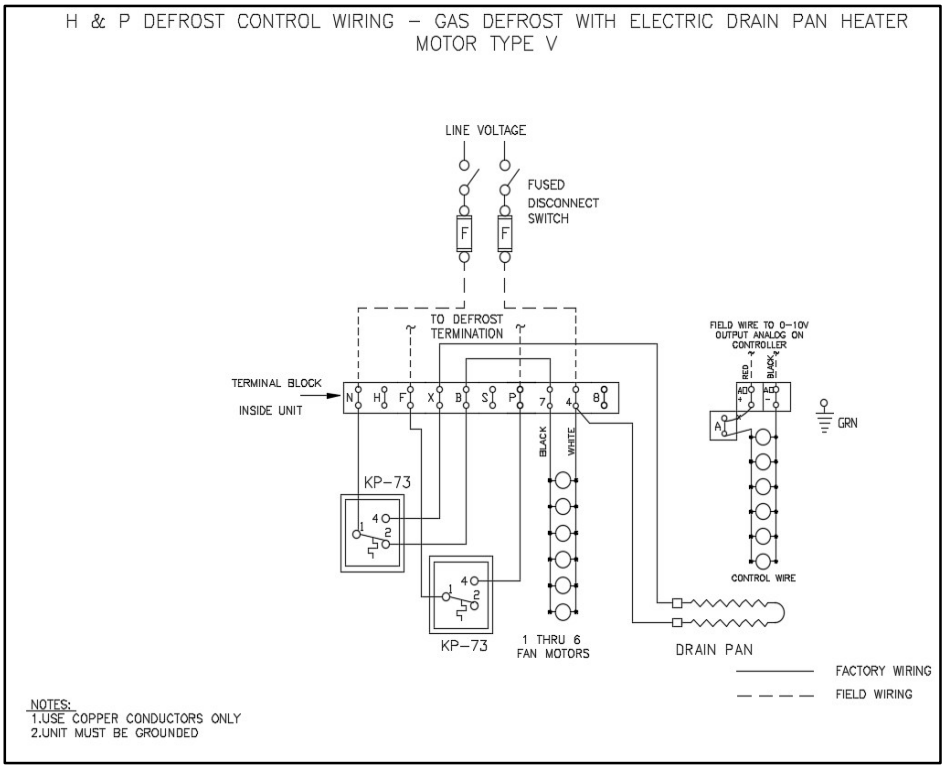


FIGURE 13C: H - 3 PIPE HOT GAS WITH ELECTRIC PAN HEAT AND P - 2 PIPE KOOL GAS WITH ELECTRIC PAN HEAT – MOTOR TYPE D

