MK/MV Series

MEDIUM PROFILE UNIT COOLERS

Installation and Operation Manual

Part Number: E206993_Q

Products that provide lasting solutions.

BEFORE YOU BEGIN

Read these instructions completely and carefully.

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.

FOR CALIFORNIA INSTALLATIONS ONLY:

WARNING:

Cancer and Reproductive Harm
www.P65Warnings.ca.gov

August 31, 2018 3069575

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

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 when working with this equipment. Observe all precautions on tags, stickers, labels and literature attached to this equipment.

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.

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, li- censed 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, possible acid exposure, food and product damage, 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.

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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.

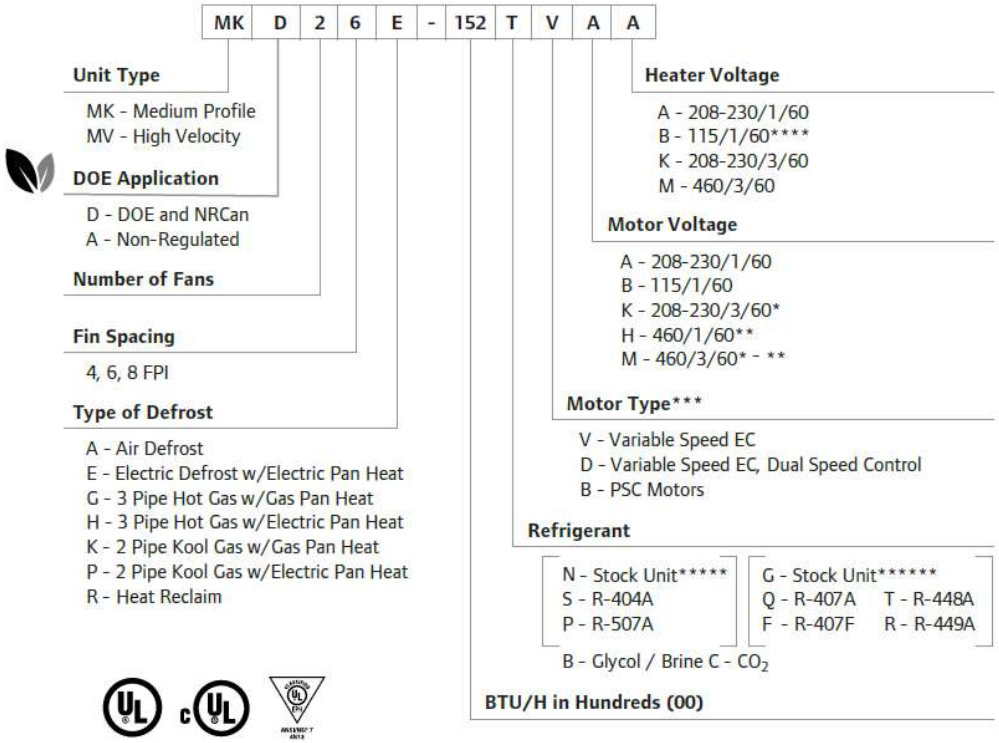
1.2 LOSS OF GAS HOLDING CHARGE

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

MK Series medium profile unit coolers. MV Series medium profile unit coolers - low temperature. The MK and MV series are designed for walk-in coolers with ceiling heights of 10 to 14 feet that require high airflow. MK/MV unit coolers draw air through the coil and discharge it into the room via the unit fans.
The MK series handles medium to low temperature requirements and has three defrost options – air, electric, and hot gas. The MV series is designed for low temperatures requiring extra high air discharge velocities. The MV unit coolers are only available with electric defrost.



* Single phase motors wired for 3 phase operation. Not available on single fan units.
** 460 V motors are Motor Type PSC only and not available for **DOE** or **NRCan** regulated applications.
*** EC motor required for **DOE** with Variable Speed or Dual Speed control option are A, B or K motor voltage only.
**** Available on pan heaters for **"H"** and **"P"** defrost options only.
***** **N Stock Units** are for non-glide or glide refrigerants
****** **G Stock Units** are for glide refrigerants only

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

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

2.2 UNIT DIMENSIONS

FIGURE 1: UNIT DIMENSIONS

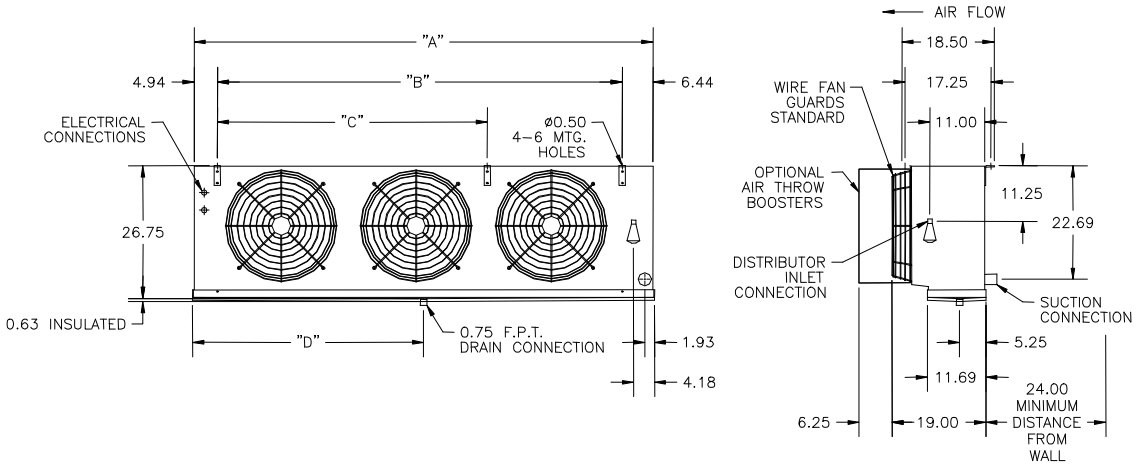


TABLE 1 UNIT DIMENSIONS

Unit Size	"A"	"B"	"C"	"D"
1 FAN	38.4	27.0	_	19.2
2 FAN	63.4	54.0	_	32.7
3 FAN	92.4	81.0	54.0	46.2
4 FAN	119.4	108.0	54.0	59.7

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 blow away from the wall and directed down an aisle rather than into and through shelves. 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. 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 24" from walls to assure unrestricted air intake.

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 insure proper drainage of the condensate. Suspended units must have sufficient clearance above for cleaning the top.

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. If the temperature surrounding the drain line and trap is below freezing (32°) 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 to safe 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 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 units with hot gas defrost refer to section 4.4 and FIGURE's 2 through 7 for piping arrangement.
Refer to section 4.5 for refrigerant distributor nozzle selection.
Refer to section 4.6 for expansion valve selection.

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. A 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

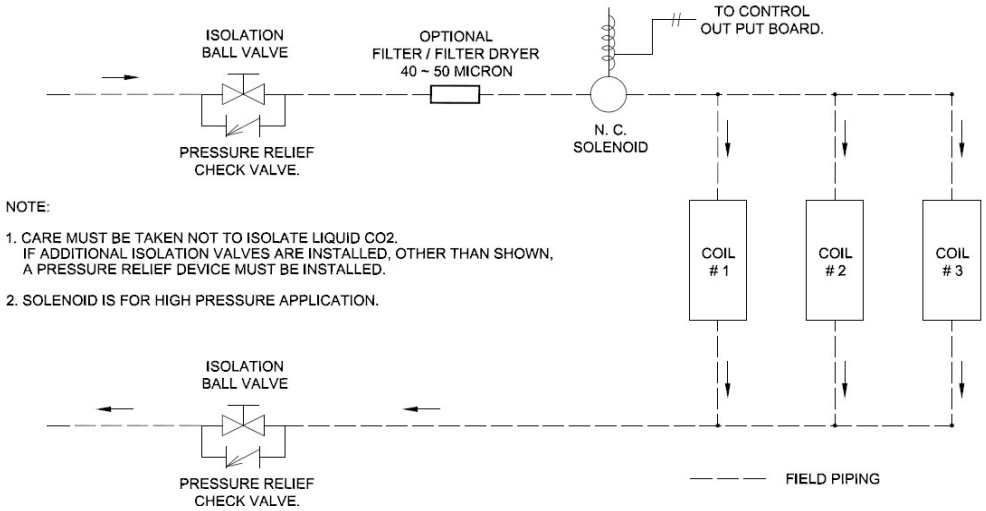
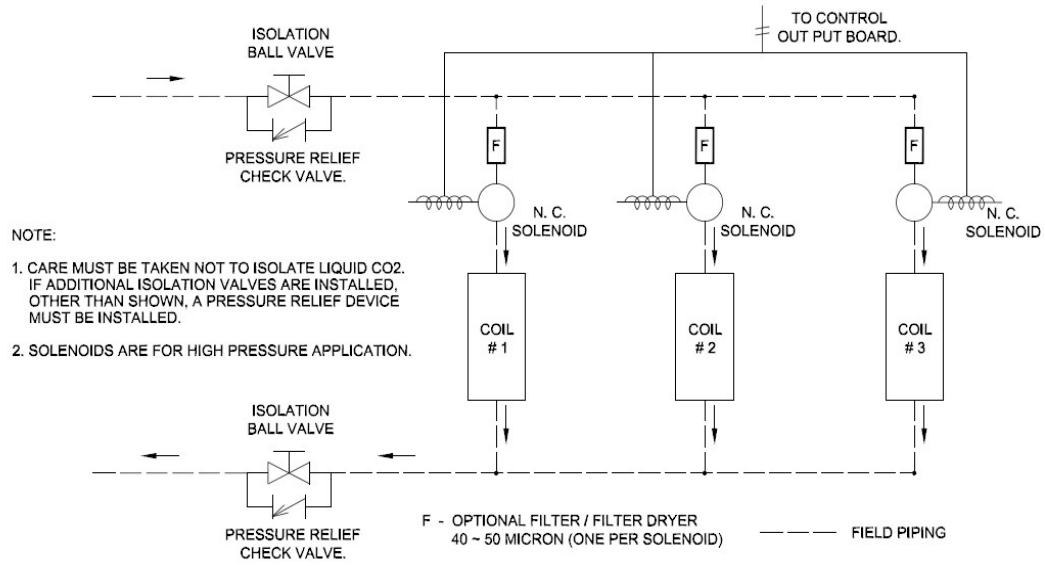


FIGURE 3: MULTIPLE UNIT COOLERS CONTROLLED BY MULTIPLE SOLENOIDS



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 compressor system for information on performing the leak test and evacuation.

4.4 MK HOT GAS DEFROST PIPING

FIGURE 4: (H) HGE - 3 PIPE HOT GAS COIL WITH ELECTRIC DRAIN PAN DEFROST PIPING

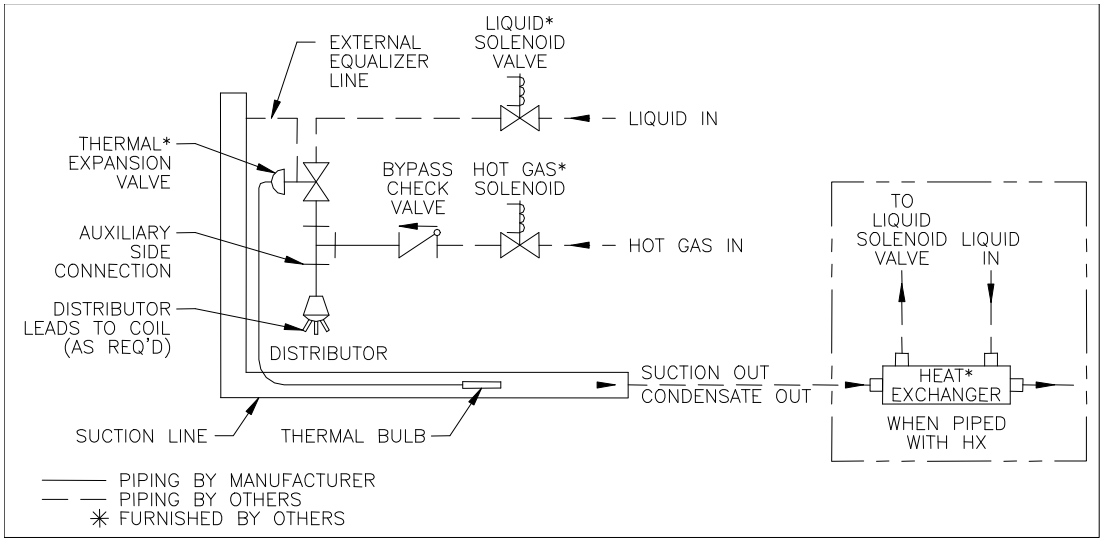


FIGURE 5: (G) HGG - 3 PIPE HOT GAS COIL WITH HOT GAS DRAIN PAN DEFROST PIPING

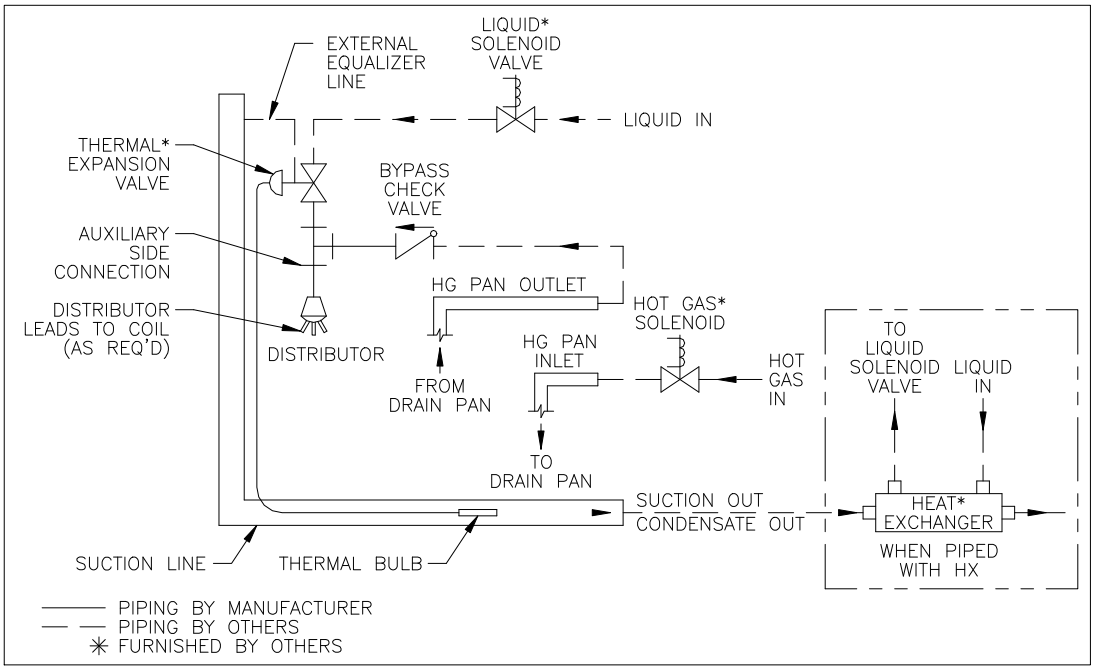


FIGURE 6: (K) KGE - 2 PIPE REVERSE CYCLE KOOL GAS COIL WITH ELECTR. DP DEFROST PIPING

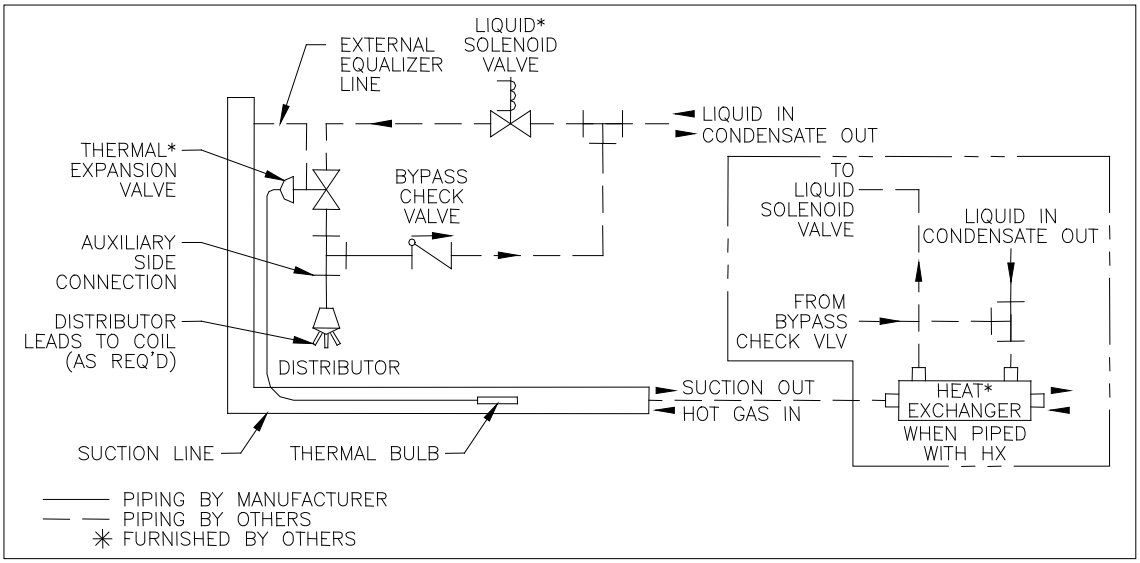


FIGURE 7: (K) KGG - 2 PIPE REVERSE CYCLE KOOL GAS COIL WITH KOOL GAS DP DEFROST PIPING

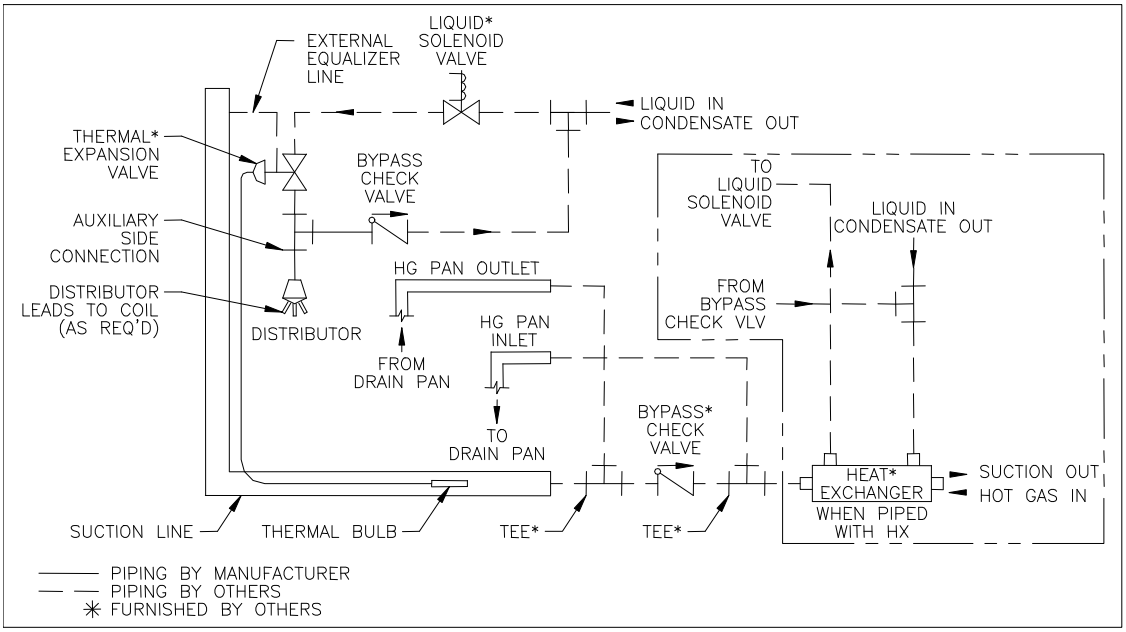


TABLE 2: SUCTION CONNECTION

2, 3 CIRCUITS	4, 5 CIRCUITS	6,7,8,10,13,15 CIRCUITS	20 CIRCUITS
7/8”	1-1/8”	1-5/8”	2-1/8”

To identify number of circuits per model refer to tables 3, 4 and 5.

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 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 10°F T.D., 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. Contact the factory for advice.