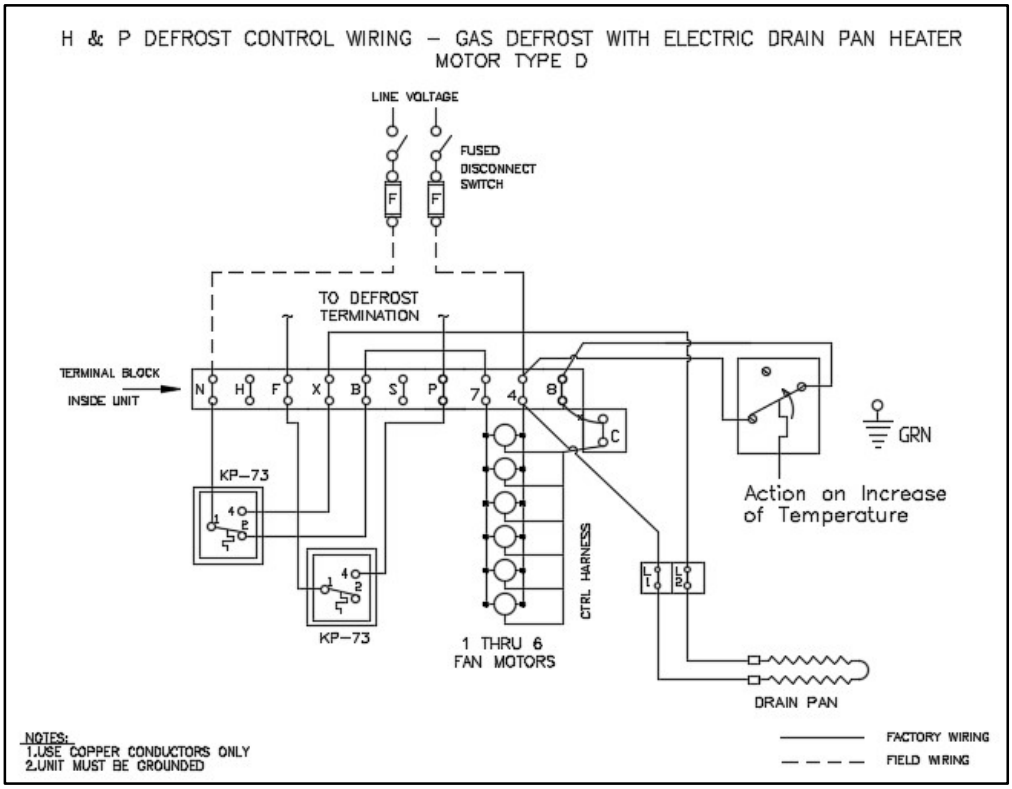


FIGURE 13D: 3 PIPE HOT GAS DEFROST WITH ELECTRIC PAN HEAT

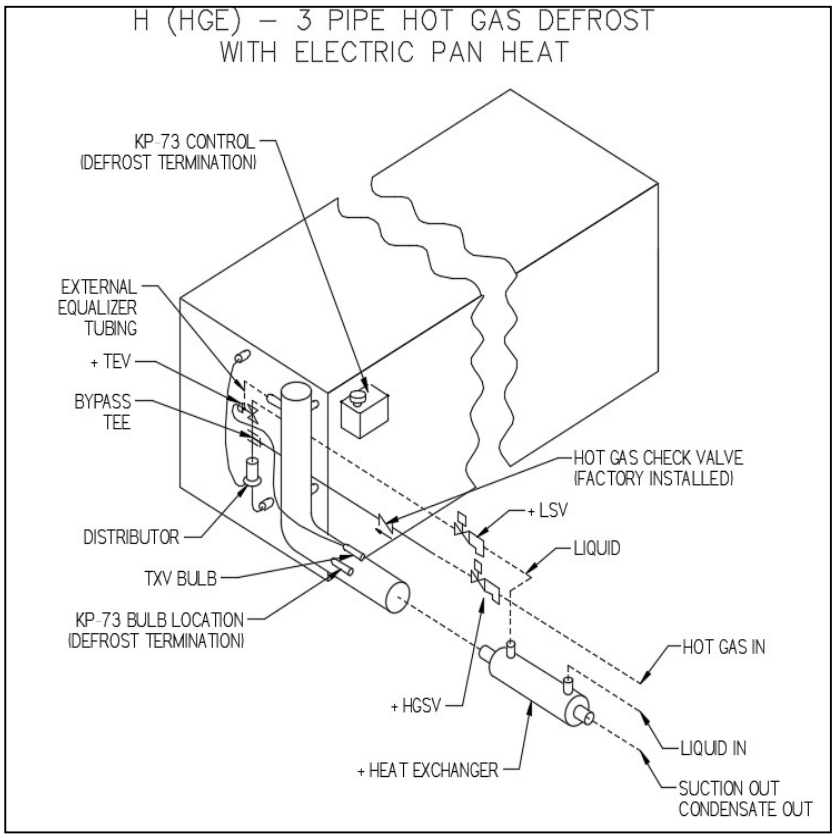
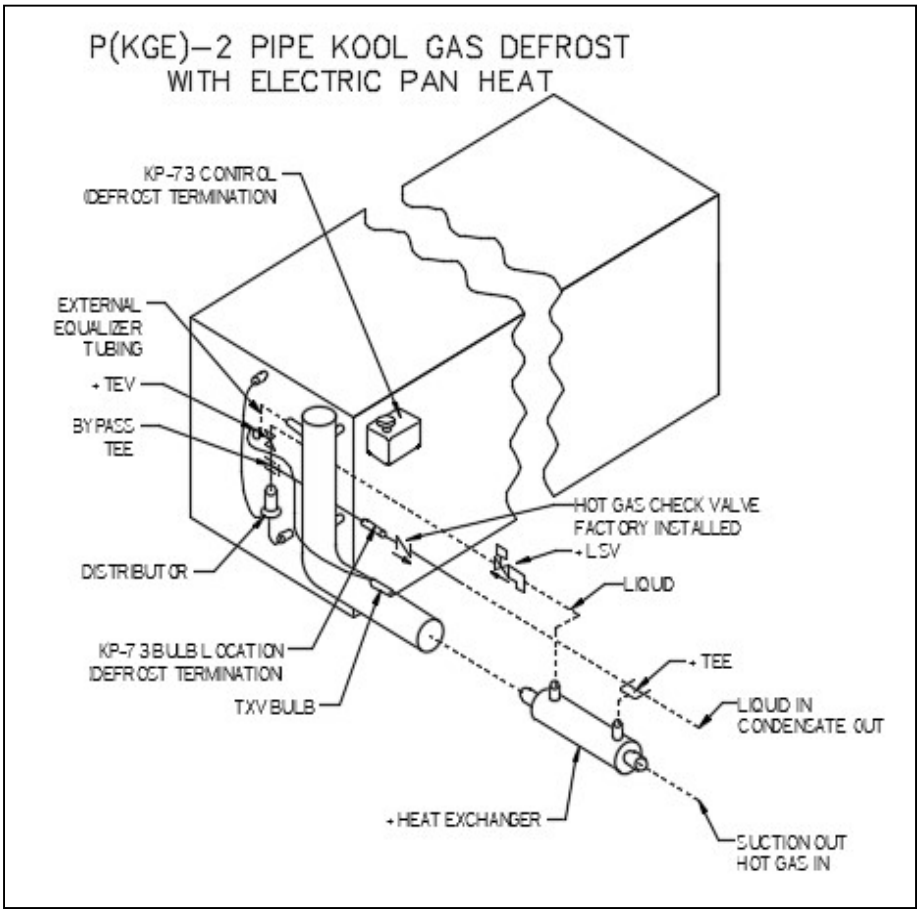


FIGURE 13E: P - 2 PIPE KOOL GAS WITH ELECTRIC PAN HEAT



5.10 *VARIABLE SPEED MOTOR WITH SYSTEM 450 – SEQUENCE OF OPERATION*

An installed System 450 C450CPN-4 controller will be utilized to supply 0-10V signal to the variable speed motor. A temperature sensor installed in the evaporator and wired to the System 450 control module will be utilized to measure the box temperature.

SYSTEM 450 PARAMETERS –

Set Point (SP) – is the target value that the control system drives toward. Set point at which the fan motor will run at full speed. – Target Box Temperature

End Point (EP) – is the maximum deviation from the target value. Set point at which fan motors will run at minimum speed **– Target Box Temperature – 5°F.**
Output at Set Point (OSP) – is the signal strength level of the analog output when the input sensor is at Set Point (SP). The OSP is expressed as a percentage (0 to 100%) of the full-scale output. **Output signal strength at set point, i.e., Analog signal at setpoint. 0% - 0V.**

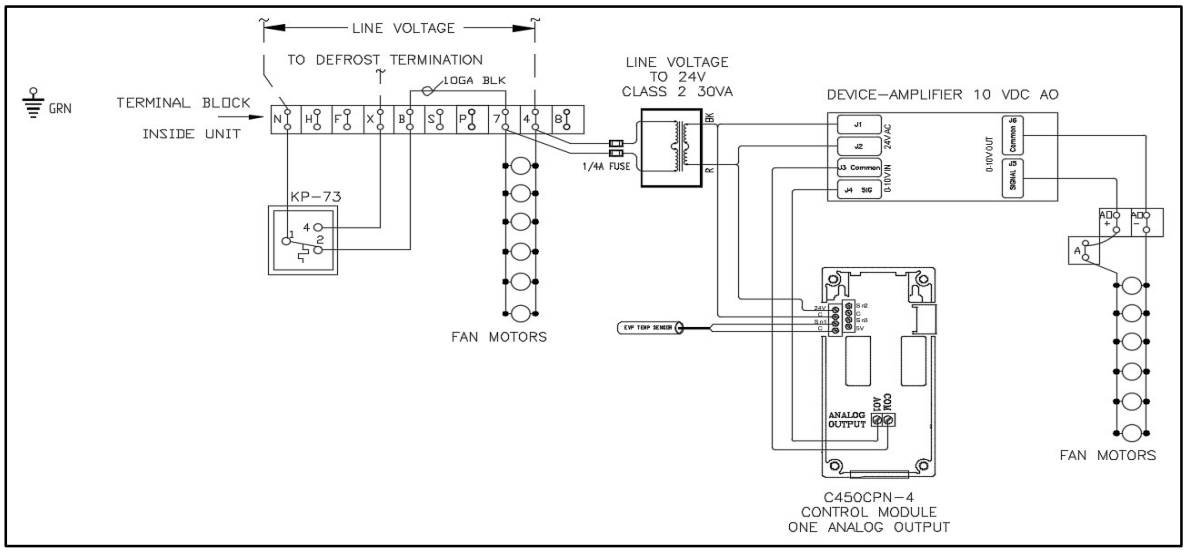
Output at Endpoint (OEP) – value (OEP) is the signal strength level of the analog output when the input sensor is at the End Point (EP). The OEP is expressed as a percentage (0 to 100%) of the full-scale output. **Output signal strength at endpoint, i.e., Analog signal at endpoint. 100% - 10V.**

Fan motor will receive 0V signal at Setpoint (SP) from System 450 controller, the fans will run at full speed. At Endpoint (EP), fans will receive 10V signal, the fans will run at minimum speed. The analog signal varies between setpoint to endpoint proportionally based on the box temperature measured by installed temperature sensor thus varies the fan speed proportionally.