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. 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 that is easily inserted or removed with a pair of needle nose pliers. Nozzle selections are listed in tables 3, 4, and 5

TABLE 3: MK MEDIUM TEMPERATURE – AIR DEFROST

Model	NOZZLE R404A	NOZZLE R407A	NOZZLE R448A
MK*14A-94[ ]{ }	L - 1	L - 3/4	L - 3/4
MK*14A-121[ ]{ }	L - 1 - 1/2	L - 1	L - 1
MK*16A-118[ ]{ }	L - 1 - 1/2	L - 1	L - 1
MK*16A-145[ ]{ }	L - 1 - 1/2	L - 1 - 1/2	L - 1 - 1/2

MK*18A-133[ ]{ }	L - 1 - 1/2	L - 1 - 1/2	L - 1 - 1/2
MK*18A-160[ ]{ }	L - 2	L - 1 - 1/2	L - 1 - 1/2
MK*24A-188[ ]{ }	L - 2	L - 1 - 1/2	L - 1 - 1/2
MK*24A-242[ ]{ }	L - 3	L - 2	L - 2
MK*26A-236[ ]{ }	L - 3	L - 2 - 1/2	L - 2 - 1/2
MK*26A-290[ ]{ }	L - 3	L - 2 - 1/2	L - 2 - 1/2
MK*28A-266[ ]{ }	L - 3	L - 2 - 1/2	L - 2 - 1/2
MK*28A-320[ ]{ }	J - 3	J - 2 - 1/2	J - 2 - 1/2
MK*34A-363[ ]{ }	J - 4	J - 3	J - 3
MK*36A-354[ ]{ }	J - 4	J - 3	J - 3
MK*36A-435[ ]{ }	J - 5	J - 4	J - 4
MK*38A-393[ ]{ }	J - 4	J - 3	J - 3
MK*38A-480[ ]{ }	J - 5	J - 4	J - 4
MK*44A-484[ ]{ }	J - 5	J - 4	J - 4
MK*46A-580[ ]{ }	J - 8	J - 5	J - 5
MK*48A-640[ ]{ }	J - 8	J - 6	J - 6

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

*** Replace with D or A where D units are DOE compliant and A are for non-regulated applications.**
[ ] Location for the refrigerant letter code.
{ } Variable speed EC motor is standard, include V for variable speed control or D when two speed control from 10V signal will be applied.
EXAMPLE FULL MODEL:

MKD16A-118TVA is DOE/NRCan with R-448A, Variable Speed EC motor and includes the additional letter A for 208V single phase fan power

TABLE 4: MK ELECTRIC OR GAS DEFROST

Model	NOZZLE R404A	NOZZLE R407A	NOZZLE R448A
MK*14()-82[ ]{ }	L - 1 - 1/2	L - 1	L - 1
MK*14()-105[ ]{ }	L - 2	L - 1 - 1/2	L - 1 - 1/2
MK*16()-103[ ]{ }	L - 2	L - 1 - 1/2	L - 1 - 1/2
MK*16()-127[ ]{ }	L - 2 - 1/2	L - 2	L - 2
MK*24()-164[ ]{ }	J - 3	J - 2	J - 2
MK*24()-210[ ]{ }	J - 4	J - 2 - 1/2	J - 2 - 1/2
MK*26()-206[ ]{ }	J - 4	J - 2 - 1/2	J - 2 - 1/2
MK*26()-254[ ]{ }	J - 5	J - 4	J - 3
MK*34()-246[ ]{ }	G - 4	G - 3	G - 3
MK*34()-315[ ]{ }	G - 5	G - 4	G - 4
MK*36()-309[ ]{ }	G - 5	G - 4	G - 4
MK*36()-381[ ]{ }	G - 8	G - 5	G - 5
MK*44()-420[ ]{ }	G - 8	G - 6	G - 6
MK*46()-508[ ]{ }	G - 12	G - 8	G - 8

Note - Distributor nozzle selections are based on -20°F suction temperature, 10°F T.D. and 95°F liquid temperature.

*** Replace with D or A where D units are DOE compliant and A are for non-regulated applications.**
[ ] Location for the refrigerant letter code. { } Variable speed EC motor is standard, include V for variable speed control or D when two speed control from 10V signal will be applied.
EXAMPLE FULL MODEL: MKD26E-254QVAA is for DOE/NRCan application with R-407A, Variable Speed EC motor and includes the additional letters AA for 208V single phase fan and defrost power.

TABLE 5: MV LOW TEMPERATURE/HIGH VELOCITY - ELECTRIC DEFROST

Model	NOZZLE R404A	NOZZLE R407A	NOZZLE R448A
MV*14()-73[ ]{ }	L-1-1/2	L-1	L-1
MV*14()-100[ ]{ }	L-2	L-1-1/2	L-1-1/2
MV*14()-128[ ]{ }	L-2	L-2	L-1-1/2
MV*24()-146[ ]{ }	J-2-1/2	J-2	J-2
MV*24()-200[ ]{ }	J-4	J-2-1/2	J-2-1/2
MV*24()-256[ ]{ }	J-5	J-4	J-3
MV*34()-300[ ]{ }	G-5	G-4	G-4
MV*34()-383[ ]{ }	G-8	G-5	G-5
MV*44()-512[ ]{ }	G-12	G-8	G-8
MV*16()-93[ ]{ }	L-2	L-1-1/2	L-1-1/2
MV*16()-126[ ]{ }	L-2-1/2	L-2	L-2
MV*16()-155[ ]{ }	L-3	L-2	L-2
MV*26()-186[ ]{ }	J-4	J-2-1/2	J-2-1/2
MV*26()-252[ ]{ }	J-5	J-4	J-4
MV*26()-310[ ]{ }	J-6	J-4	J-4
MV*36()-378[ ]{ }	G-8	G-5	G-5
MV*36()-465[ ]{ }	G-12	G-6	G-6
MV*46()-620 [ ]{ }	G-17	G-12	G-12

Note - Low temperature distributor nozzle selections are based on -20°F suction temperature, 10°F T.D. and 95°F liquid temperature.

MV units are only available for non-DOE regulated applications.

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 are adjusted at the factory prior to shipment. The setting will be correct for many applications, but in other applications adjustments may be needed. 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.

TABLE 6 MK SERIES – AIR DEFROST

Model	TXV R404A	TXV R407A	TXV R448A
MK*14A-94[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-AA-C EGNE-3/4-C	SBFDE-AA-C EGDE-1/2-C
MK*14A-121[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-C	SBFDE-A-C EGDE-1-C
MK*16A-118[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-C	SBFDE-A-C EGDE-1-C
MK*16A-145[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C
MK*18A-133[ ]{ }	SBFSE-A-C EGSE-1-C	SBFNE-A-C EGNE-1-C	SBFDE-A-C EGDE-1-C
MK*18A-160[ ]{ }	SBFSE-B-C EGSE-1-1/2-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C
MK*24A-188[ ]{ }	SBFSE-B-C EGSE-1-1/2-C	SBFNE-A-C EGNE-1-1/2-C	SBFDE-A-C EGDE-1-C
MK*24A-242[ ]{ }	SBFSE-B-C EGSE-2-C	SBFNE-B-C EGNE-2-C	SBFDE-B-C EGDE-1-1/2-C
MK*26A-236[ ]{ }	SBFSE-B-C EGSE-2-C	SBFNE-B-C EGNE-2-C	SBFDE-B-C EGDE-1-1/2-C
MK*26A-290[ ]{ }	SBFSE-C-C	SBFNE-B-C EGNE-3-C	SBFDE-B-C EGDE-1-1/2-C
MK*28A-266[ ]{ }	SBFSE-B-C EGSE-2-C	SBFNE-B-C EGNE-2-C	SBFDE-B-C EGDE-1-1/2-C
MK*28A-320[ ]{ }	SBFSE-C-C	SBFNE-B-C EGNE-3-C	SBFDE-B-C EGDE-1-1/2-C
MK*34A-363[ ]{ }	SBFSE-C-C	SBFNE-B-C EGNE-3-C	SBFDE-B-C EGDE-2-1/2-C
MK*36A-354[ ]{ }	SBFSE-C-C	SBFNE-B-C EGNE-3-C	SBFDE-B-C EGDE-2-1/2-C
MK*36A-435[ ]{ }	EBSSE-6-C	SBFNE-C-C EGNE-3-C	SBFDE-C-C
MK*38A-393[ ]{ }	SBFSE-C-C	SBFNE-C-C EGNE-3-C	SBFDE-B-C EGDE-2-1/2-C
MK*38A-480[ ]{ }	EBSSE-6-C	SBFNE-C-C	SBFDE-C-C
MK*44A-484[ ]{ }	EBSSE-6-C	SBFNE-C-C	SBFDE-C-C
MK*46A-580[ ]{ }	EBSSE-6-C	SBFNE-C-C	EBSDE-7-C
MK*48A-640[ ]{ }	EBSSE-6-C	SBFNE-C-C	EBSDE-7-C

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

*For **R-507**, on the R404A TXV model name replace the second **S** with **P**. For example, SBF**S**E-B-C (R404A) becomes SBF**P**E-B-C and EG**S**E-1-1/2-C becomes EG**P**E-1-1/2-C (R-507)*

*For **R-449A**, use the same TXV as **R-448A.** For **R-407F**, use the same TXV as **R-407A***

*** Replace with D or A where D units are DOE compliant and A are for non-regulated applications.**
[ ] Replace with refrigerant letter code. { } Variable speed EC motor is standard, include V for variable speed control or D when two speed control from 10V signal will be applied.
EXAMPLE FULL MODEL:

MKD16A-118TVA is DOE/NRCan with R-448A, Variable Speed EC motor and includes the additional letter A for 208V single phase fan power

TABLE 7: MK SERIES – ELECTRIC DEFROST

Model	TXV R404A	TXV R407A	TXV R448A
MK*14E-82[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-Z	SBFDE-A-Z EGDE-1/2-Z
MK*14E-105[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-1/2-Z	SBFDE-A-Z EGDE-1-Z
MK*16E-103[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-1/2-Z	SBFDE-A-Z EGDE-1-Z
MK*16E-127[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-1/2-Z	SBFDE-A-Z EGDE-1-Z
MK*24E-164[ ]{ }	SBFSE-B-Z EGSE-1-1/2-Z	SBFNE-B-Z EGNE-2-Z	SBFDE-A-Z EGDE-1-Z
MK*24E-210[ ]{ }	SBFSE-C-Z EGSE-2-Z	SBFNE-B-Z EGNE-3-Z	SBFDE-B-Z EGDE-1-1/2-Z
MK*26E-206[ ]{ }	SBFSE-C-Z EGSE-2-Z	SBFNE-B-Z EGNE-2-Z	SBFDE-B-Z EGDE-1-1/2-Z
MK*26E-254[ ]{ }	SBFSE-C-Z	SBFNE-C-Z EGNE-3-Z	SBFDE-B-Z EGDE-2-1/2-Z
MK*34E-246[ ]{ }	SBFSE-C-Z	SBFNE-C-Z EGNE-3-Z	SBFDE-B-Z EGDE-1-1/2-Z
MK*34E-315[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z EGDE-2-1/2-Z
MK*36E-309[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z EGDE-2-1/2-Z
MK*36E-381[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z
MK*44E-420[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z
MK*46E-508[ ]{ }	EBSSE-7-1/2-Z	EBSNE-8-Z	EBSDE-7-Z

TXV selections are based on -20°F suction temperature, 10°F T.D. and 95°F liquid temperature, 105°F Condensing temperature and high side pressure drop of 10PSIG

*For **R-507**, on the R404A TXV model name replace the second **S** with **P**. For example, SBF**S**E-B-C (R404A) becomes SBF**P**E-B-C and EG**S**E-1-1/2-C becomes EG**P**E-1-1/2-C (R-507)*

*For **R-449A**, use the same TXV as **R-448A***
*For **R-407F**, use the same TXV as **R-407A***
*** Replace with D or A where D units are DOE compliant and A are for non-regulated applications.**
[ ] Location for the refrigerant letter code. { } Variable speed EC motor is standard, include V for variable speed control or D when two speed control from 10V signal will be applied.
EXAMPLE FULL MODEL: MKD26E-254QVAA is for DOE/NRCan application with R-407A, Variable Speed EC motor and includes the additional letters AA for 208V single phase fan and defrost power.

TABLE 8: MV SERIES – LOW TEMPERATURE – HIGH VELOCITY

MODEL	NOZZLE R404A	NOZZLE R407A	NOZZLE R448A
MV*14E-73[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-Z	SBFDE-AA-Z EGDE-1/2-Z
MV*14E-100[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-1/2-Z	SBFDE-A-Z EGDE-1/2-Z
MV*14E-128[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-1/2-Z	SBFDE-A-Z EGDE-1-Z
MV*24E-146[ ]{ }	SBFSE-B-Z EGSE-1-1/2-Z	SBFNE-B-Z EGNE-2-Z	SBFDE-A-Z EGDE-1-Z
MV*24E-200[ ]{ }	SBFSE-C-Z EGSE-2-Z	SBFNE-B-Z EGNE-2-Z	SBFDE-B-Z EGDE-1-1/2-Z
MV*24E-256[ ]{ }	SBFSE-C-Z	SBFNE-C-Z	SBFDE-B-Z EGDE-2-1/2-Z
MV*34E-300[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z EGDE-2-1/2-Z
MV*34E-383[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z
MV*44E-512[ ]{ }	EBSSE-7-1/2-Z	EBSNE-8-Z	EBSDE-7-Z
MV*16E-93[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-Z	SBFDE-A-Z EGDE-1/2-Z
MV*16E-126[ ]{ }	SBFSE-A-Z EGSE-1-Z	SBFNE-A-Z EGNE-1-1/2-Z	SBFDE-A-Z EGDE-1-Z
MV*16E-155[ ]{ }	SBFSE-B-Z EGSE-1-1/2-Z	SBFNE-B-Z EGNE-2-Z	SBFDE-A-Z EGDE-1-Z
MV*26E-186[ ]{ }	SBFSE-B-Z EGSE-2-Z	SBFNE-B-Z EGNE-2-Z	SBFDE-A-Z EGDE-1-Z
MV*26E-252[ ]{ }	SBFSE-C-Z	SBFNE-C-Z EGNE-3-Z	SBFDE-B-Z EGDE-1-1/2-Z
MV*26E-310[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z EGDE-2-1/2-Z
MV*36E-378[ ]{ }	EBSSE-6-Z	SBFNE-C-Z	SBFDE-C-Z
MV*36E-465[ ]{ }	EBSSE-7-1/2-Z	EBSNE-8-Z	EBSDE-7-Z
MV*46E-620[ ]{ }	EBSSE-10-Z	EBSNE-11-Z	EBSDE-7-Z

TXV selections are based on -20°F suction temperature, 10°F T.D. and 95°F liquid temperature, 105°F Condensing temperature and high side pressure drop of 10PSIG

*For **R-507**, on the R404A TXV model name replace the second **S** with **P**. For example, SBF**S**E-B-C (R404A) becomes SBF**P**E-B-C and EG**S**E-1-1/2-C becomes EG**P**E-1-1/2-C (R-507)*

*For **R-449A**, use the same TXV as **R-448A***
*For **R-407F**, use the same TXV as **R-407A***
[ ] Replace with refrigerant letter code. { } Variable speed EC motor is standard, include V for variable speed control or D when two speed control from 10V signal will be applied.
EXAMPLE FULL MODEL: MVA36E-465SVAA is for non-regulated application with R-404A, Variable Speed EC motor and includes the additional letters AA for 208V single phase fan and defrost power.

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 9, 10, 11,12 and 13 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 exceed the amp rating of the fan delay or heater safety switch, then a contactor must be installed.

5.2 ELECTRICAL DATA

TABLE 09 MK MOTOR AMPS – 1/4 HP MOTOR (B-PSC Motor)

FANS	115/60/1	230/60/1	230/60/3	460/60/1	460/60/3
1 Fan	3.8	1.9	N/A	0.9	N/A
2 Fan	7.6	3.8	3.3	1.8	2.0
3 Fan	11.4	5.7	3.3	2.7	2.0
4 Fan	15.2	7.6	5.1	3.6	3.0

TABLE 10 MV MOTOR AMPS – 1/3 HP MOTOR

FANS	115/60/1	230/60/1	230/60/3	460/60/1	460/60/3
1 Fan	4.3	2.3	N/A	1.1	N/A
2 Fan	8.6	4.6	4.0	2.2	2.0
3 Fan	12.9	6.9	4.0	3.3	2.0
4 Fan	17.2	9.2	6.1	4.4	3.0

TABLE 11 MK & MV EC AMPS – 1/3 HP MOTOR

FANS	115/60/1	230/60/1	230/60/3
1 Fan	4.5	2.6	N/A
2 Fan	9	5.2	4.6
3 Fan	13.5	7.8	4.6
4 Fan	18	10.4	6.9

TABLE 12: HEATER VOLTAGE CHART – MK COILS

HEATER VOLTAGE AMP CHART FOR "E" DEFROST

		A VOLTAGE	K VOLTAGE	H VOLTAGE	MOP		
MODEL	WATTS	230/1/60	230/3/60	460/3/60	230/1/60	230/3/60	460/3/60
MK-1	2300	10.0	6.5	3.3	15	15	15
MK-1	2900	12.6	7.3	3.6	20	15	15
MK-2	4400	19.1	12.2	6.2	25	20	15
MK-2	5600	24.3	14.1	7.1	35	20	15
MK-3	6600	28.7	18.3	9.3	40	25	15
MK-3	8400	36.5	21.2	10.6	50	30	15
MK-4	11000	47.80	27.90	13.80	60	35	20

HEATER VOLTAGE AMP CHART "H" & "P" DEFROST

		A VOLTAGE	B VOLTAGE	MOP	
MODEL	WATTS	230/1/60	115/1/60	230/1/60	115/1/60
MK-1	500	2.2	4.4	15	15
MK-2	800	3.5	7.0	15	15
MK-3	1200	5.2	10.4	15	20
MK-4	1400	6.10	12.20	15	20

TABLE 13 Heater Voltage Chart – MV Coils

HEATER VOLTAGE AMP CHART FOR "E" DEFROST

		A VOLTAGE	K VOLTAGE	H VOLTAGE	MOP		
MODEL	WATTS	230/1/60	230/3/60	460/3/60	230/1/60	230/3/60	460/3/60
MV–1	2300	10.00	6.50	3.30	15	15	15
MV–1	2900	12.60	7.50	3.60	20	15	15
MV–2	4400	19.10	12.20	6.20	25	20	15
MV–2	5600	24.30	14.30	7.10	35	20	15
MV–3	6600	28.70	18.30	9.30	40	25	15
MV–3	8400	36.50	21.50	10.60	50	30	15
MV–4	11000	47.80	27.90	13.80	60	35	20

6 AIR DEFROST SEQUENCE OF OPERATIONTABLE 12 HEATER VOLTAGE CHART – MK COIL

6.1 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 pressure 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.

For air defrost to work properly the compressor run time should not exceed 40 minutes per hour.

AIR DEFROST WIRING 1 PH

FIGURE 8: AIR DEFROST WIRING DIAGRAM FOR – MOTOR TYPE B

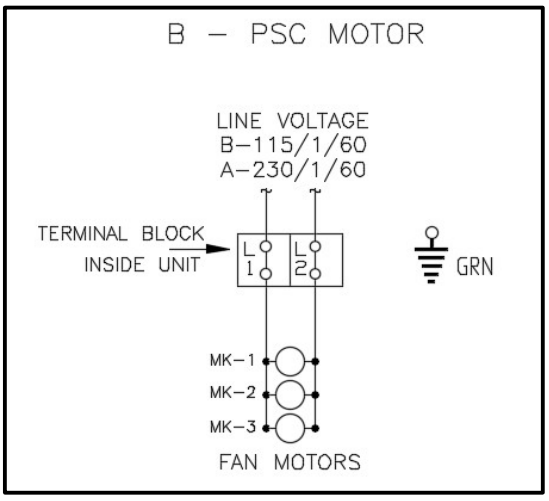


FIGURE 9: AIR DEFROST WIRING DIAGRAM FOR – MOTOR TYPE D

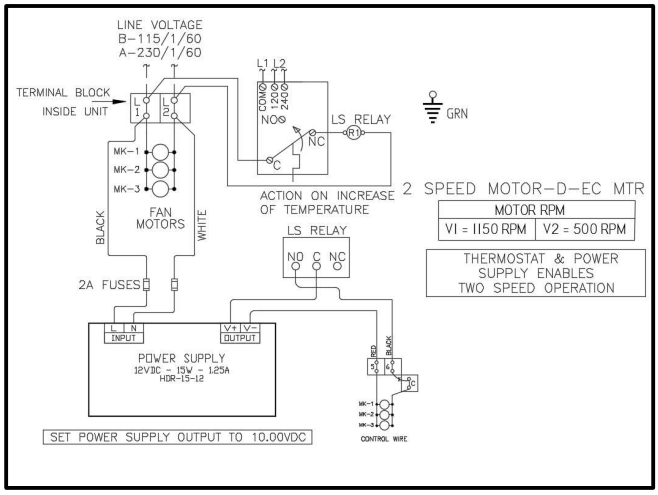
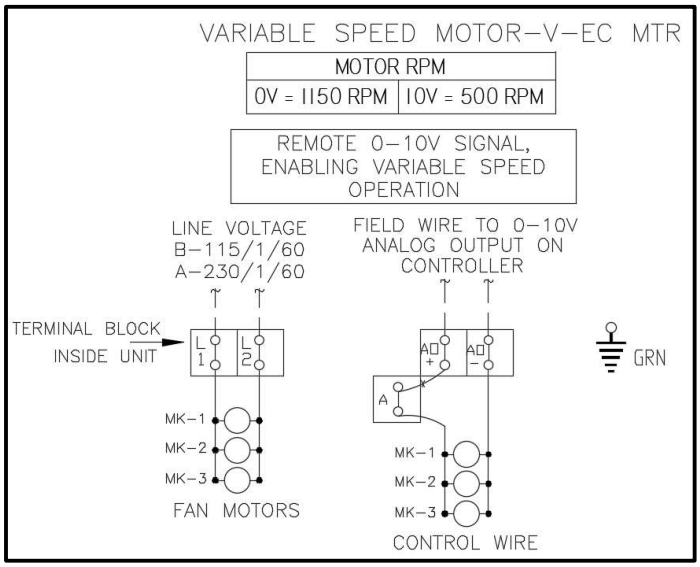