Signal Amplifier is used enhance the analog signal strength from System 450 and then feed the signal to the motor to vary the fan speed. (Signal amplifier needed for KR, GH, GL, and LH evaporator coils only).

Sensor Failure Mode –
System 450 allows the user to select the mode of operation for control system outputs in the event of a sensor (or sensor wiring) failure of the sensor that the outputs reference. Set **SNF as OFF.** Analog output SNF OFF = Output Signal Strength at Set point (OSP). i.e., Analog output will fail at OSP setpoint. Sending 0V signal to motor.

FIGURE 15: WIRING DRAWING OF EVAPORATOR WITH SYSTEM 450 AND SIGNAL AMPLIFIER

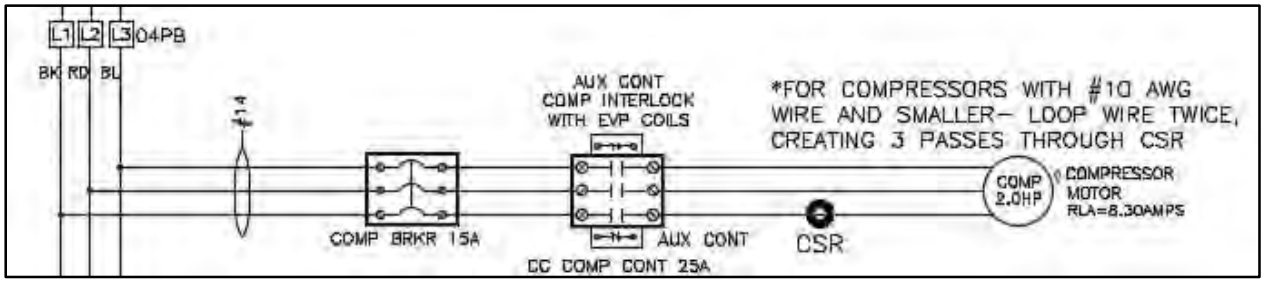


5.11 *INTERLOCKING SINGLE COMPRESSOR UNIT WITH KRACK COIL*

When a single compressor unit is utilized with a Krack evaporator, the evaporator fan should run at full speed whenever the compressor is running (i.e., when using evaporator with dual speed motor fans), and variable speed motor fans the fan speed should not modulate when the compressor is running. Fan speed can modulate only when compressor is turned off due to system operation.

When Krack evaporator coils are used with single compressor units from Hussmann (HE-Series, H-Series, and C-Series), there is a provision given to interlock the compressor with evaporator fans. Single compressor units use a contactor for compressor operation, a NC Aux contact attached to the main contactor and will be used to interlock.

FIGURE 16: SETUP IN A SINGLE COMPRESSOR UNIT:



Aux contact in Single compressor unit wired to terminal pins

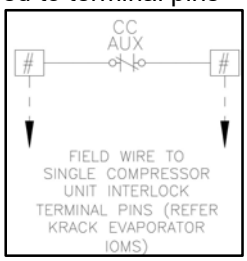
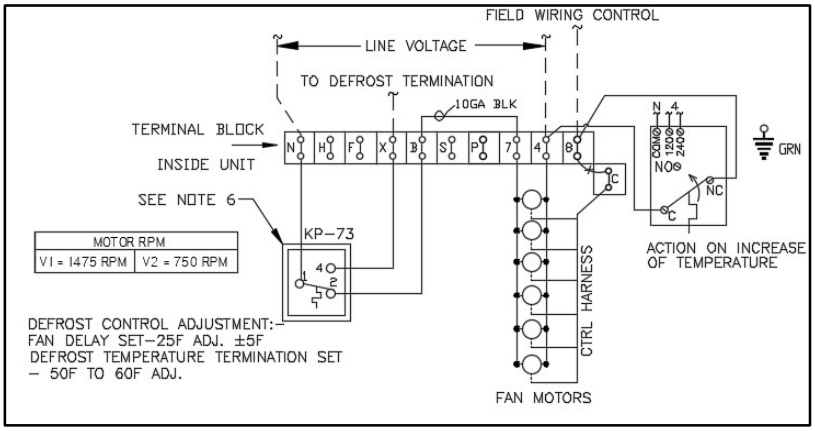


FIGURE 17: DUAL SPEED MOTOR EVAPORATER COILS – (MOTORS WITH CONTROL HARNESS)



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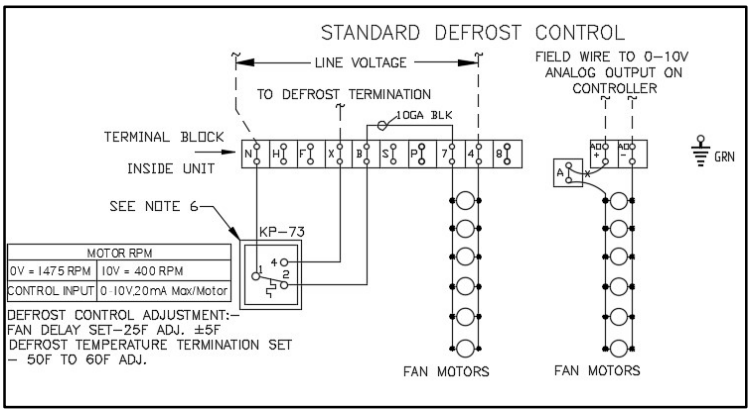
In the case of a dual speed motor coil with control harness, the jumper between terminal 8 and C should be removed and then the aux contact from single compressor unit wired in series. Whenever the compressor contactor is energized, the Aux contact energizes, and NC contacts changes state to NO, there by opening the control harness circuit. So, whenever compressor is on, fans will never go to low speed mode, even getting signal from the room thermostat or filed controller.

VARIABLE SPEED MOTOR EVAPORATER COILS – FIGURE 18:



In the case of variable speed motor coils, the jumper between the terminal A0+ and A should be removed and then the aux contact from the single compressor unit be wired in series. Whenever the compressor contactor is energized, the aux contact energizes, and NC contacts changes state to NO, there by opening the analog 10V signal circuit. Whenever the controller sends the 10V signal, it goes through the aux contact, and ensuring the compressor is on deactivating the analog signal circuit. When the compressor is ON, the fans will never be able to modulate, though the controller is signaling the fans to modulate.

6 START UP

6.1 *PRE-STARTUP*

After installation is complete, a review of the following items should be performed before the system is placed into operation:

Check electrical connections, fan blade set screws, fan motors, guards, and all other fasteners for tightness. Ensure the thermostatic expansion valve bulb is properly located, strapped, and insulated. With the system operating, check the supply voltage. It must be within +/- 10% of the voltage marked on the unit nameplate.