FIGURE 10: AIR DEFROST WIRING DIAGRAM FOR – MOTOR TYPE V



AIR DEFROST WIRING 3 PH

FIGURE 11: AIR DEFROST WIRING DIAGRAM FOR – MOTOR TYPE B

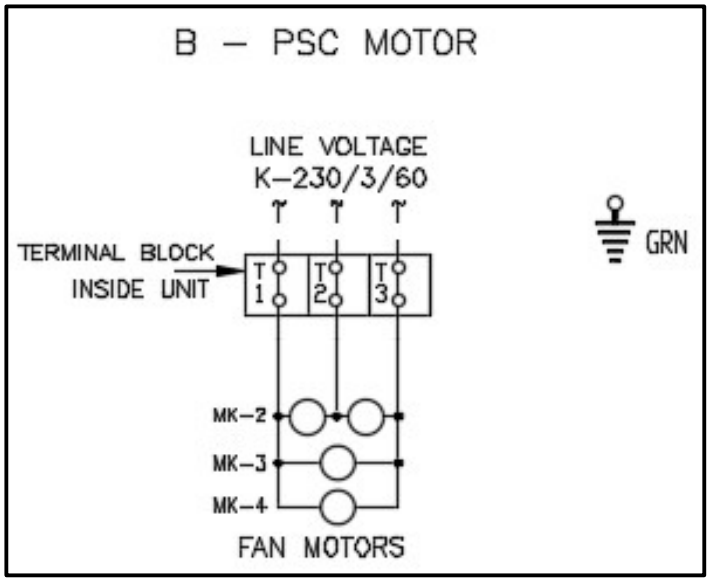


FIGURE 12: AIR DEFROST WIRING DIAGRAM FOR – MOTOR TYPE D

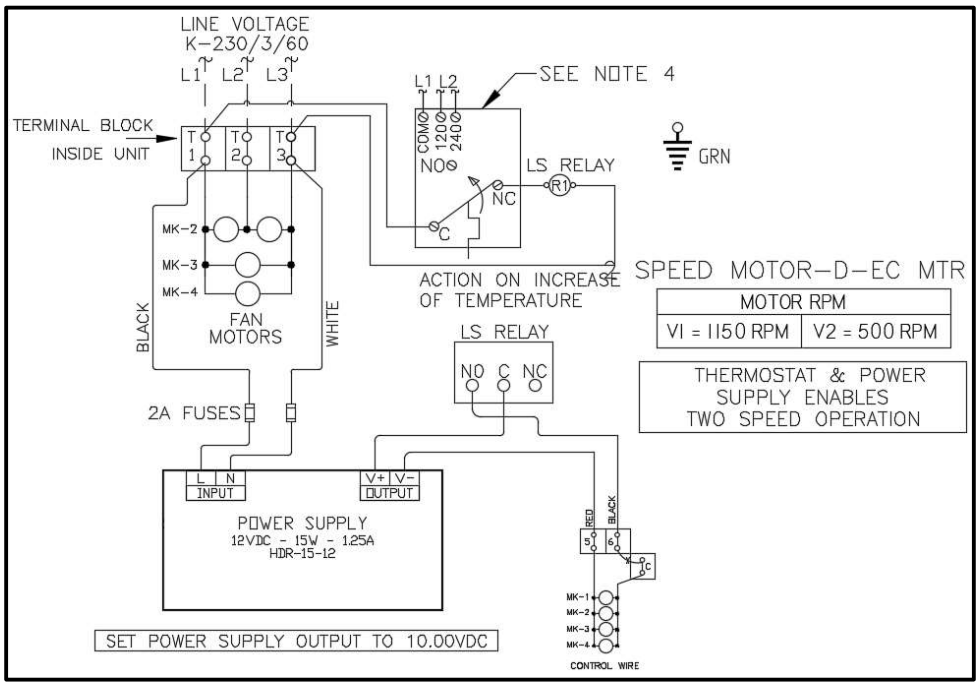
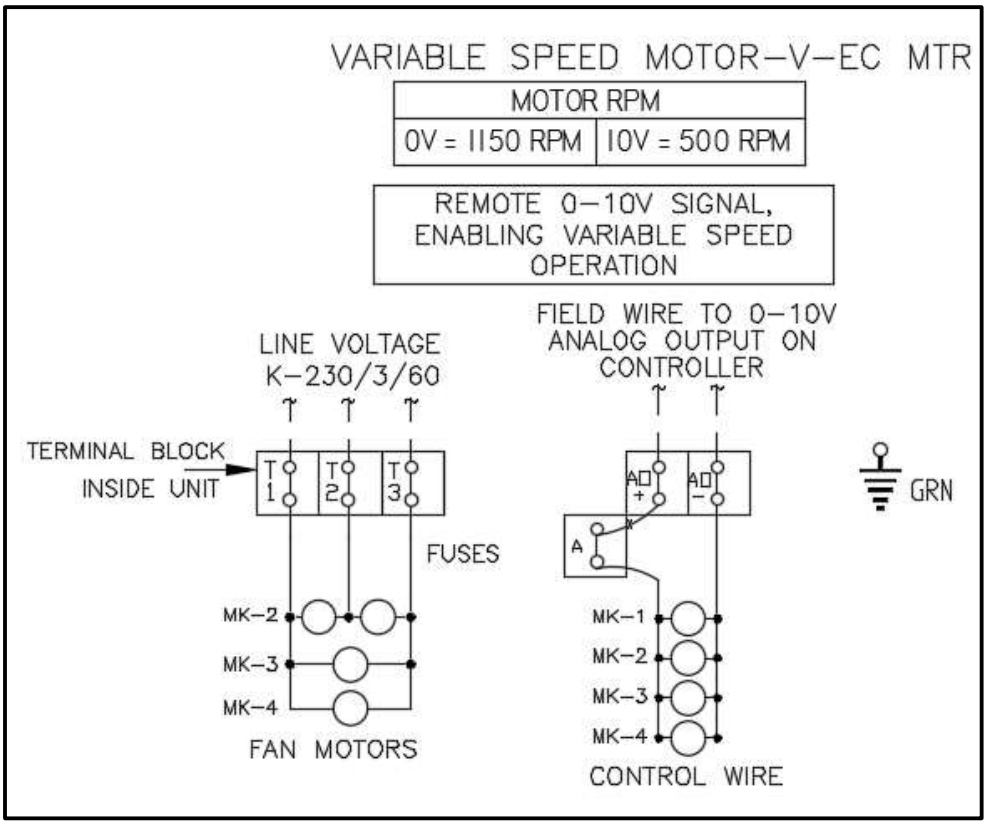


FIGURE 13: AIR DEFROST WIRING DIAGRAM FOR – MOTOR TYPE V



7 ELECTRIC DEFROST SEQUENCE OF OPERATION

The electric defrost cycle is time clock initiated and temperature terminated with a timer and or high temperature over-ride. For systems with multiple unit coolers and a single defrost time clock the defrost termination thermostat must be wired in series. Reference FIGUREs 15 Through 26, for electric defrost wiring diagrams.

7.1 SEQUENCE OF OPERATION

7.1.1 STEP A: NORMAL REFRIGERATION CYCLE

1. Power is supplied to terminals “N’ and “4” on the defrost timer.
2. The heater safety and fan delay thermostat are 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.

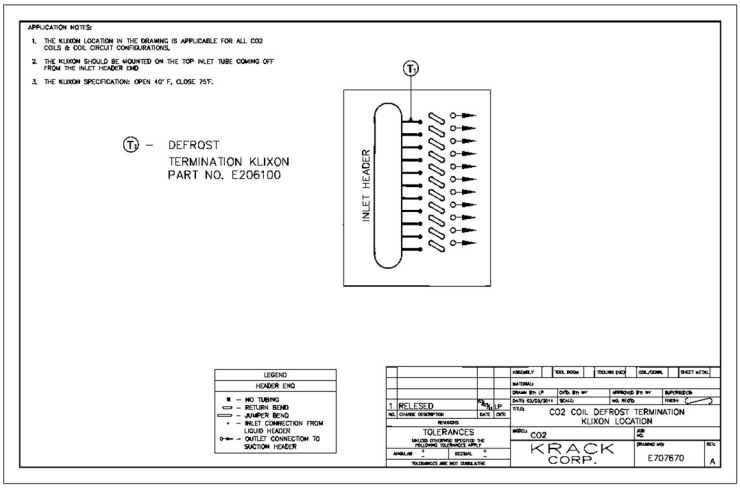
7.1.2 STEP B: DEFROST CYCLE

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 temperature of the coil 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. Because there is power at terminal “4” the liquid line solenoid opens and the compressor restarts.
7. The evaporator fan motor(s) remain off because the fan delay thermostat is still open. This prevents warm air from being blown into the refrigerated area.
8. The evaporator coil cools down approaching operating temperature.
9. 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.
10. 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.

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

FIGURE 14: DEFROST TERMINATION THERMOSTAT LOCATION FOR CARBON DIOXIDE (R-744)



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 14.

7.1.3 DUAL SPEED MOTOR SEQUENCE OF OPERATION –

MK/MV coils use 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 should operate at half speed.

Full Speed

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

Fan off

• For EL/Gas defrost evaporators, during defrost fans should turn off

Krack gives the option of field control for this motor to run at minimum speed or it also gives the option of installed room thermostat to operate this as DUAL SPEED motor. When using the option of installed room thermostat, do not use the same thermostat to control the LLSV.

For DUAL SPEED operation MK/MV coils comes with 10V power supply and a Relay named LS relay installed in the panel. When using installed thermostat, the SPDT switch of the thermostat will energize the LS Relay. This relay will close the contact of the 10V power supply to the motor, thus supplies 10V to motor and Motor will run in low speed. When the room temperature is above the setpoint and will not energize the LS relay, when the room temperature is met the SPDT switch of the thermostat will energize the LS relay and send 10V signal to motor 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. LS relay will be energized 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.

7.1.4 *VARIABLE SPEED MOTOR SEQUENCE OF OPERATION*

Variable speed motor need 0-10V signal from filed, 0-10V signal wires will be connected to terminal allotted in the Evaporator panel (Terminal A0+ & A0-). 0V being the high speed, 1150 RPM and 10V being minimum speed of 500RPM. Speed varies based on the analog signal received by motor

ELECTRIC DEFROST WIRING 208-230/60/1

FIGURE 15: ELECTRIC DEFROST 208-230/60/1 WIRING DIAGRAM FOR – MOTOR TYPE B

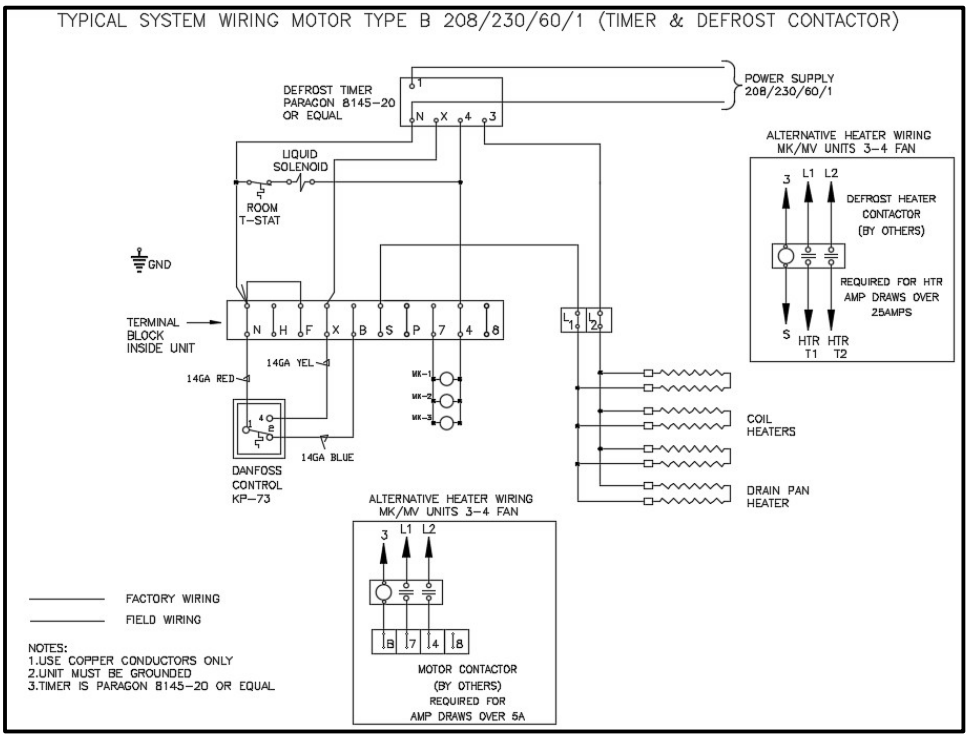


FIGURE 16: ELECTRIC DEFROST 208-230/60/1 WIRING DIAGRAM FOR – MOTOR TYPE D

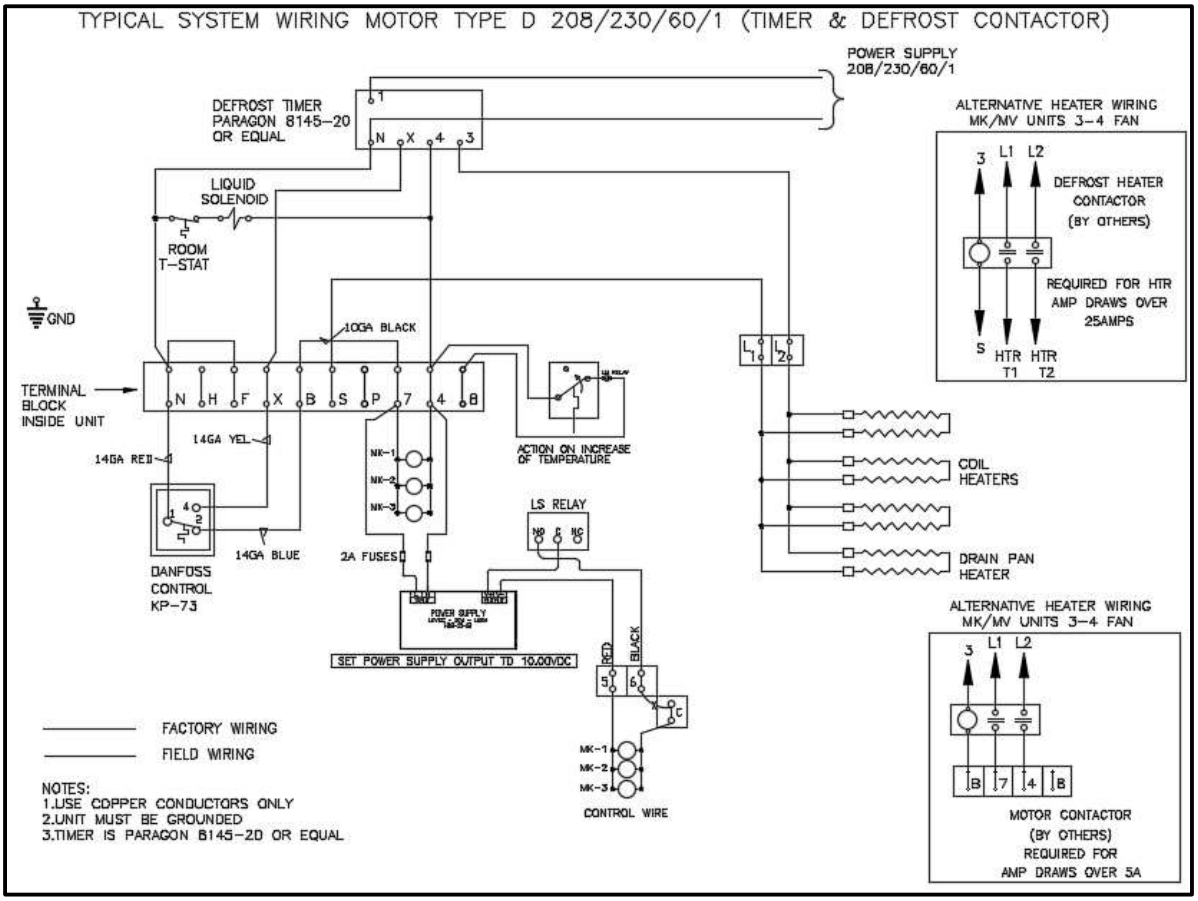
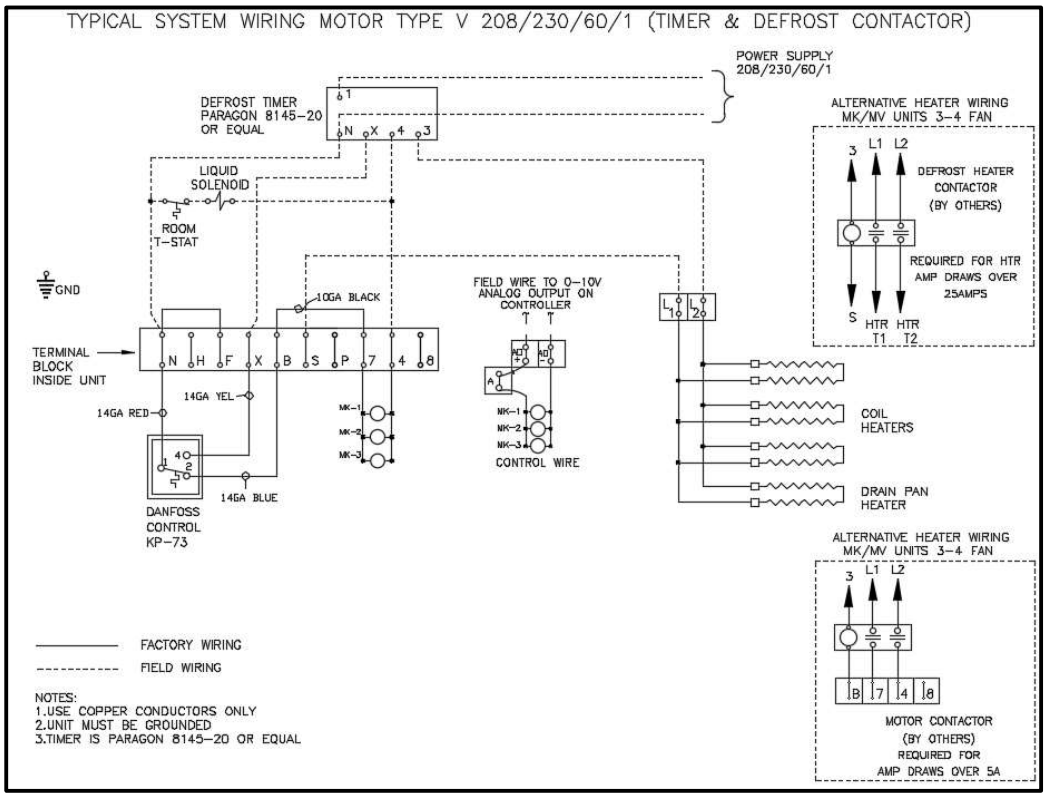