For electric defrost systems, check the defrost timer to see that is set for the correct time of day, and that the starting pins have been installed (normally two per day). The defrost should be scheduled for times when the freezer doors are not likely to be open.

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.

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 an extended period. To prevent this, it is permissible to install a temporary jumper wire between terminals “F” and “B” or “N” and “B” depending on the unit wiring arrangement. Once the box temperature is below +25°F, the jumper wire should be removed.

6.2 *OPERATION CHECKOUT*

Check the room thermostat setting. Ensure it functions properly.

After the system has balanced out at the desired room temperature, check the operation of the expansion valve by properly measuring the superheat at the sensing bulb. Refer to section 4.5 for instructions on expansion valve adjustments. As much as 30 minutes may be required for the new balance to take place after an adjustment is made.

For electric defrost systems, once the coil is frosted, manually advance the defrost timer to initiate a defrost. Observe the defrost cycle to see if all controls are functioning properly and that the coil is

clear of all frost before the system returns to refrigeration. Reset the defrost timer to the correct time of day.

A defrost cycle is only needed when the frost builds up, such that it impedes the airflow through the coil. The defrost requirements will vary on each installation and may change depending on the time of the year and other conditions.

7 PREVENTATIVE MAINTENANCE

A preventative maintenance schedule should be established as soon as the unit cooler is installed. The unit should be inspected periodically for proper operation and buildup of soil.

1. Inspect and clean the drain pan to ensure free drainage of condensate. The drain pan should be cleaned regularly with warm water and soap.
2. The cabinet, fans, and guards can be cleaned with warm water and soap.
3. The evaporator coil should be checked once a month for proper defrosting. Many variables affect coil frosting such as room temperature, type of product being stored, how often new product is brought in, and the length of time the door to the room remains open. Summer conditions of high humidity can cause heavier frost loads. It may be necessary to change the numbers of defrost cycles seasonally.
4. At least every six months, check all fan motors. Tighten motor mounting screws and fan set screws.

WARNING: All power to the evaporator must be off before opening any compartments, cleaning, or performing maintenance.

8 TROUBLESHOOTING CHART

TABLE 10: TROUBLESHOOTING CHART

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Fans will not operate.	Unit not wired properly. Defective motor. Defective defrost timer, termination thermostat or fan delay switch.	Check wiring. Replace motor. Replace defective component.
Ice forming on ceiling. Steaming during defrost.	Too many defrosts per day. Defective termination Thermostat or defrost timer.	Observe frost build up on coil, change to fewer defrost per day. Replace defective component.
Excessive buildup of frost on coil.	Too few defrost times. Defrost cycle too short. Too high humidity in cooler.	Add more defrost cycles to timer. Extend defrost time on timer. Limit access to cooler, do not prop doors open during stocking.
Accumulation of ice in drain pan.	Drain line plugged. Defective heater.	Clean drain line. Make sure drain line is insulated properly. Replace heater.

9 REPLACEMENT PARTS LIST

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.