FIGURE 17: ELECTRIC DEFROST 208-230/60/1 WIRING DIAGRAM FOR – MOTOR TYPE V



ELECTRIC DEFROST WIRING 208-230/60/3

FIGURE 18: ELECTRIC DEFROST 208-230/60/3 WIRING DIAGRAM FOR – MOTOR TYPE B

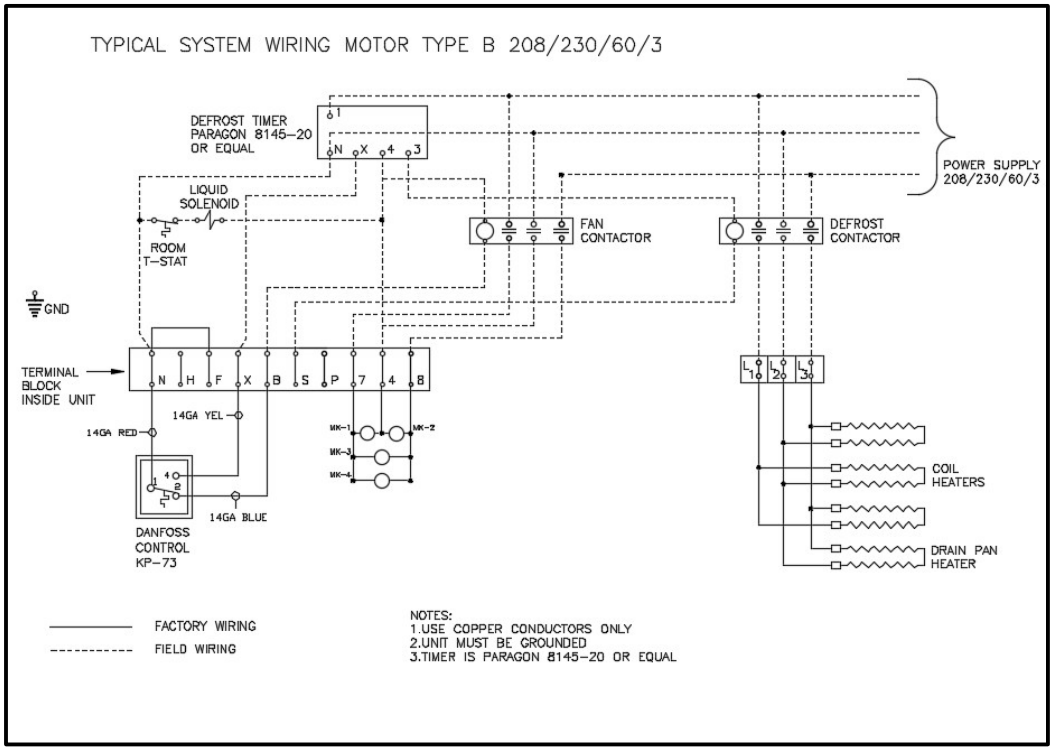


FIGURE 19: ELECTRIC DEFROST 208-230/60/3 WIRING DIAGRAM FOR – MOTOR TYPE D

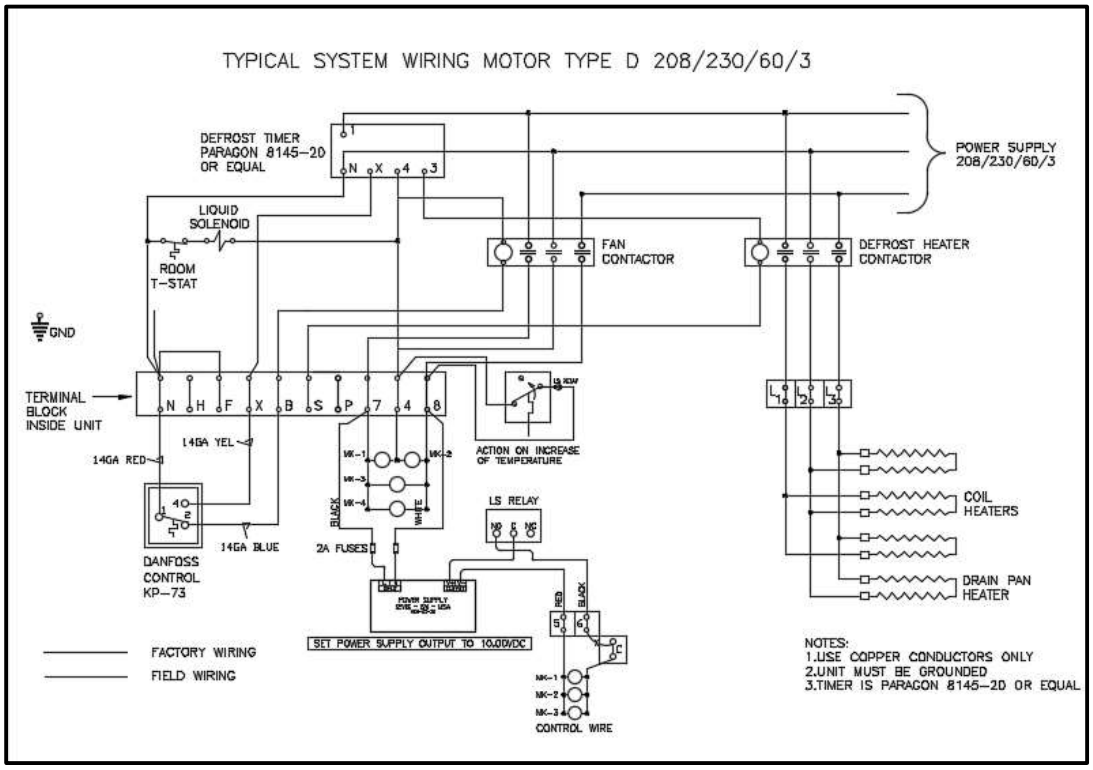
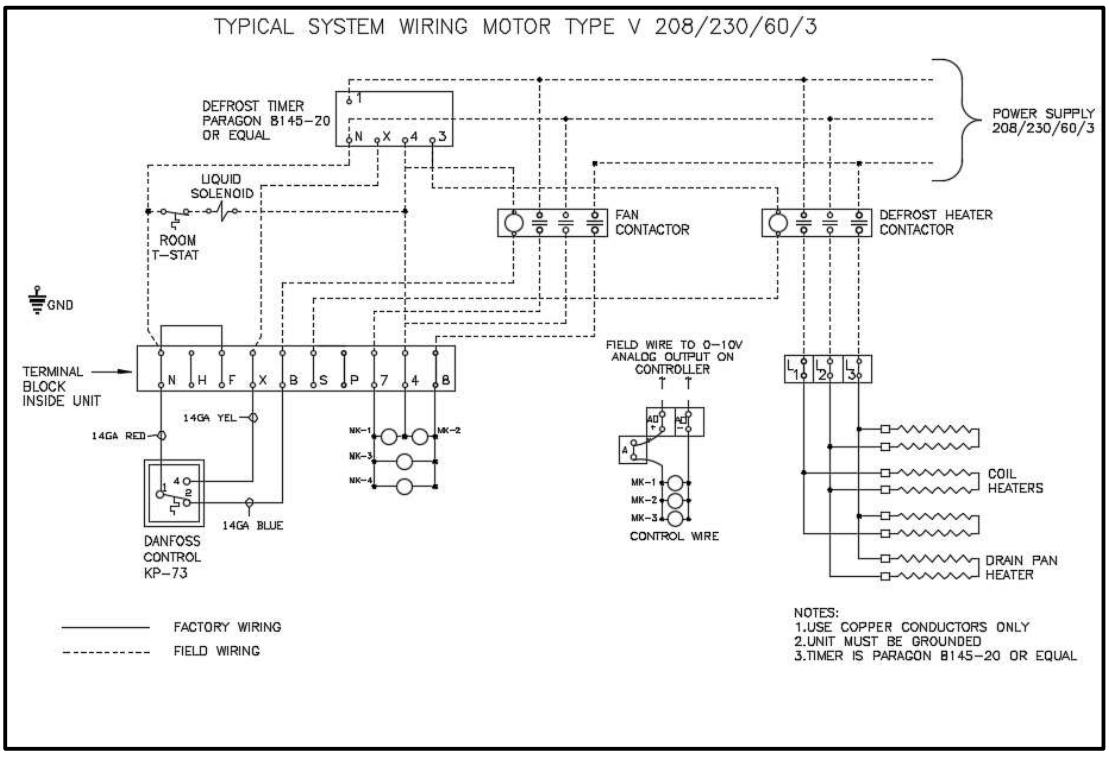


FIGURE 20: ELECTRIC DEFROST 208-230/60/3 WIRING DIAGRAM FOR – MOTOR TYPE V



ELECTRIC DEFROST WIRING 460/60/3

FIGURE 21: ELECTRIC DEFROST WIRING 460/60/3 MOTOR TYPE B

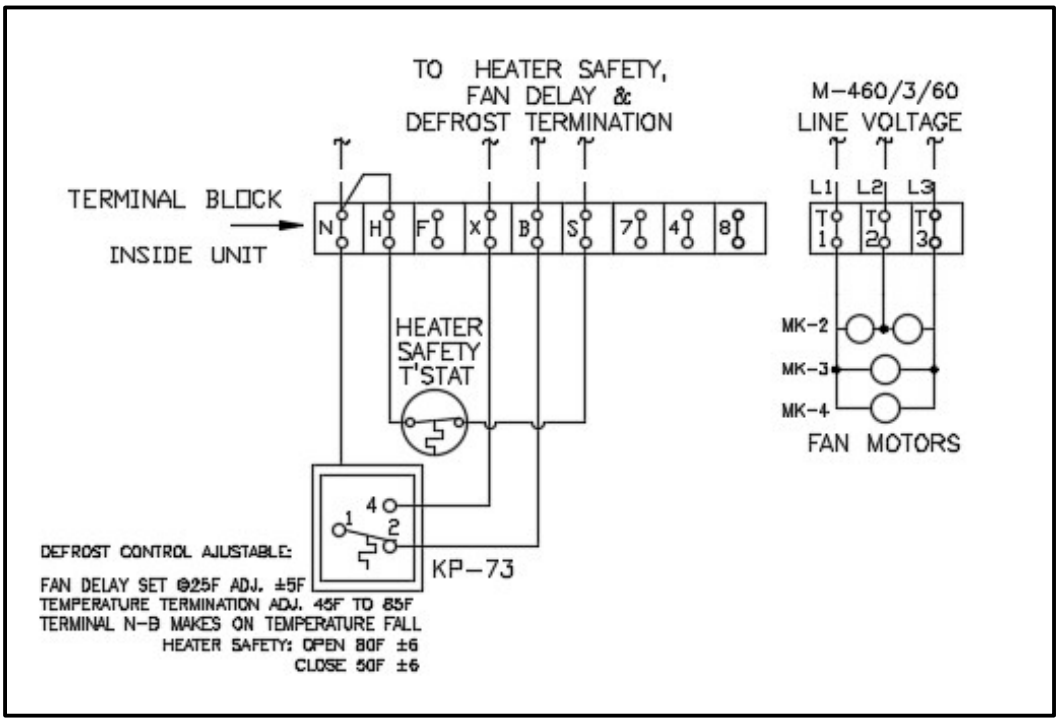


FIGURE 22: ELECTRIC DEFROST WIRING 460/60/1 MOTOR TYPE B

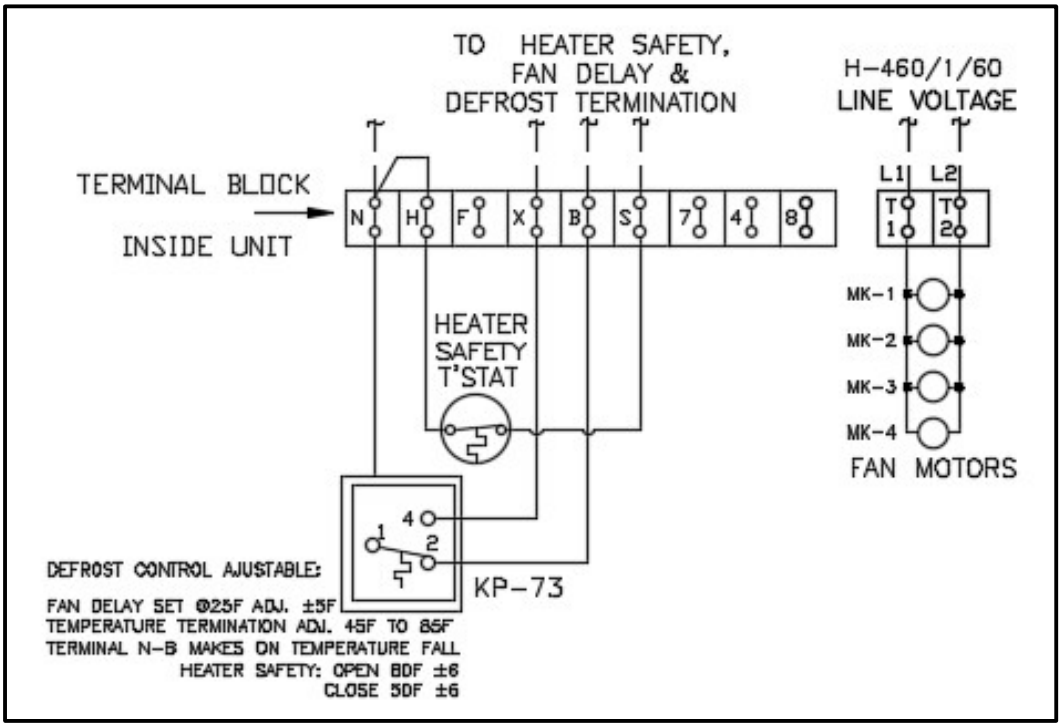


FIGURE 23: MULTIPLE UNIT COOLERS, ELECTRIC DEFROST 460/60/3

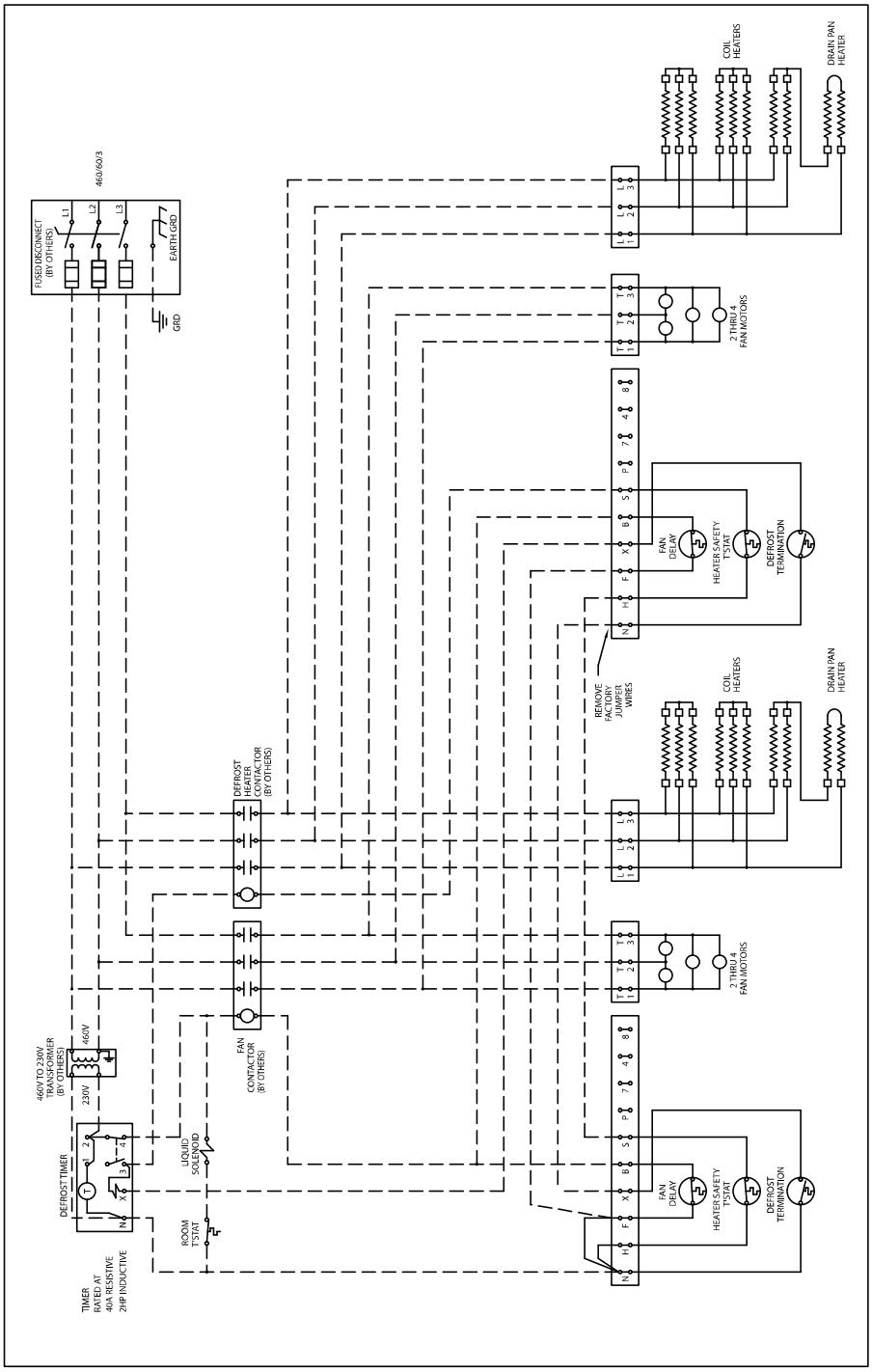


FIGURE 24: MULTIPLE UNIT COOLERS, ELECTRIC DEFROST 208-230/60/3 – B MOTOR

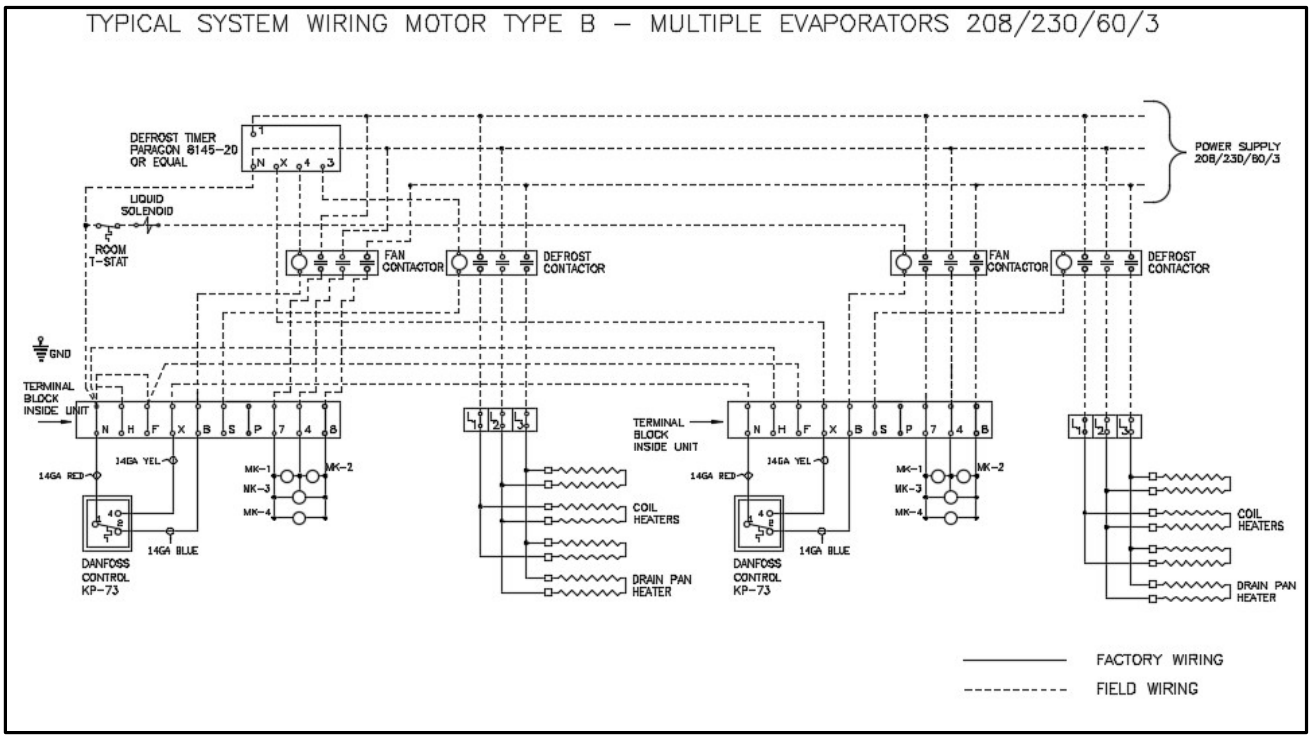


FIGURE 85: MULTIPLE UNIT COOLERS, ELECTRIC DEFROST 208-230/60/3 – D MOTOR

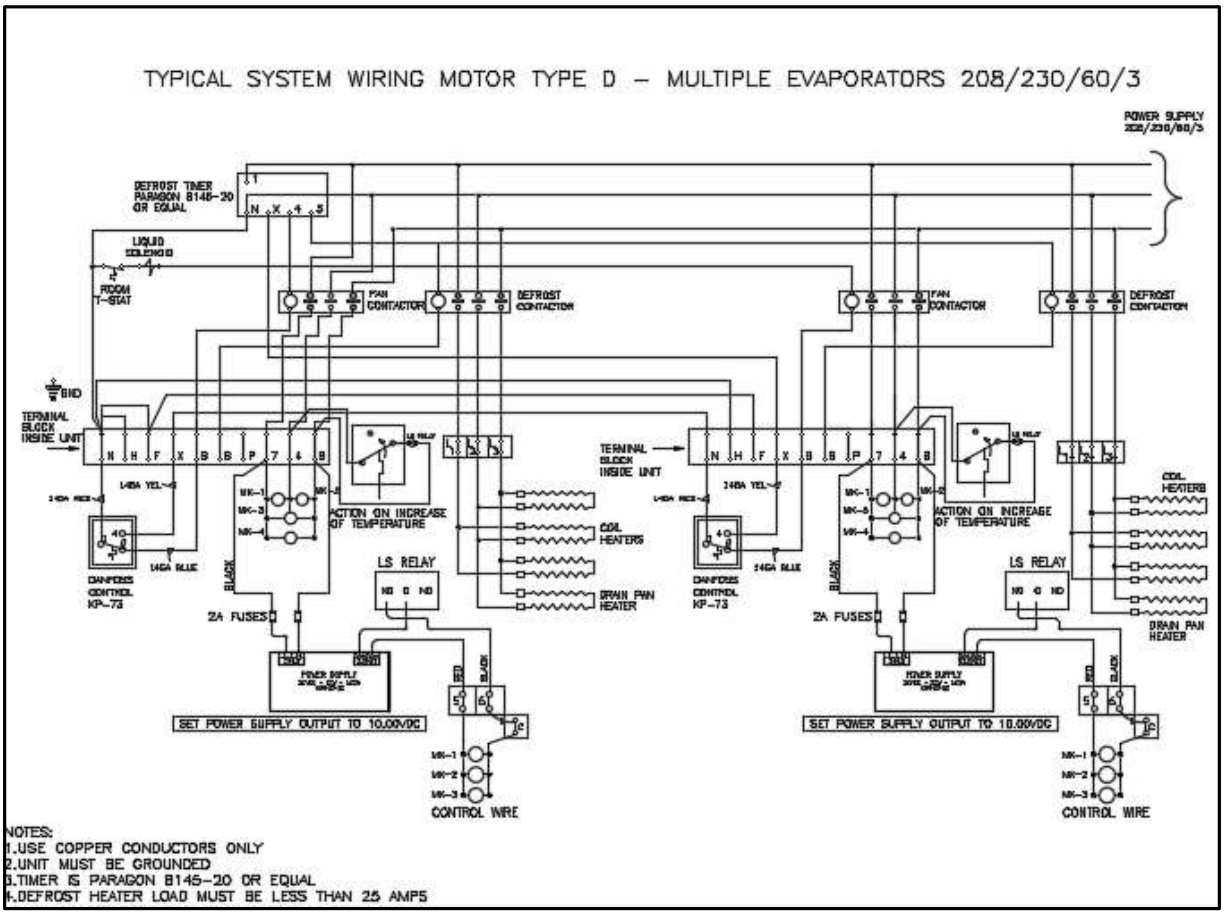
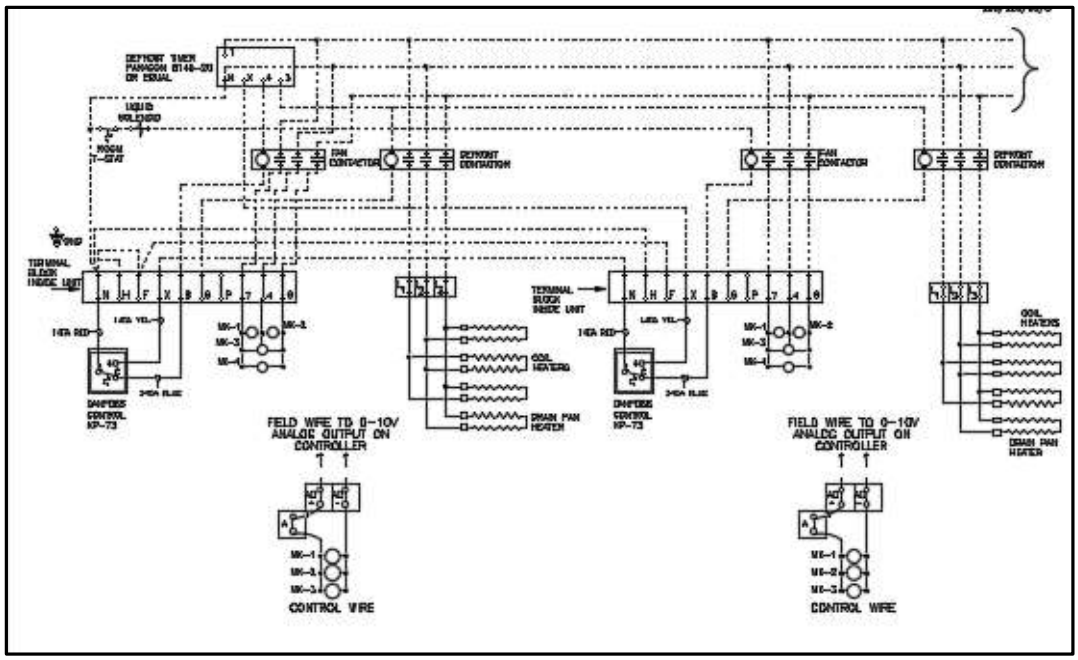