FIGURE 19: REPLACEMENT PARTS

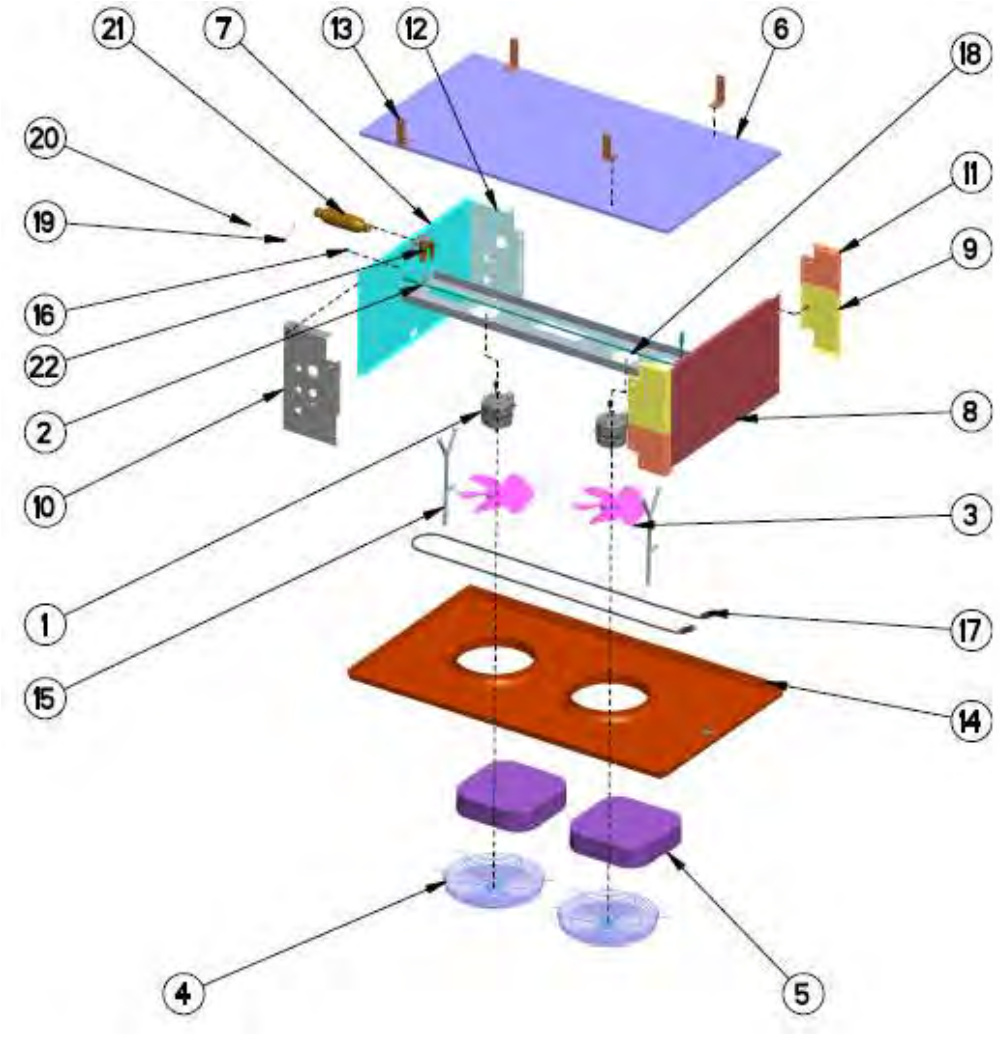


TABLE 11: REPLACEMENT PARTS

Item	General Description	Options Description	Hussmann Aftermarket Part Number
1	MOTOR	PSC 115/1/60 1/28 HP	E205109
		PSC 230/1/60 1/28 HP	E201949
		EC 115/1/60 1/15 HP	E410412001
		EC 230/1/60 1/15 HP	E410413001
		EC 115/230V DUAL Speed	3047949
		EC 115/230V VAR SPEED	3047950
2	MOTOR MOUNT	22"	E104108
		44"	E104109
		66"	E104110
3	FAN BLADE	GH	112650
		GL	112630
4	FAN GUARD		E103789
5	AIR FILTER		E103798
6	FAN/TOP PANEL	1 FAN	E103757
		2 FAN	E103758
		3 FAN	E103759
		4 FAN	E103760
		5 FAN	E103761
		6 FAN	E103762
7	END COVER PANEL (HEADER END)	GH	E103796
		GL	E103770
8	END COVER PANEL (RETURN END)	GH	E103797
		GL	E103771
9	LEFT CORNER PANEL (RETURN END)	GH	E103794
		GL	E103768
10	LEFT CORNER PNL (HEADER END)	GH	E103792
		GL	E103766
11	RIGHT BOT CNR PANEL (RETURN END)	GH	E103795
		GL	E103769
12	RIGHT CORNER PNL (HEADER END)	GH	E103793
		GL	E103767
13	HANGER GL/GH UNITS		660220
14	DRAIN PAN WITH FAN GUARD	1 FAN-INSULATED	CE202778
		2 FAN-INSULATED	CE202779
		3 FAN-INSULATED	CE202780
		4 FAN-INSULATED	CE202781
		5 FAN-INSULATED	CE202782
		6 FAN-INSULATED	CE202783
		1 FAN-NON-INSULATED	CE103782
		2 FAN-NON-INSULATED	CE103783
		3 FAN-NON-INSULATED	CE103784
		4 FAN-NON-INSULATED	CE103785
		5 FAN-NON-INSULATED	CE103786
		6 FAN-NON-INSULATED	CE103787