FIGURE 26: MULTIPLE UNIT COOLERS, ELECTRIC DEFROST 208-230/60/3 – V Motor

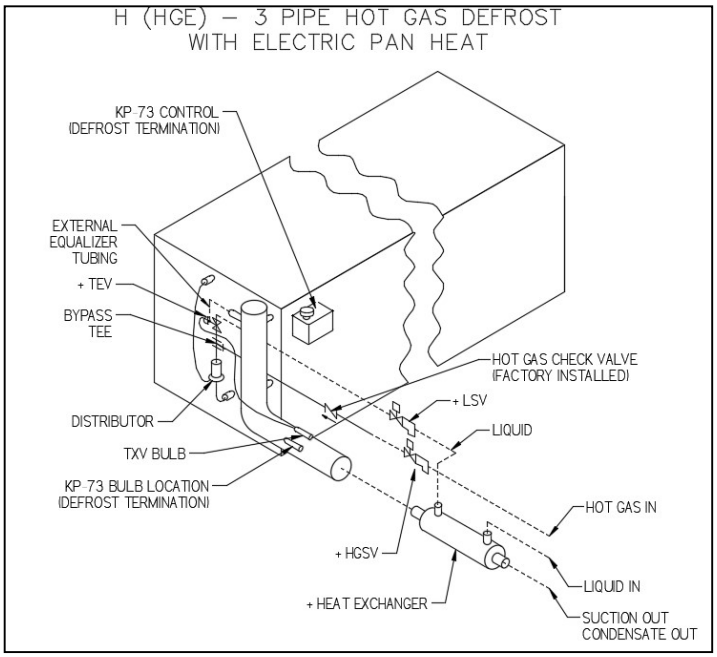


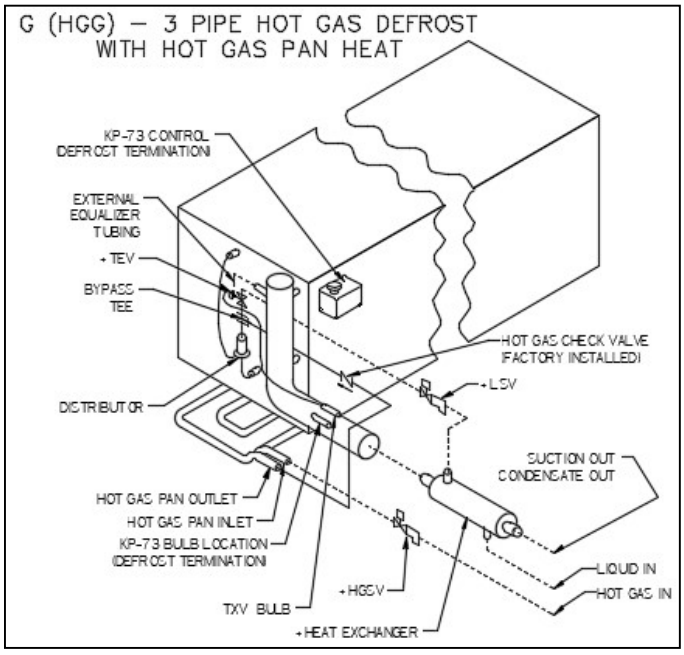
8 GAS DEFROST SEQUENCE OF OPERATION

The defrost cycle is field controller initiated and terminated.

8.1 HGE/HGG 3 PIPE HOT GAS DEFROST

Three pipe hot gas defrost systems 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 is evaporated in a liquid-line/suction-line heat exchanger, prior to returning to the compressor through the suction line.





8.2 SEQUENCE OF OPERATION

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. 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.

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

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)

HGE 3 PIPE HOT GAS COIL AND WITH ELECTRIC DRAIN PAN DEFROST WIRING.

FIGURE 27: MOTOR TYPE – B

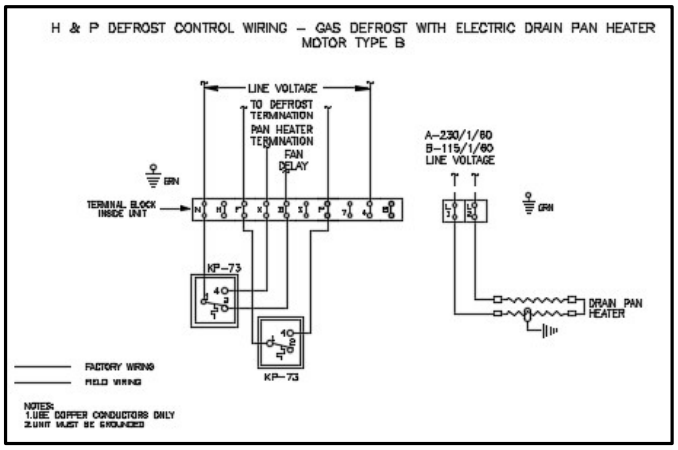


FIGURE 28: MOTOR TYPE –

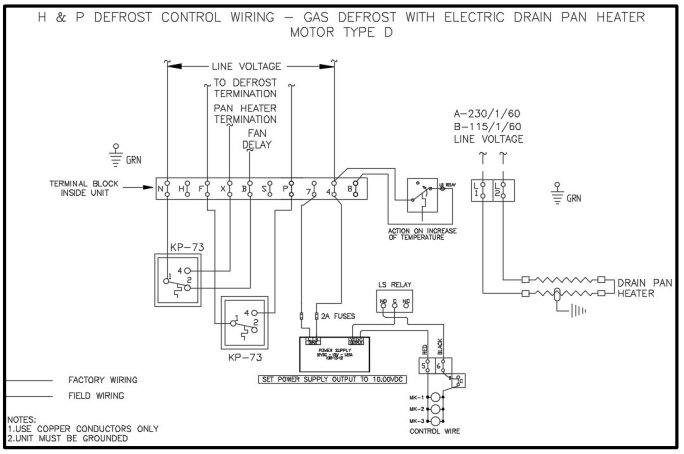
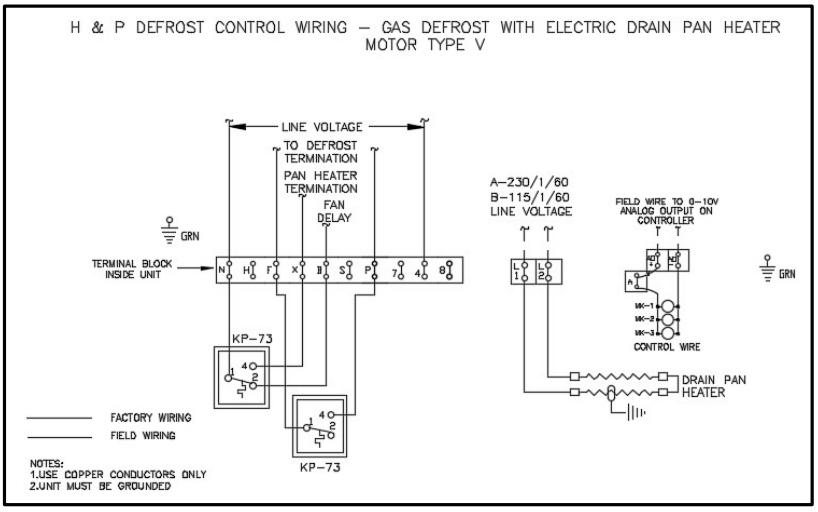


FIGURE 29: MOTOR TYPE – V



(G) HGG - 3 PIPE HOT GAS COIL AND HOT GAS DRAIN PAN DEFROST WIRING

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 G
Step D – The factory mounted thermostat senses the drop in coil temperature and closes the circuit to the fan motors.

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

FIGURE 30: MOTOR TYPE – B

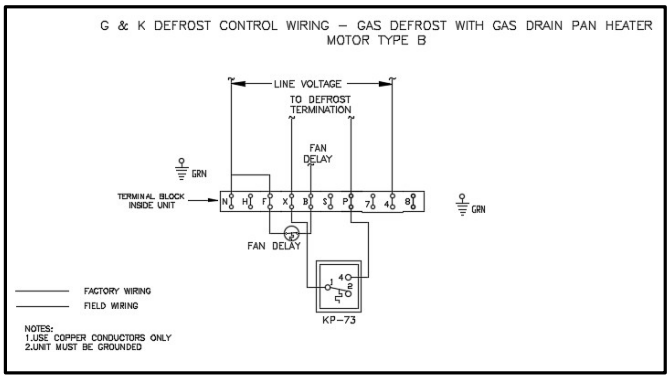


FIGURE 31: MOTOR TYPE – D

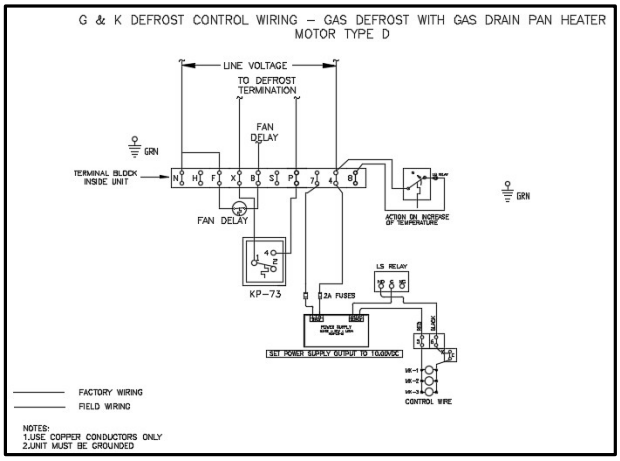
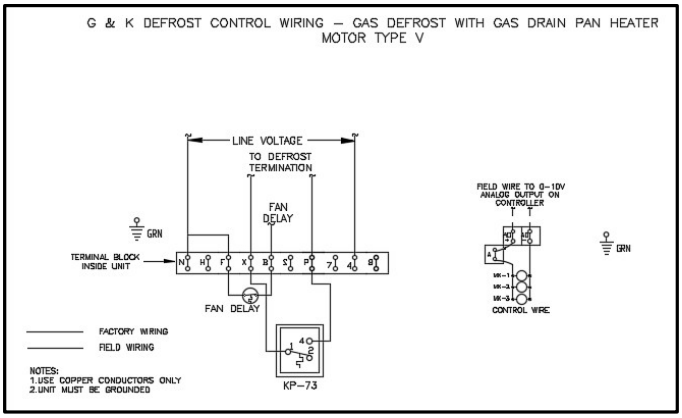
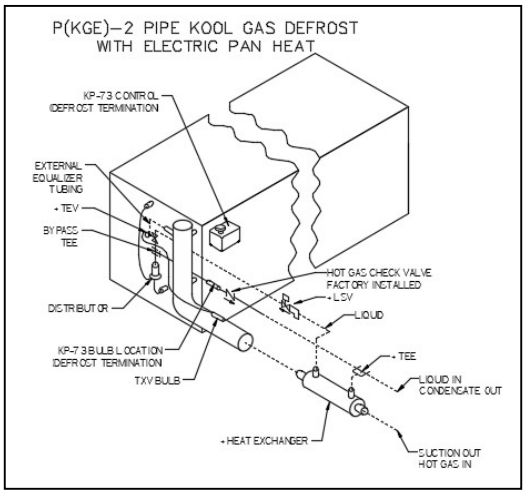


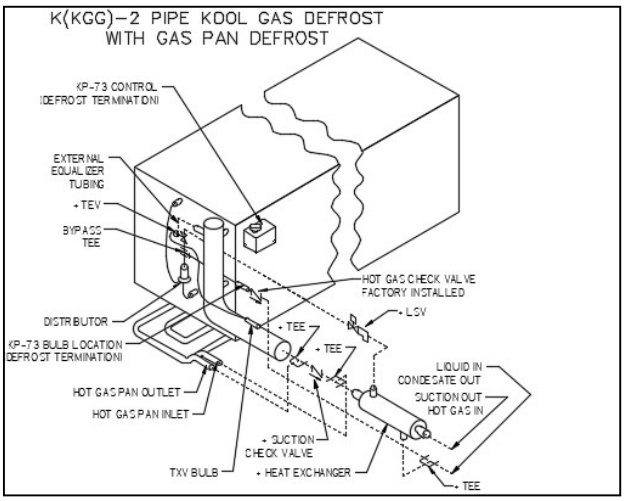
FIGURE 32: MOTOR TYPE – V



8.3 KGE/KGG REVERSE CYCLE 2 PIPE KOOL GAS DEFROST

Reverse cycle (2 pipe) defrost systems 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.





8.4 SEQUENCE OF OPERATION

Step A – Power is supplied to the unit cooler continuously.
Step B – 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.

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

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)

(P) KGE-2 PIPE KOOL GAS AND ELECTRIC DRAIN PAN DEFROST WIRING,

FIGURE 33: MOTOR TYPE – B

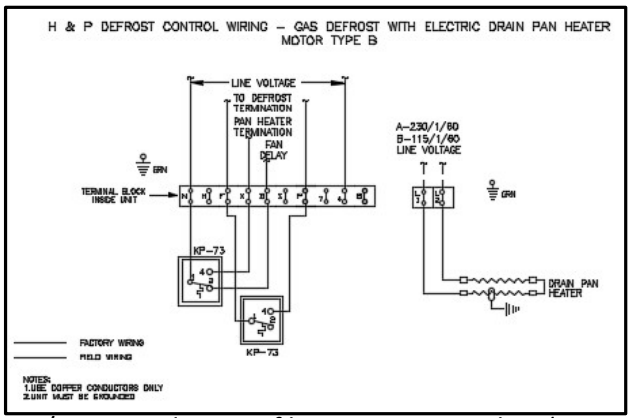


FIGURE 34: MOTOR TYPE –

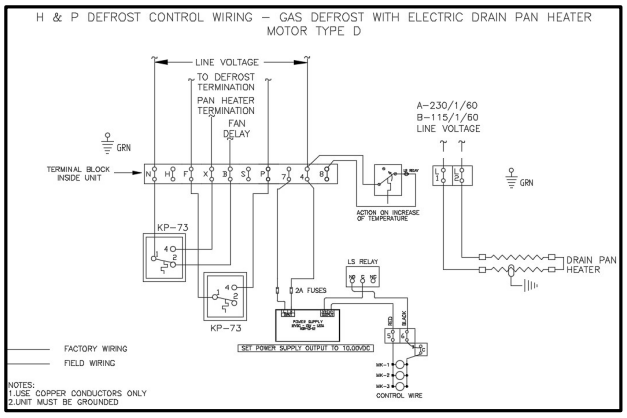
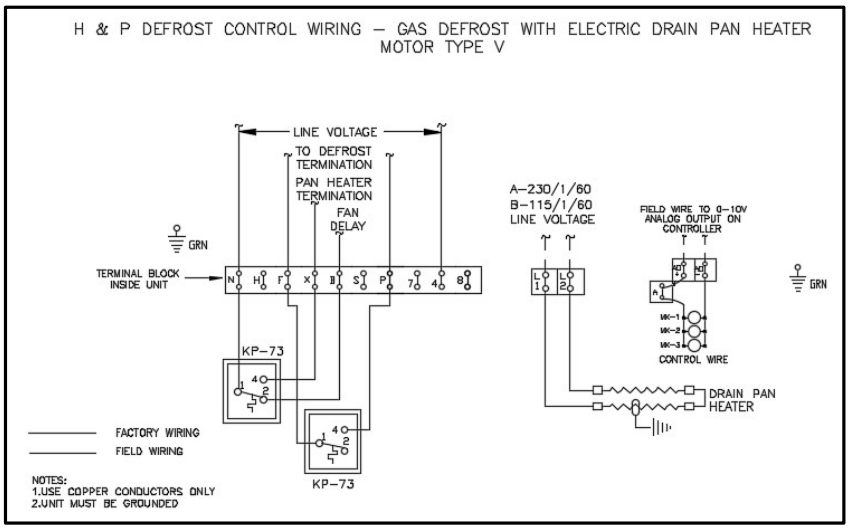


FIGURE 35: MOTOR TYPE – V



(K) KGG - 2 PIPE KOOL GAS COIL WITH KOOL GAS DRAIN PAN DEFROST WIRING

FIGURE 36: MOTOR TYPE – B

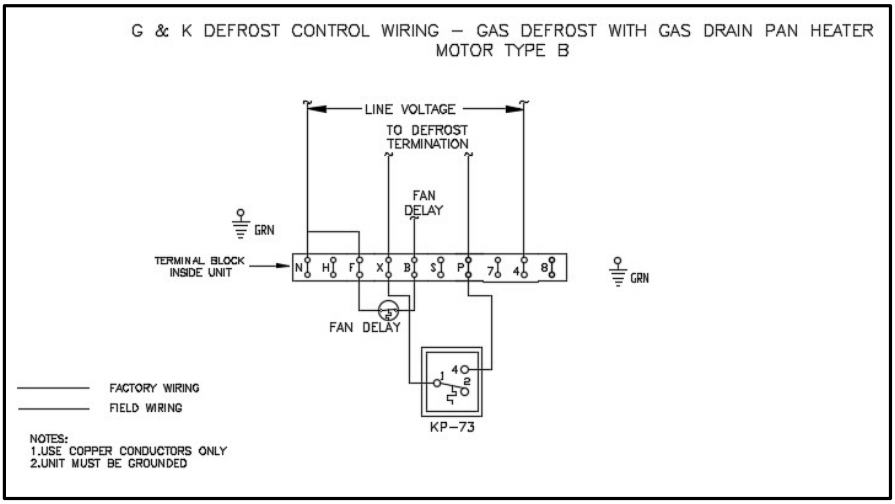


FIGURE 37: MOTOR TYPE – D

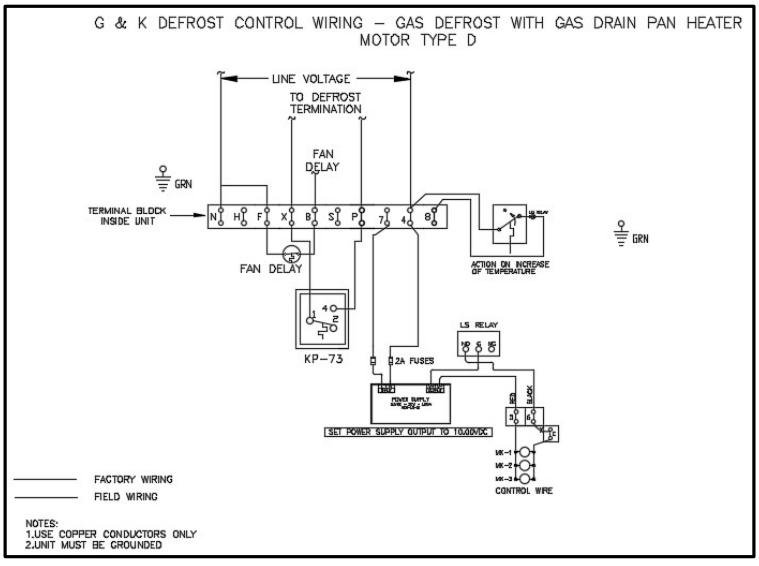


FIGURE 38: MOTOR TYPE – V

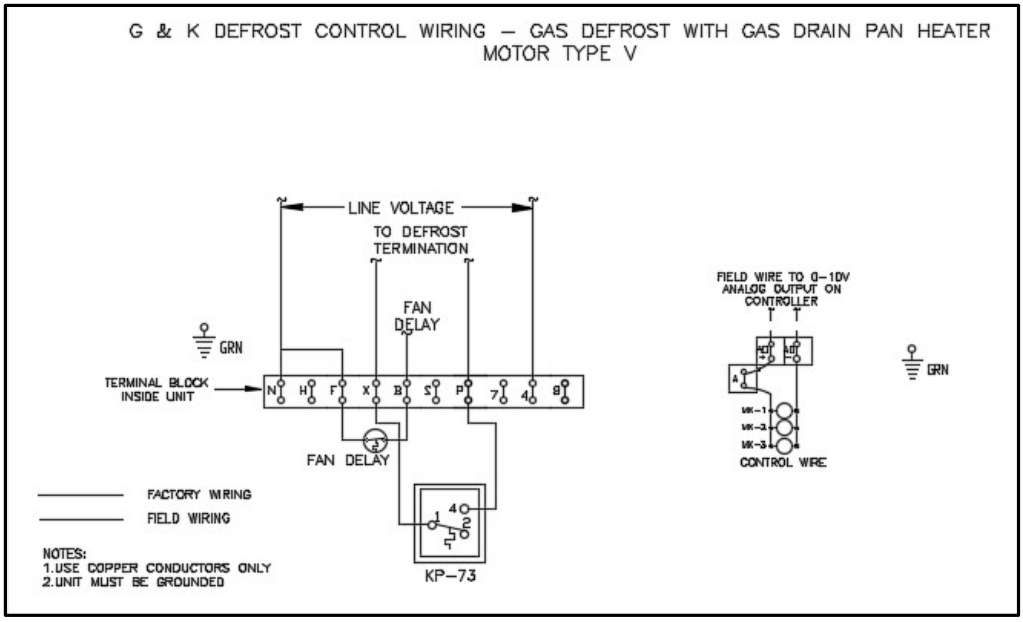


TABLE 14: - RECOMMENDED (SPST) FAN DELAY THERMOSTAT SETTINGS FOR KGE/HGG

ROOM TEMPERATURE	RANGE	DIFFERENTIAL
0° F TO +35° F	45° F	15° F
BELOW 0° F	20° F	10° F

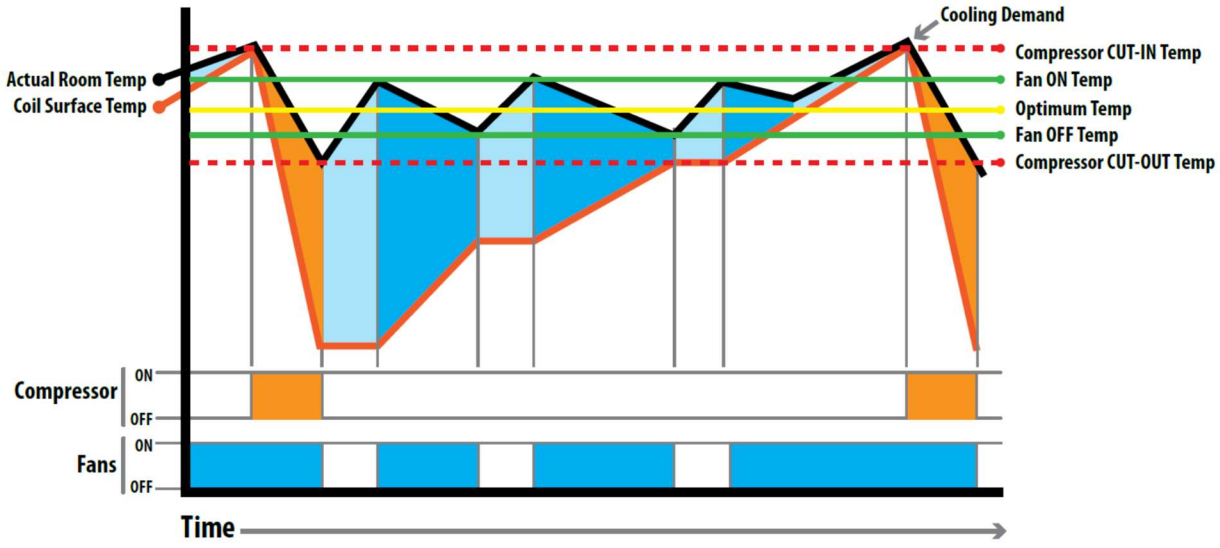
9 UNITS WITH KE2 EVAP OEM CONTROLLER

KE2 Evap OEM controller reduces the energy used by the evaporator coil in refrigeration systems through precise control of superheat, fan management, and demand defrost.

9.1 SEQUENCE OF OPERATION

1. KE2 Evap OEM creates the evaporator profile when powered up initially. The controller completes a sequence of operational tests of the system (brings the space down to temperature, defrosts the coil, and repeats) to identify a temperature relationship between the coil temperature and space temperature.
2. Once the controller has established the most efficient method of controlling the evaporator, it uses advanced fan control algorithms to maximize the energy efficiency of the coil.
3. During normal operation, the refrigeration cycle pulls the coil down to temperature and continues running until the space temperature is satisfied.
4. When the space temperature is achieved, the controller closes the liquid line solenoid valve and turns off the fans. The system continues to run until any liquid refrigerant is pumped out of the coil.
5. During the refrigeration –off cycle, the fans will periodically cycle, based on the Fan ON/OFF Temps shown in FIGURE 8. In the process of returning additional cooling capacity to the space:
   a. Frost is reduced naturally through the process of sublimation, which returns valuable moisture to the space.
   b. The time between compressor runtimes is extended, saving.

FIGURE 39: LATENT ENERGY RECOVERY



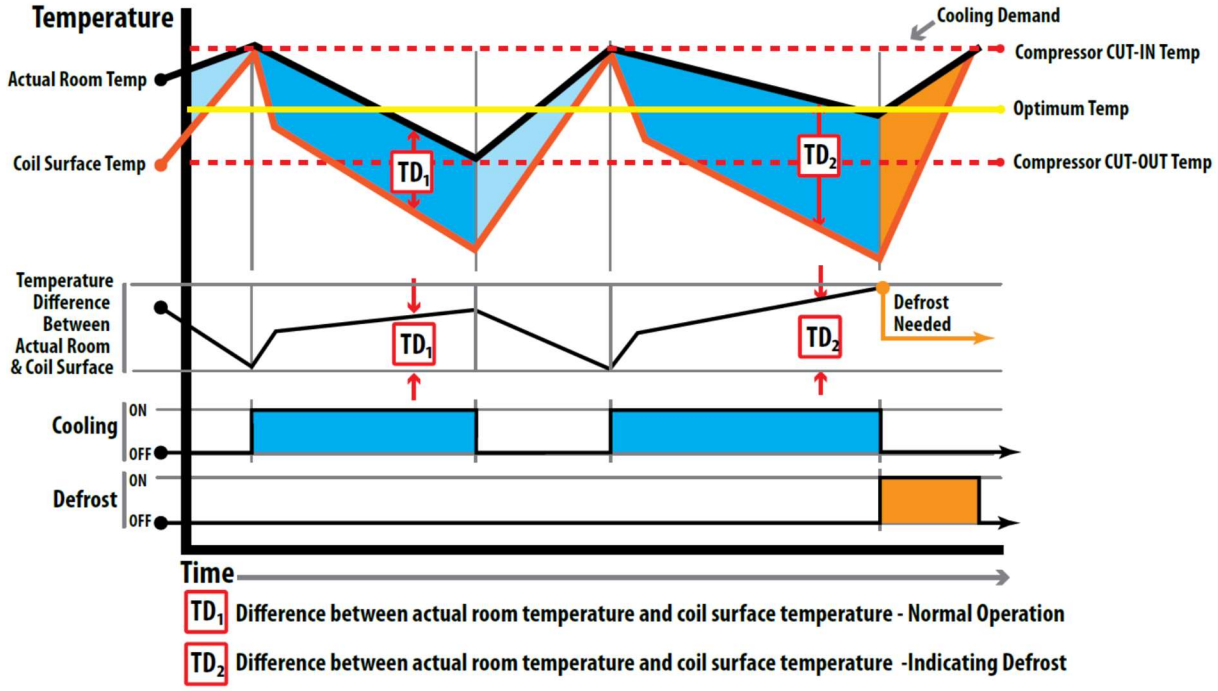
9.2 DEFROST OPERATION

KE2 EvapOEM defrost uses a two-tier approach:

a. Monitors the coil performance to extend the time between defrosts.
b. Monitors the coil's efficiency (comparing the temperature of the coil to the space temperature) and only calls for defrost when efficiency is less than 90% (incoming data is compared to the evaporator profile data stored in the controller's memory).

The following FIGURE illustrates how the KE2 Evap OEM controller monitors the temperature difference between the coil and space, to determine the optimum time to initiate defrost.

FIGURE 40: RECOGNITION OF NECESSITY TO DEFROST



Defrost process involves pumping down the refrigerant, defrosting, draining the water and delaying fan operation upon initiation of the refrigeration cycle.

9.2.1 PUMP DOWN SETTINGS

"Defrost Pump Down Time" is the minimum specified duration for pump down. When "Defrost Pump Down Time" is not defined, the controller monitors coil temperature and determines the pump down is finished when coil temperature is close to the room temperature.

9.2.2 DEFROST SETTINGS

The “Defrost Mode” parameter enables defrost initiation either based on demand, or by schedule, or by monitoring the compressor run time (duration of refrigeration “ON” cycles). Demand or schedule mode is preferred.

Scheduling defrosts evenly across the day, can be achieved by setting following parameters:

a. Defrost Per Day
b. Max Defrost Time
c. First Defrost Delay

Based on the hardware, “Defrost type” parameter shall be selected as one of the following options:

a. Electric
b. Air – off time
c. Hot gas with compressor on
d. Hot gas with compressor off

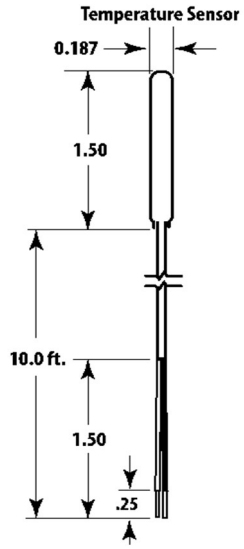
In electric defrost, the heaters can be either pulsed or permanently on by setting the “Electric Defrost Mode” parameter appropriately.
The “defrost Fan State” parameter defines the fan operation during defrost (ON/OFF).
Usually fans would be running during air defrost but turned off during other defrost types.
Defrost is terminated when coil temperature reaches the defrost termination temperature defined through “Defrost Term Temp” parameter.

9.2.3 DRAIN SETTINGS

The “Drain Time” parameter defines the time allotted for water to drip into the drain pans, following defrost termination (prior to initiation of the refrigeration cycle).

9.2.4 FAN DELAY SETTINGS

After initiation of the refrigeration cycle, the controller will restart the fans once the coil temperature reaches the “Fan Delay Temp” setpoint. This allows any remaining moisture on the coil surface to freeze in place, rather than be propelled into the airstream. If this setpoint is not reached, then the fans will restart only after reaching the “Max Fan Delay Time”.

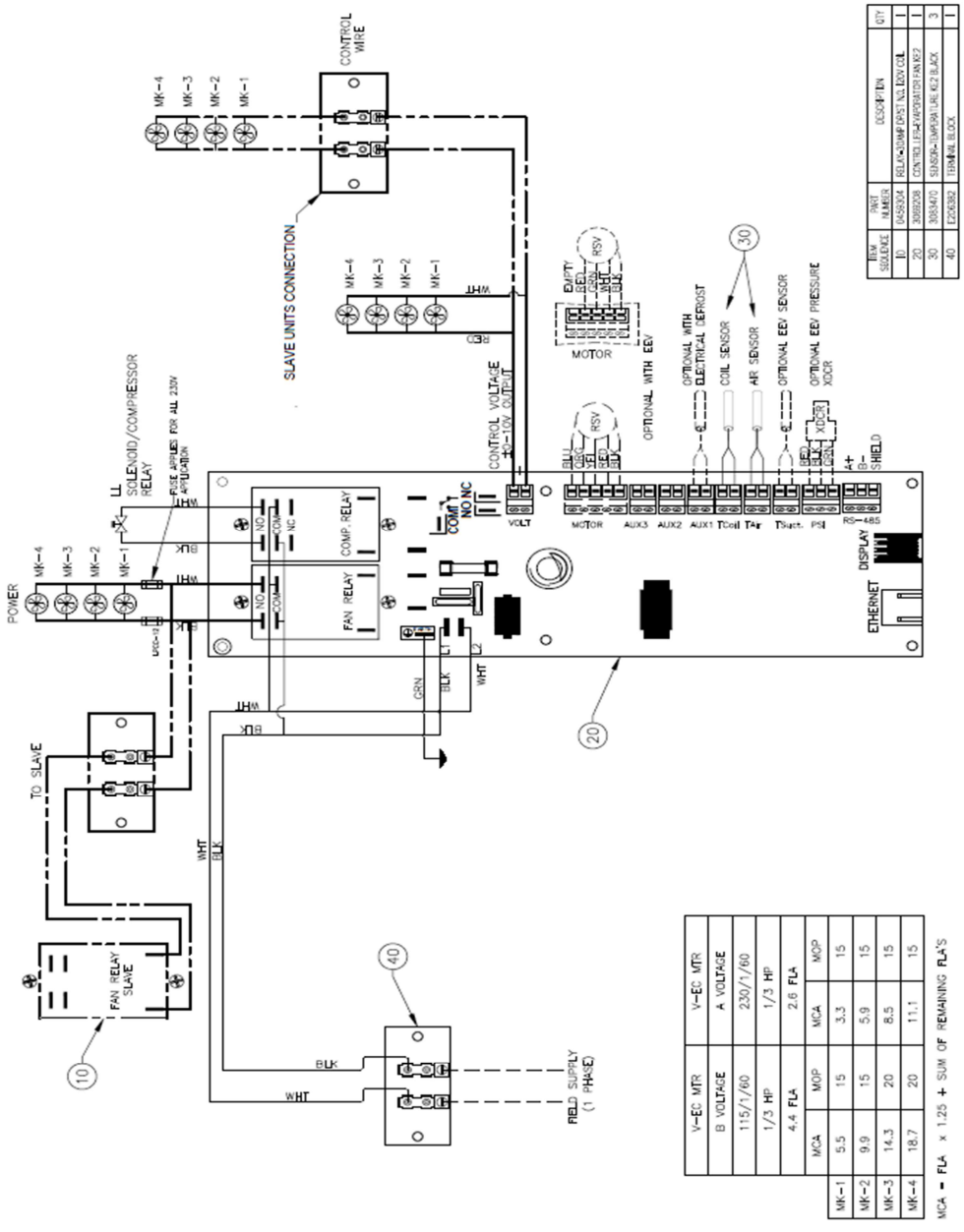


9.2.5 AIR DEFROST

Units operate fans continuously during defrost, with the liquid line valve closed. For air defrost to work, the space temperature must be above freezing. For medium temperature off time defrost applications operating in ‘Demand’ mode, the KE2 controller performs temperature initiated/terminated defrost. When using master slave configuration, temperature sensors for each coil can be connected to the auxiliary inputs (Aux1, Aux2 and Aux3). See sensor splicing guide in the adjacent diagram.
Note: For best control signal quality use shielded cable for the 0-10V control signal. Never exceed a maximum of 120ft.

Dimensions shown in inches.

FIGURE 41: AIR DEFROST CONTROLLER WIRE DIAGRAM



ITEM SEQUENCE	PART NUMBER	DESCRIPTION	QTY
10	0458004	RELAY-ADOMP DPST NO, 120V COIL	1
20	3089208	CONTROL,EF4,EVAPORATOR FAN KIT	1
30	3083470	SENSOR-TEMPERATURE,KIT,BLACK	3
40	E206992	TERMINAL BLOCK	1

V-EC MTR		V-EC MTR		
B VOLTAGE		A VOLTAGE		
115/1/60		230/1/60		
1/3 HP		1/3 HP		
4.4 FLA		2.6 FLA		
	MCA	MOP	MCA	MOP
MK-1	5.5	15	3.3	15
MK-2	9.9	15	5.9	15
MK-3	14.3	20	8.5	15
MK-4	18.7	20	11.1	15

MCA = FLA x 1.25 + SUM OF REMAINING FLA'S

FIGURE 42: AIR DEFROST SLAVE POWER DIAGRAM

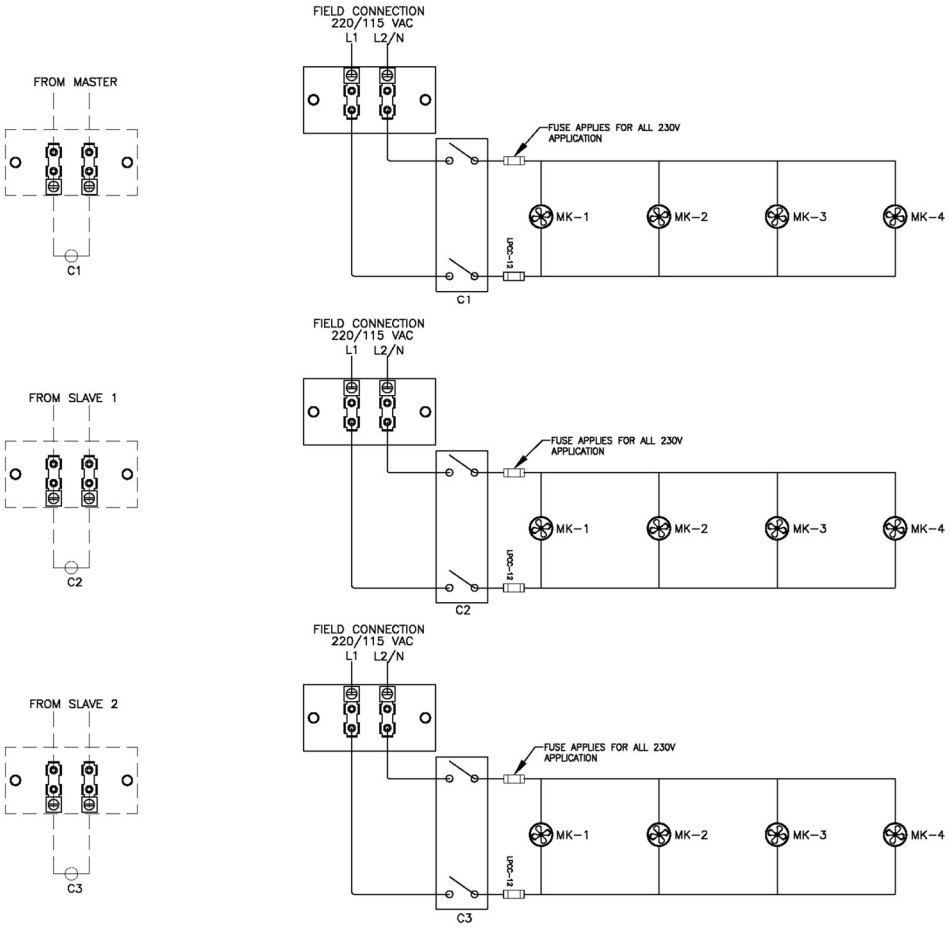
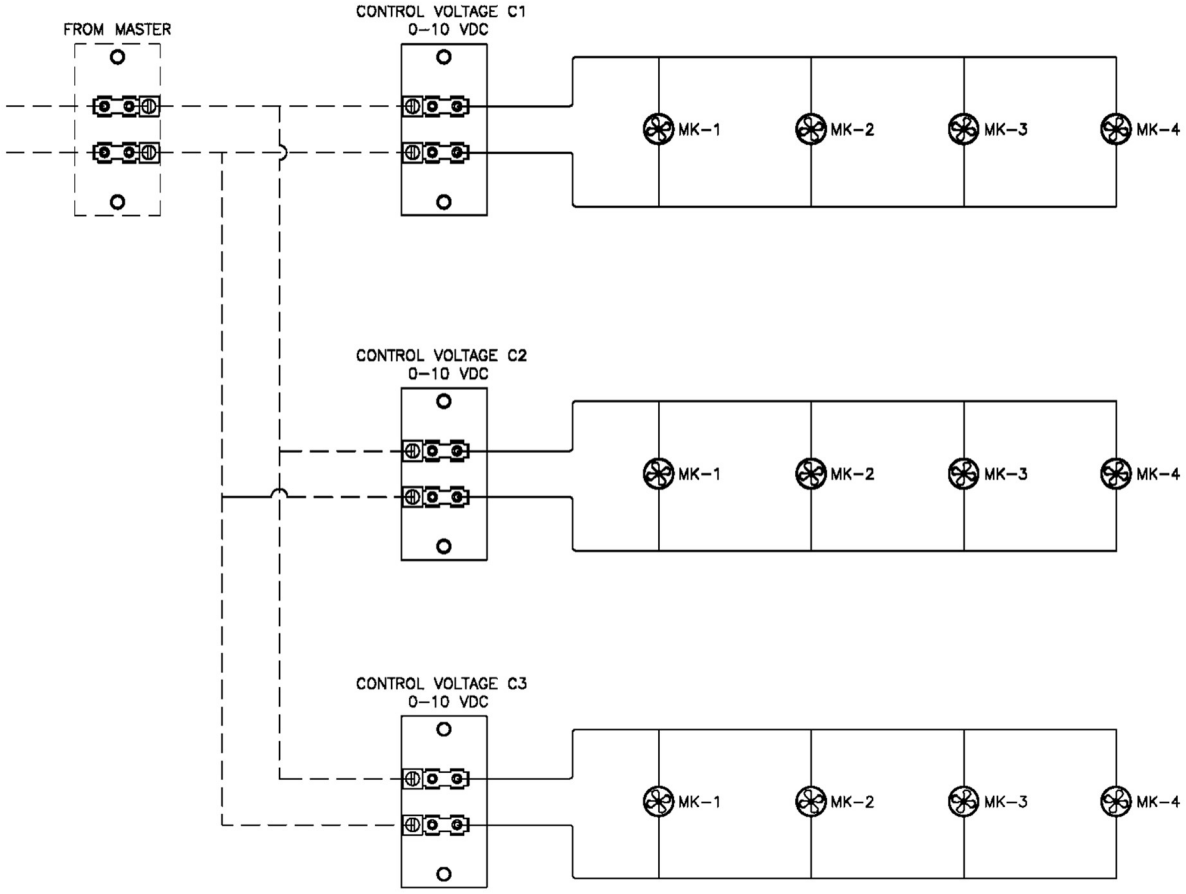


FIGURE 43: AIR DEFROST SLAVE CONTROL DIAGRAM



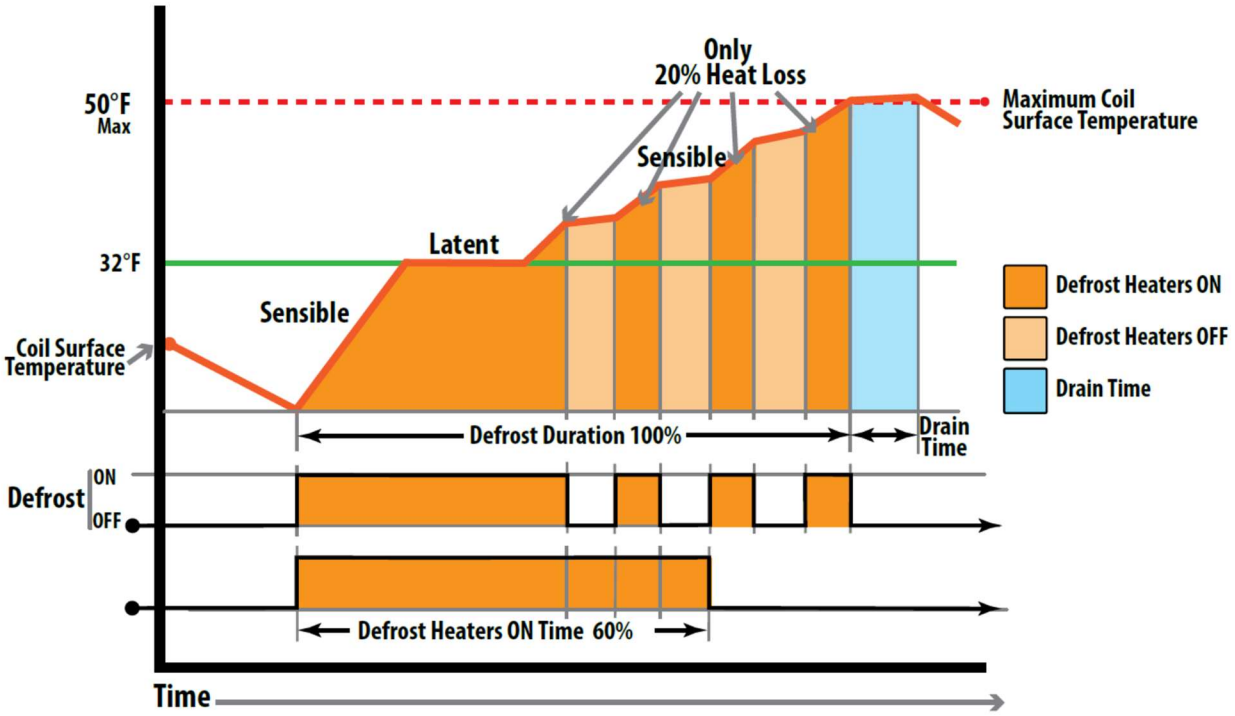
Note: Master and Slave configuration is only applicable to air defrost units, the control signal from KE2 controller can support up to 16 EC motors.