15	WIRING HARNESS	1 FAN 115-230V	E206449
		2 FAN 115-230V	E206450
		3 FAN 115-230V	E206451
		4 FAN 115-230V	E206452
		5 FAN 115-230V	E206453
		6 FAN 115-230V	E206454
		1 FAN 460V	E206518
		2 FAN 460V	E206519
		3 FAN 460V	E206520
		4 FAN 460V	E206521
		5 FAN 460V	E206522
		6 FAN 460V	E206523
	DUAL Speed HARNESS	HARNESS-2SP 1 FAN	3105724
		HARNESS-2SP 2 FAN	3105725
		HARNESS-2SP 3 FAN	3105726
		HARNESS-2SP 4 FAN	3105727
		HARNESS-2SP 5 FAN	3105728
		HARNESS-2SP 6 FAN	3105729
	VARIABLE SPEED HARNESS	HARNESS-VS 1 FAN	3086202
		HARNESS-VS 2 FAN	3086203
		HARNESS-VS 3 FAN	3086204
		HARNESS-VS 4 FAN	3086205
		HARNESS-VS 5 FAN	3086206
		HARNESS-VS 6 FAN	3086207
16	THERMOSTATS	DEFROST TERMINATION THERMOSTAT FIXED (KLIXON)	E206100
		HEATER SAFETY THERMOSTAT	109560
		HEATER SAFETY THERMOSTAT SPDT	E206465
		FAN DELAY	E201818
		KP-73	E205004
	FAN SPEED CONTROLS	AMPLIFIER 10 VDC AO	3122367
		SYSTEM 450 CONTROLLER	3059162
		ROOM THERMOSTAT	E206766
		A99BC-300 TEMP SENSOR	E205564
17	PAN HEATERS	115/230/1/60, 1 FAN	631080
		115/230/1/60, 2 FAN	631090
		115/230/1/60, 3 FAN	631100
		115/230/1/60, 4 FAN	631110
		115/230/1/60, 5 FAN	631120
		115/230/1/60, 6 FAN	631130
18	COIL HEATERS	230V, 1 FAN	E101930
		460V, 1 FAN	E101936
		230V, 2 FAN	E101931
		460V, 2 FAN	E101937
		230V, 3 FAN	E101932
		460V, 3 FAN	E101938
		230V, 4 FAN	E101933
		460V, 4 FAN	E101939
		230V, 5 FAN	E101934
		460V, 5 FAN	E101940
		230V, 6 FAN	E101935
		460V, 6 FAN	E101941
19	FACE HEATER CLIP		E102007
20	BOTTOM HEATER SUPPORT		E205740
21	CHECK VALVE		118520

			118530
22	EXPANSION VALVE	EBSJE-5-C	E206822
		EBSSE-6-C	E314439
		EGJE-1/2-C	E205915
		EGJE-1/4-C	E206474
		EGJE-1-1/2-C	E206131
		EGJE-1-C	E205916
		EGJE-2-C	E205987
		EGSE-1/2-C	E205984
		EGSE-1/4-C	E206277
		EGSE-1-1/2-C	E205983
		EGSE-1-C	E205982
		EGSE-2-C	E205985
		EGVE-1/2-C	E205717
		EGVE-1-1/2-C	E205723
		EGVE-1-C	E205721
		EGVE-2-C	E205781
		EGVE-3/4-C	E205719
		EGVE-3-C	E205803
		SBFJE-AA-C	E205991
		SBFJE-A-C	E205992
		SBFJE-B-C	E205993
		SBFJE-C-C	E205994
		SBFSE-AA-C	E206015
		SBFSE-A-C	E206013
		SBFSE-B-C	E206014
		SBFSE-C-C	E206016
		SBFVE-AA-C	E205501
		SBFVE-A-C	E311117
		SBFVE-B-C	E205500
		SBFVE-C-C	E311118
23	AUX CONTACT FOR SINGLE COMP INTERLOCK	C320KG2 AUX CONT 1 NC 25-75A C320DPG01 AUX CONT 1 NC 90A	E209975002 E209976002

NOTES:

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