9.2.6 ELECTRIC DEFROST

A traditional defrost controller will power the heaters and keep them on until it receives a signal to terminate based on time or a temperature cut out. One of the issues created with this approach is a fogging effect. KE@ Evap's electric defrost cycle pulses the defrost heaters to reduce fogging potential and achieve reduced energy consumption.

The fans remain off until the defrost cycle is terminated and the drain time has elapsed.

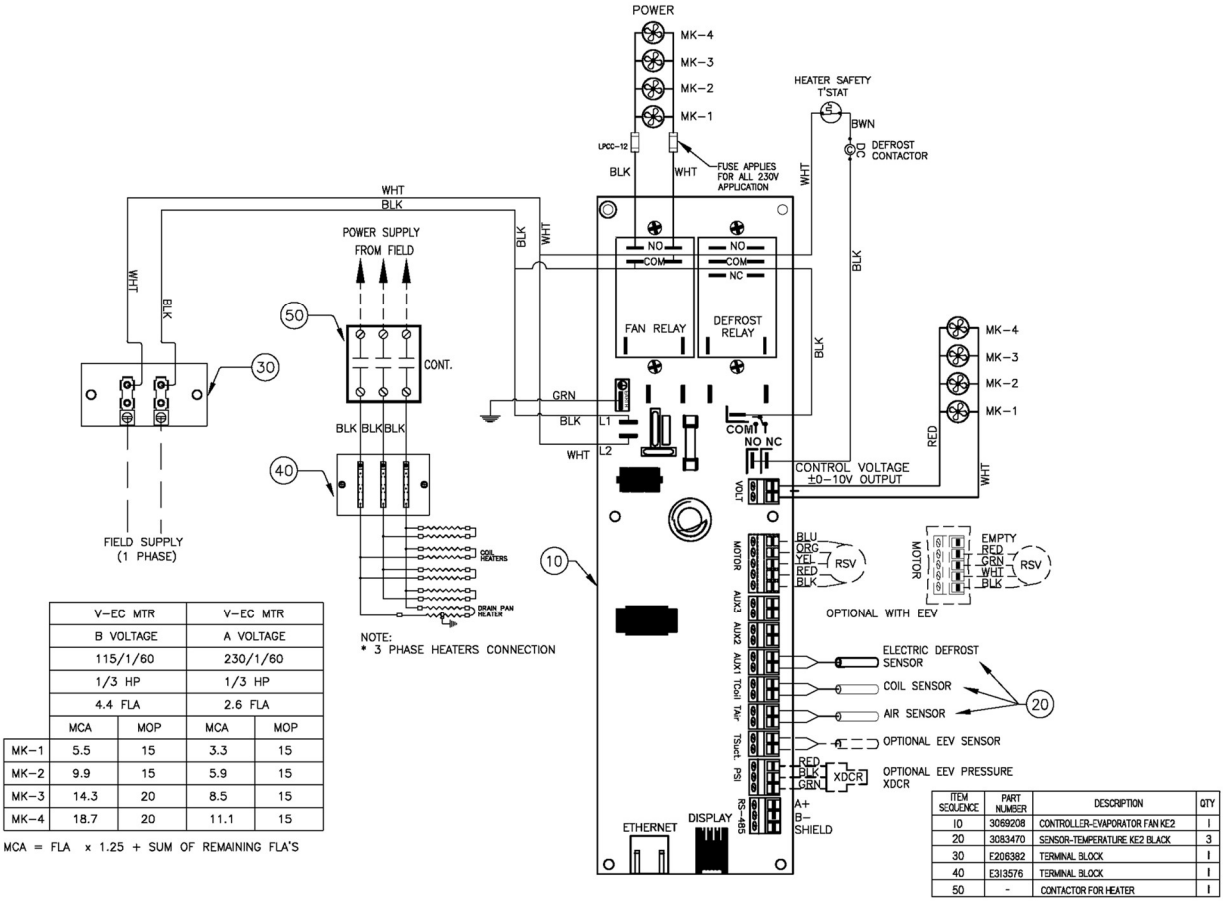
FIGURE 44: KE2 DEFROST CYCLE CHART



CYCLE CHART

Note:
When controllers are bonded, the "Multi Air Temp Ctrl" setpoint shall be set to Warmest air option.

FIGURE 45: ELECTRIC DEFROST CONTROLLER WIRING DIAGRAM



	V-EC MTR		V-EC MTR	
	B VOLTAGE		A VOLTAGE	
	115/1/60		230/1/60	
	1/3 HP		1/3 HP	
	4.4 FLA		2.6 FLA	
	MCA	MOP	MCA	MOP
MK-1	5.5	15	3.3	15
MK-2	9.9	15	5.9	15
MK-3	14.3	20	8.5	15
MK-4	18.7	20	11.1	15

MCA = FLA x 1.25 + SUM OF REMAINING FLA'S

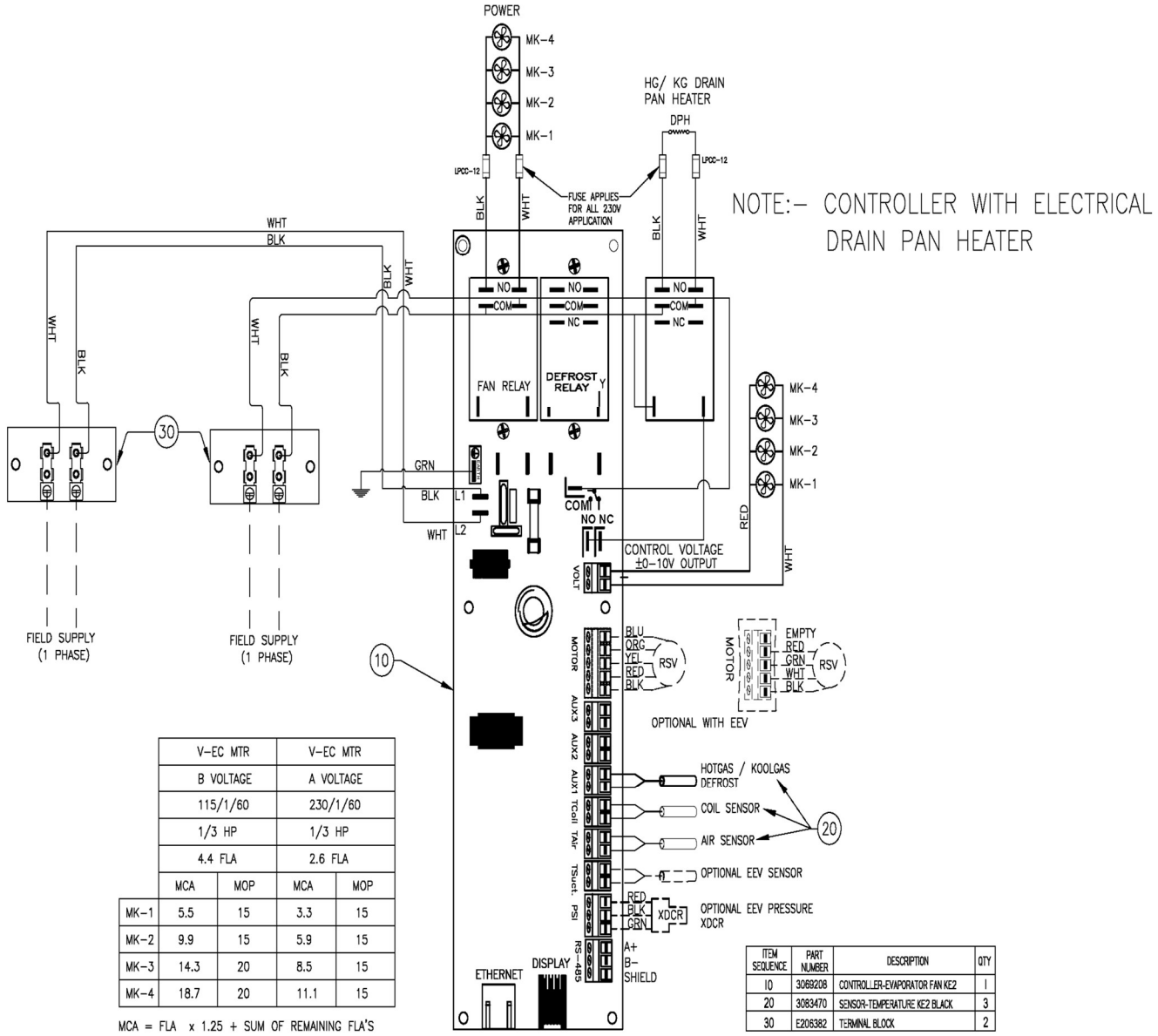
ITEM SEQUENCE	PART NUMBER	DESCRIPTION	QTY
10	3069208	CONTROLLER-EVAPORATOR FAN KE2	1
20	3083470	SENSOR-TEMPERATURE KE2 BLACK	3
30	F206382	TERMINAL BLOCK	1
40	E313576	TERMINAL BLOCK	1
50	-	CONTACTOR FOR HEATER	1

9.2.7 HOT GAS DEFROST

Notes:

1. The factory default setting for “Defrost Pump Down Time” is 2 minutes for hot gas defrost units. This parameter may be adjusted in the field based on the specific application. (liquid line length, location of liquid line solenoid valve, etc.).

FIGURE 46: HOT GAS DEFROST WITH ELECTRICAL DRAIN PAN HEATER CONTROLLER WIRE DIAGRAM

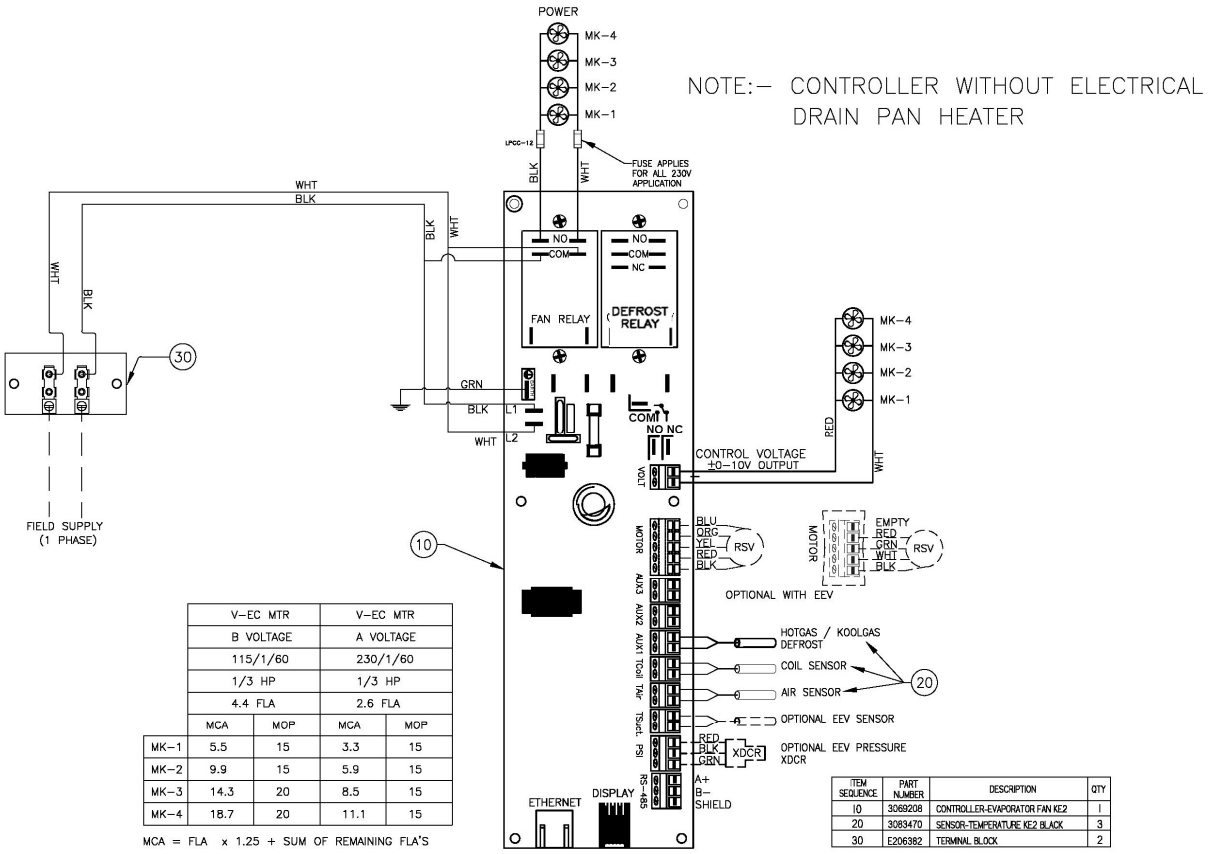


V-EC MTR		V-EC MTR	
B VOLTAGE		A VOLTAGE	
115/1/60		230/1/60	
1/3 HP		1/3 HP	
4.4 FLA		2.6 FLA	
MCA	MOP	MCA	MOP
MK-1	5.5	15	3.3	15
MK-2	9.9	15	5.9	15
MK-3	14.3	20	8.5	15
MK-4	18.7	20	11.1	15

MCA = FLA x 1.25 + SUM OF REMAINING FLA'S

ITEM SEQUENCE	PART NUMBER	DESCRIPTION	QTY
10	3069208	CONTROLLER-EVAPORATOR FAN KE2	1
20	3083470	SENSOR-TEMPERATURE KE2 BLACK	3
30	E206382	TERMINAL BLOCK	2

FIGURE 47: HOT GAS DEFROST NO ELECTRICAL DRAIN PAN HEATER CONTROLLER WIRE DIAGRAM



	V-EC MTR		V-EC MTR	
	B VOLTAGE		A VOLTAGE	
	115/1/60		230/1/60	
	1/3 HP		1/3 HP	
	4.4 FLA		2.6 FLA	
	MCA	MOP	MCA	MOP
MK-1	5.5	15	3.3	15
MK-2	9.9	15	5.9	15
MK-3	14.3	20	8.5	15
MK-4	18.7	20	11.1	15

MCA = FLA x 1.25 + SUM OF REMAINING FLA'S

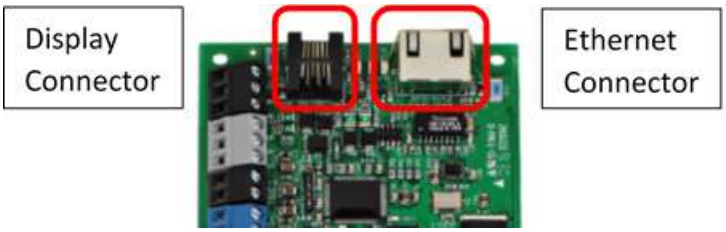
ITEM SEQUENCE	PART NUMBER	DESCRIPTION	QTY
10	3069208	CONTROLLER-EVAPORATOR FAN KE2	1
20	3083470	SENSOR-TEMPERATURE KE2 BLACK	3
30	E206382	TERMINAL BLOCK	2

9.3 CONNECTIVITY (ENABLING SMART ACCESS SETUP)

Following are the three connection methods to the KE2 Evap OEM controller:

a. Establish a connection between KE2 Standard Remote Display w/cable (Part number: 21232) to the display connector on the board.
b. Establish a LAN point to point connection using CAT5 cable from PC/Laptop to ethernet connector on the board.
c. Browse for the controller on the web, using dynamic IP address allocated (KE2 controller must be connected to the customer network and DHCP must be enabled in the settings).

FIGURE 48: CONNECTORS ON KE2 EVAP OEM

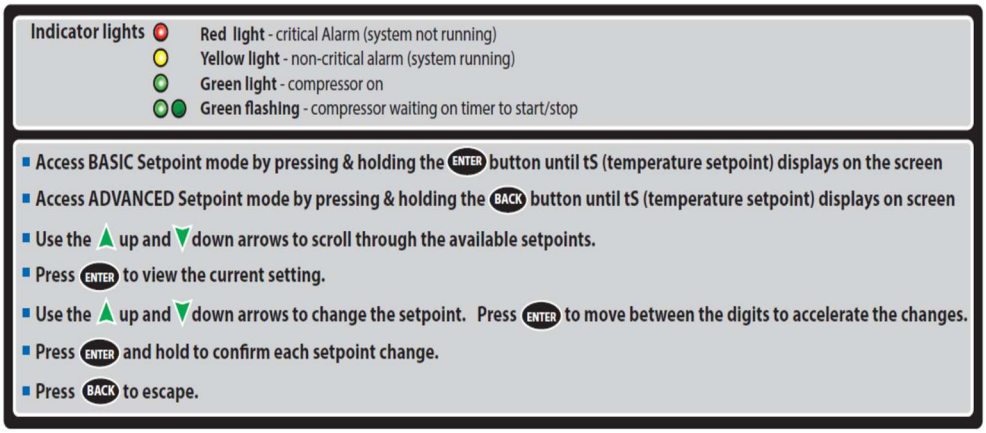


9.3.1 KE2 STANDARD REMOTE DISPLAY INTERFACE

9.3.1.1 Navigating Basic and Advanced Menus

Please use the following information to navigate **Basic Setpoints Menu** and **Advanced Setpoints Menu**.

Navigation Using the Basic Display



9.3.1.2 Navigating Variables Menu

From the default display, pressing the up and down arrows will cycle through the **Variables Menu**. The Enter button will toggle between the variable name and value.

9.3.1.3 Manual Valve Control

Press and hold the Back button & down arrow to put the EEV in **Manual Control** mode.
The up and down arrows will control the valve opening. Enter will advance to the next digit and Back will exit this mode.

9.3.1.4 Manual Defrost

Pressing and holding the Back and Enter buttons will put the controller into **Defrost (next mode)**.

9.3.2 DIAGNOSTICS MODE

The KE2 Evap OEM has been programmed with a diagnostics mode. When activated, the controller energizes each relay for 60 seconds. When the compressor relay is on the EEV will regulate to the Superheat setpoint.

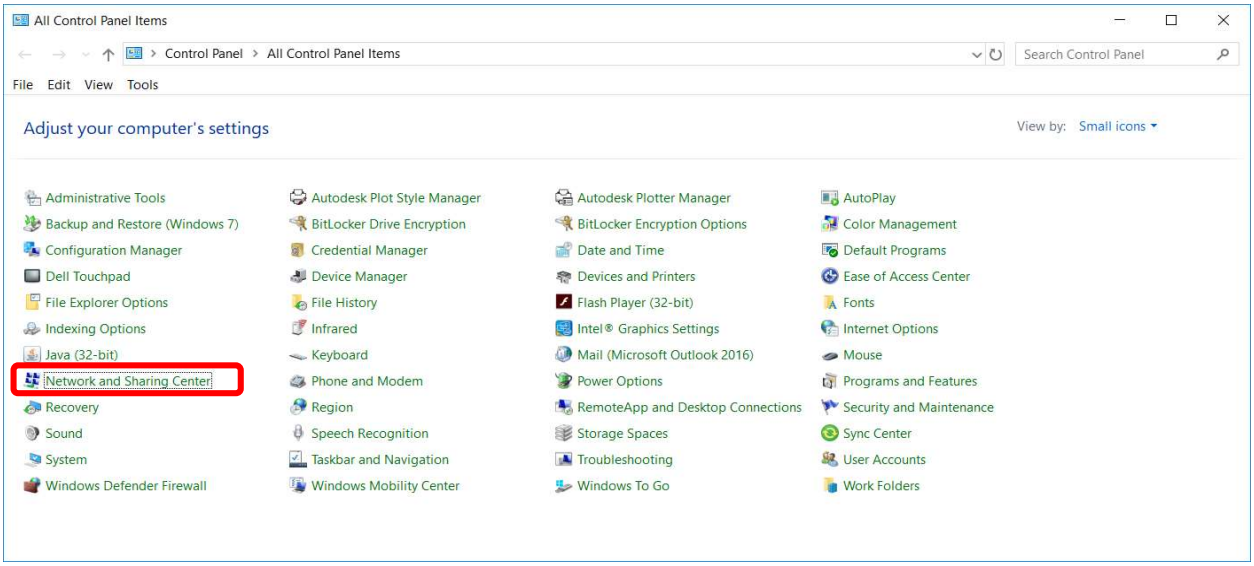
9.3.3 POINT TO POINT LAN INTERFACE

Assumption: The controller isn't connected to the customer network.
Following steps illustrates PC/Laptop setup to use for communicating with KE2 Evap OEM controller. These settings must be reverted to defaults after the connection with controller is severed.

9.3.3.1 LAPTOP/PC Setup

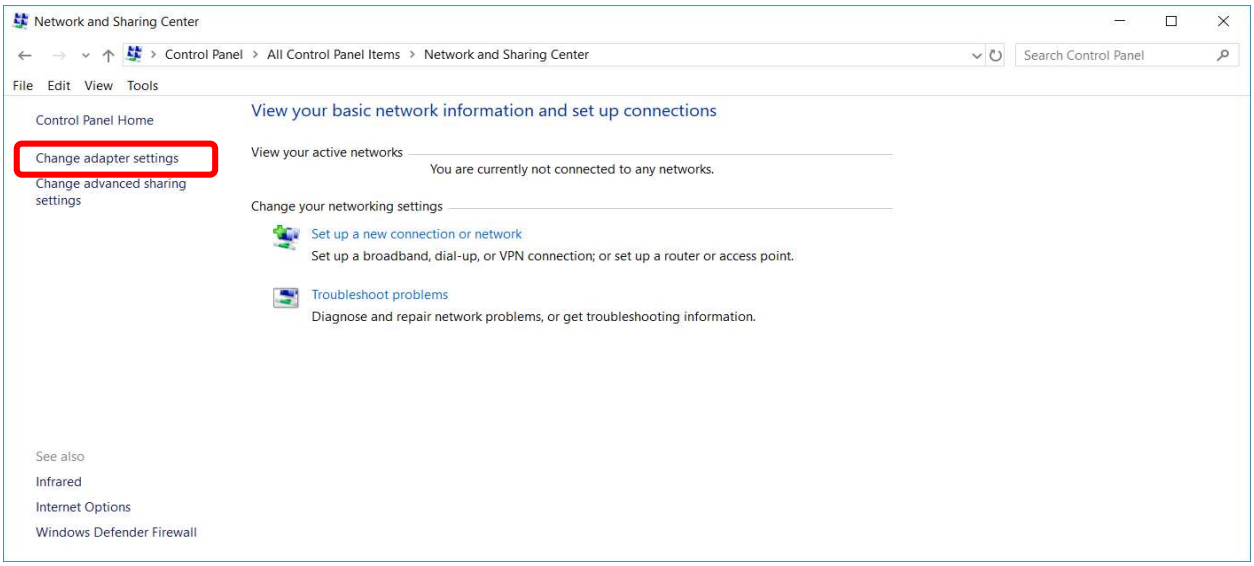
1. Open Windows "Control Panel" and select Network and Sharing Center

FIGURE 49: CONTROL PANEL



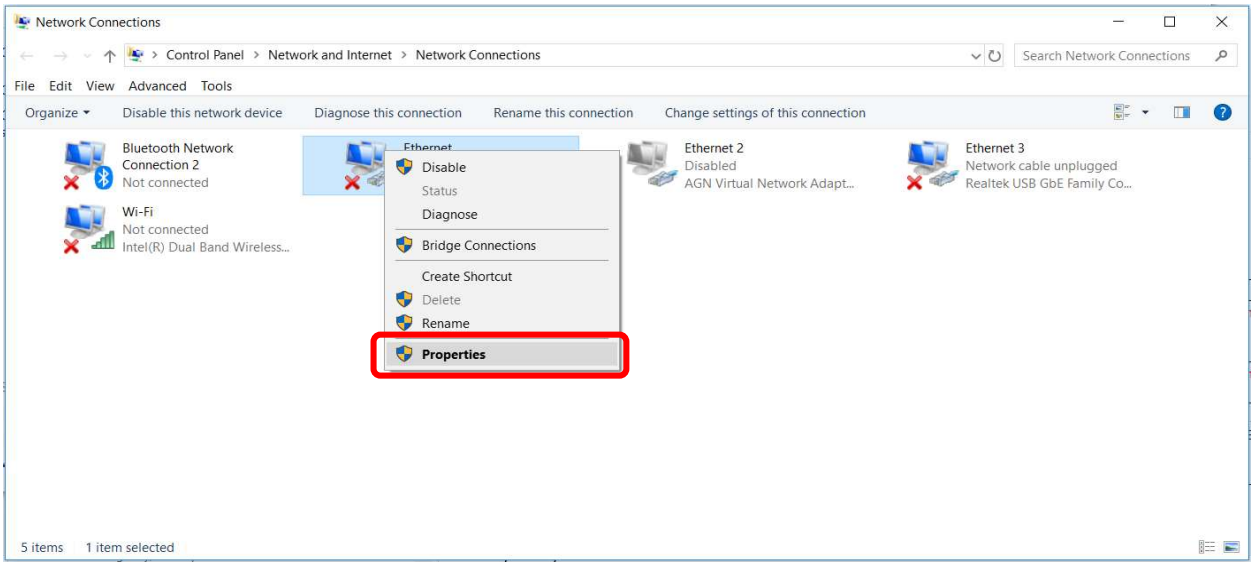
2. Select "Change Adaptor Settings"

FIGURE 50: NETWORK AND SHARING CENTER



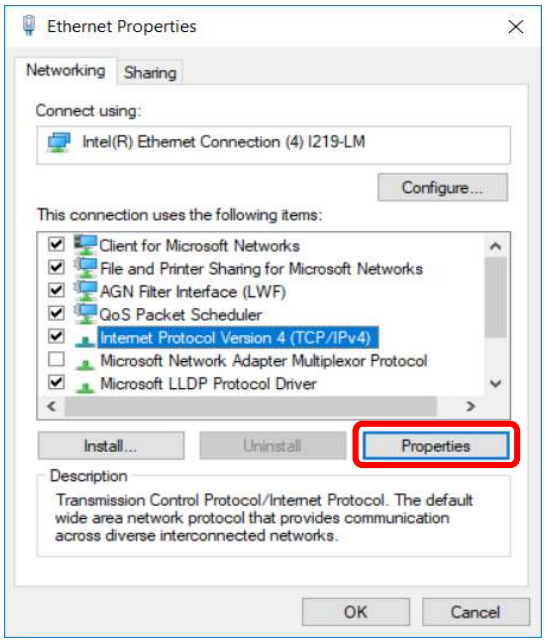
3. Right click “Ethernet” or “Local Area Connection” (Wired)

FIGURE 51: NETWORK CONNECTIONS



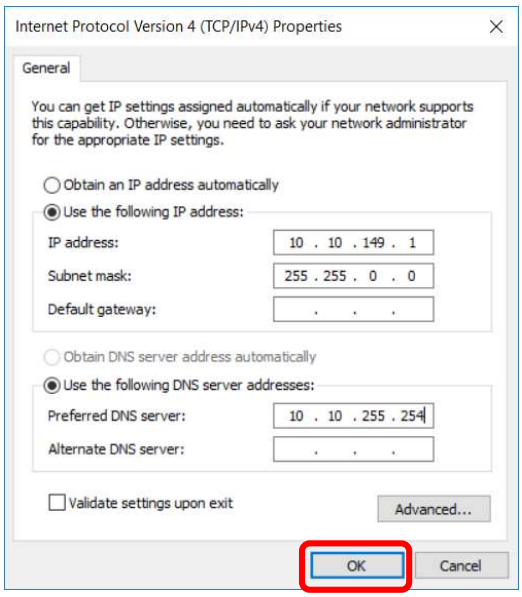
1. Select/Highlight “Internet Protocol Version 4 (TCP/IPv4)”, then choose “Properties”

FIGURE 52: ETHERNET PROPERTIES



2. Select Radio Buttons “Use the following IP address:”
   Enter the IP address: 10.10.149.1
   Enter Subnet mask: 255.255.0.0
   Enter Preferred DNS server: 10.10.255.254
   Select “OK”

FIGURE 53: INTERNET PROTOCOL VERSION 4 PROPERTIES

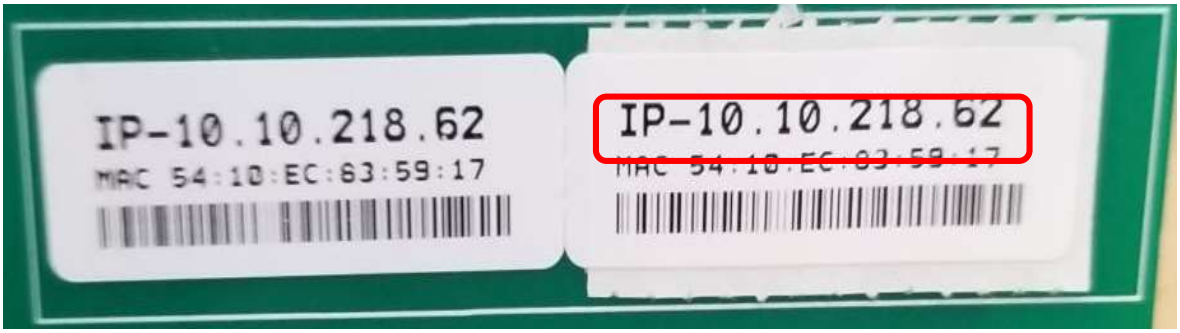


3. As PC/Laptop is now ready to communicate with KE2 Evap OEM controller, close all remaining open windows.
4. Open an internet browser (Mozilla Firefox, Google Chrome, Internet Explorer) and type the controller's current IP address in the browser.

FIGURE 54: WEB BROWSER

Note: The factory default is found on the sticker located on the back of the controller.

FIGURE 55: IP ADDRESS ON KE2 EVAP HARDWARE



9.3.4 NETWORK INTERFACE

Assumption: The controller is connected to the customer network and a dynamic IP address is allocated by the DHCP server.

1. Identify the dynamic IP ADDRESS assigned to the controller using following instructions:
   a. Following variables provide IP address:
      iP1 – First 3 digits of IP address
      iP2 – Second 3 digits of IP address
      iP3 – Third 3 digits of IP address
      iP4 – Fourth 3 digits of IP address

b. Connect the KE2 standard remote display interface to the controllers display connector.
c. Press the up or down arrow to cycle through the **Variables** menu until "iP1" displays on the screen. Press Enter button to find the value first. Press Enter button again to toggle back to "iP1" name.
d. Repeat the above step until all "iP2", "iP3" and "iP4" values are read.

2. Open an internet browser (Mozilla Firefox, Google Chrome, Internet Explorer) and type the controller's current IP address in the browser.

9.4 SMART ACCESS FROM A WEB BROWSER

9.4.1 HOME PAGE

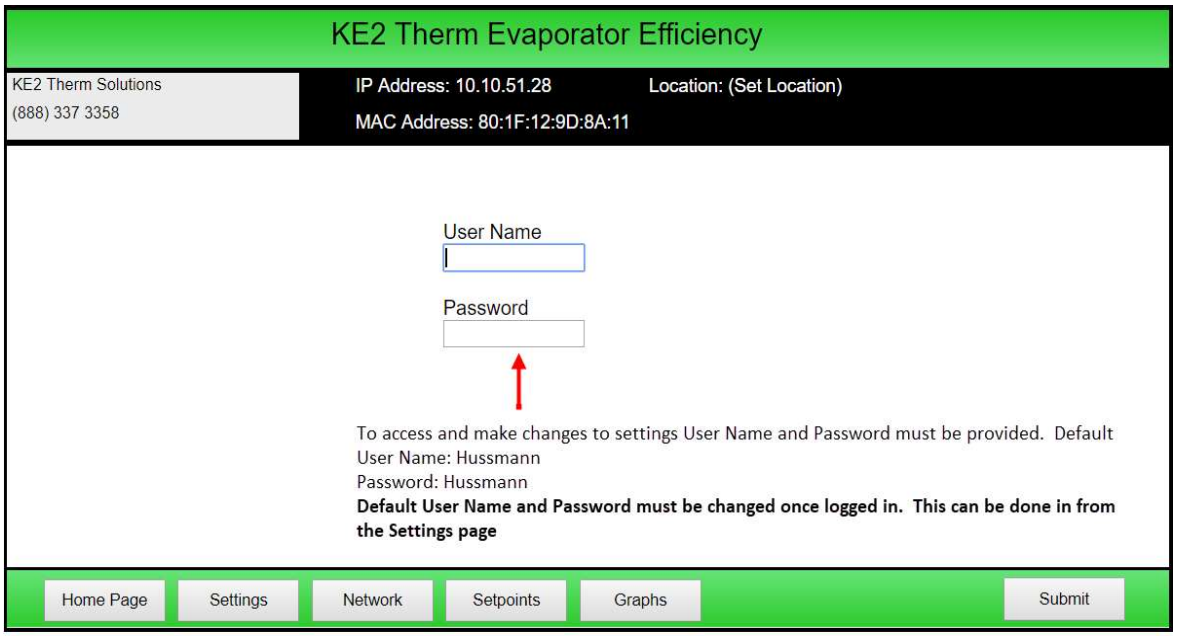
Upon entering IP address in the browser, home page gets invoked, which displays real time system information and shows the interaction of multiple system conditions.

FIGURE 56: KE2 EVAP HOME PAGE

9.4.2 LOGIN PAGE

The Login feature prevents unauthorized access to the controller. The user must enter the password to make changes to the Settings page, Network page, and Setpoints page.

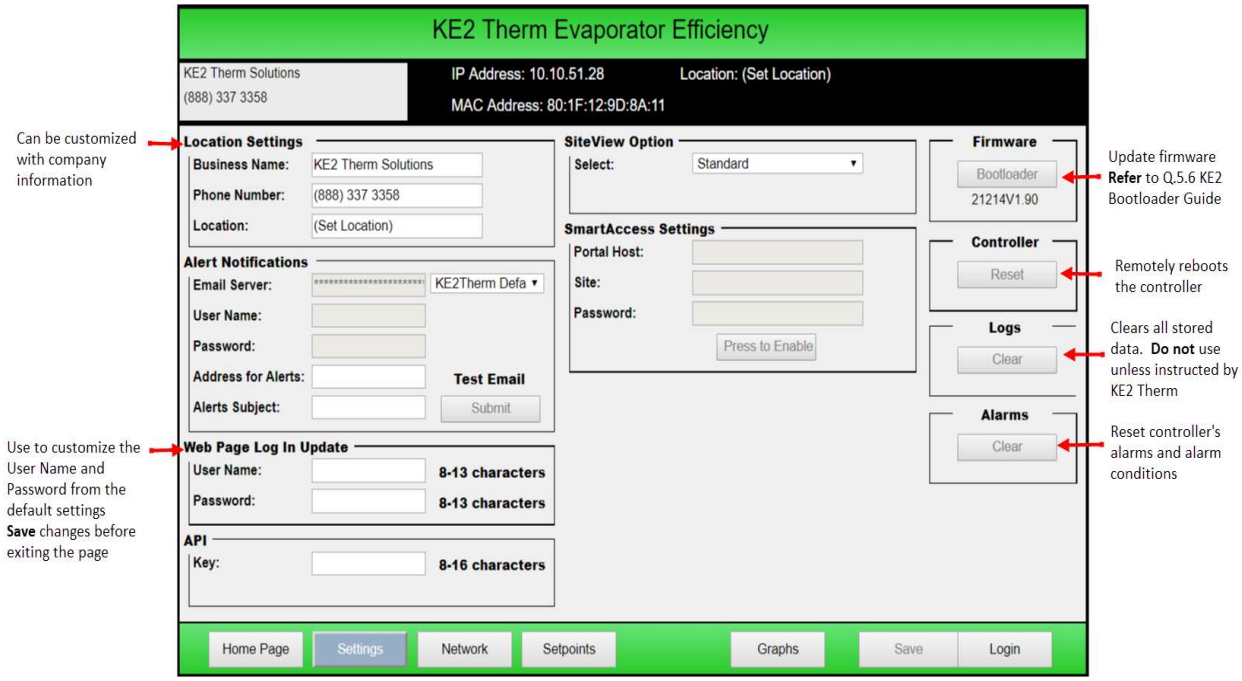
FIGURE 57: KE2 EVAP LOGIN PAGE



9.4.3 SETTINGS PAGE

The Settings page contains controller configuration for email and web access. It allows installers to customize the MasterView with their company information, update the controller, reset power to the controller, send a test e-mail, clear data collected, and clear alarms.

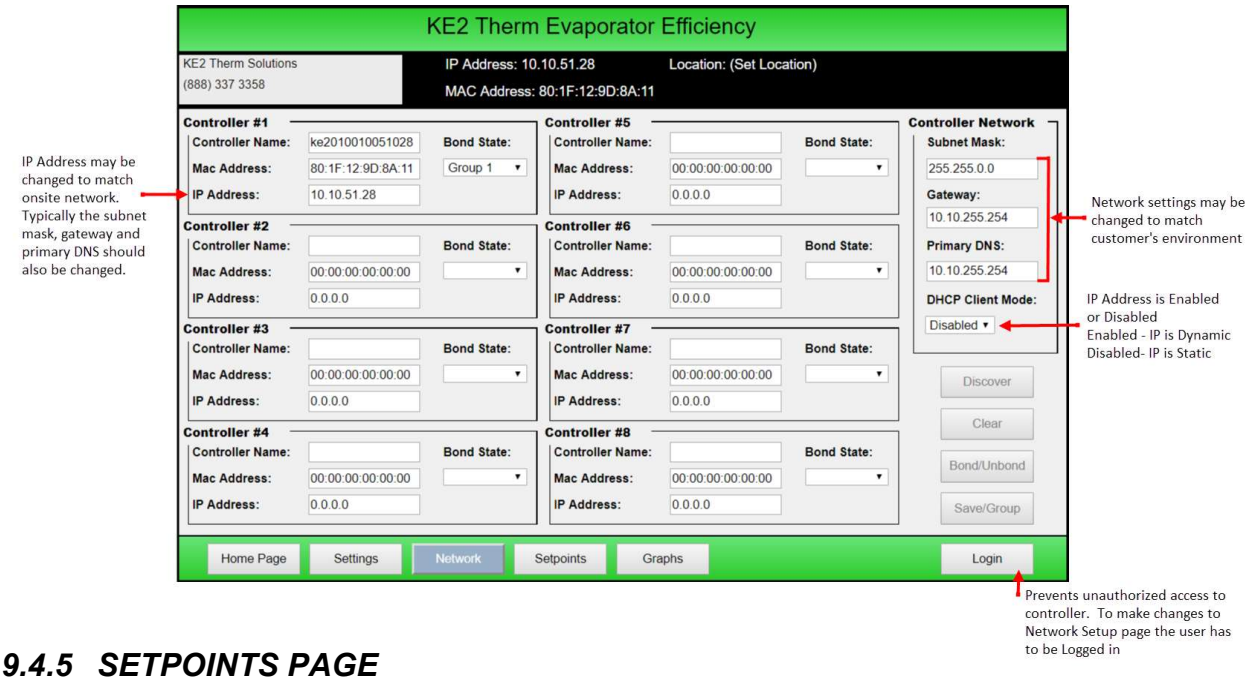
FIGURE 58: KE2 EVAP SETTINGS PAGE



9.4.4 NETWORK SETUP PAGE

The network screen enables the user to Bond the KE2 Evap OEM controller for multiple evaporator applications and provides setup for adding controllers to an existing network.

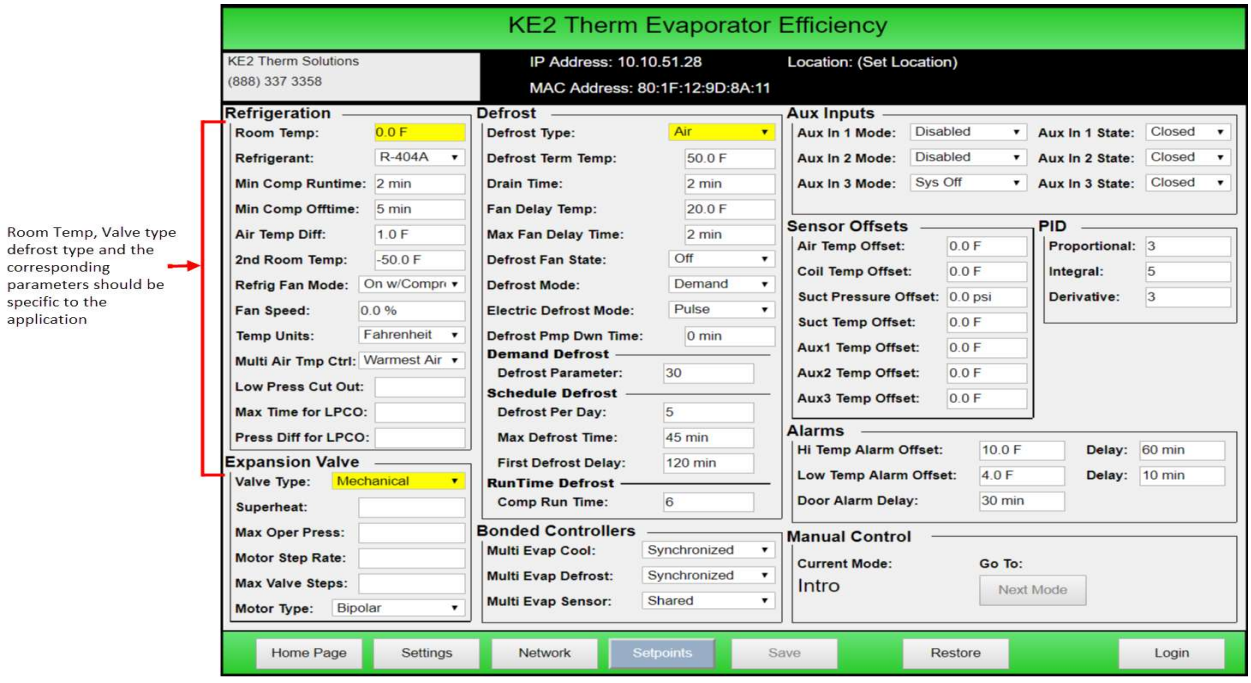
FIGURE 59: KE2 EVAP NETWORK SETTINGS PAGE



9.4.5 SETPOINTS PAGE

Allows the user to setup and customize the controller to meet specific application needs.
Room Temp, Defrost Type and Valve Type are necessary for the controller to begin operation.

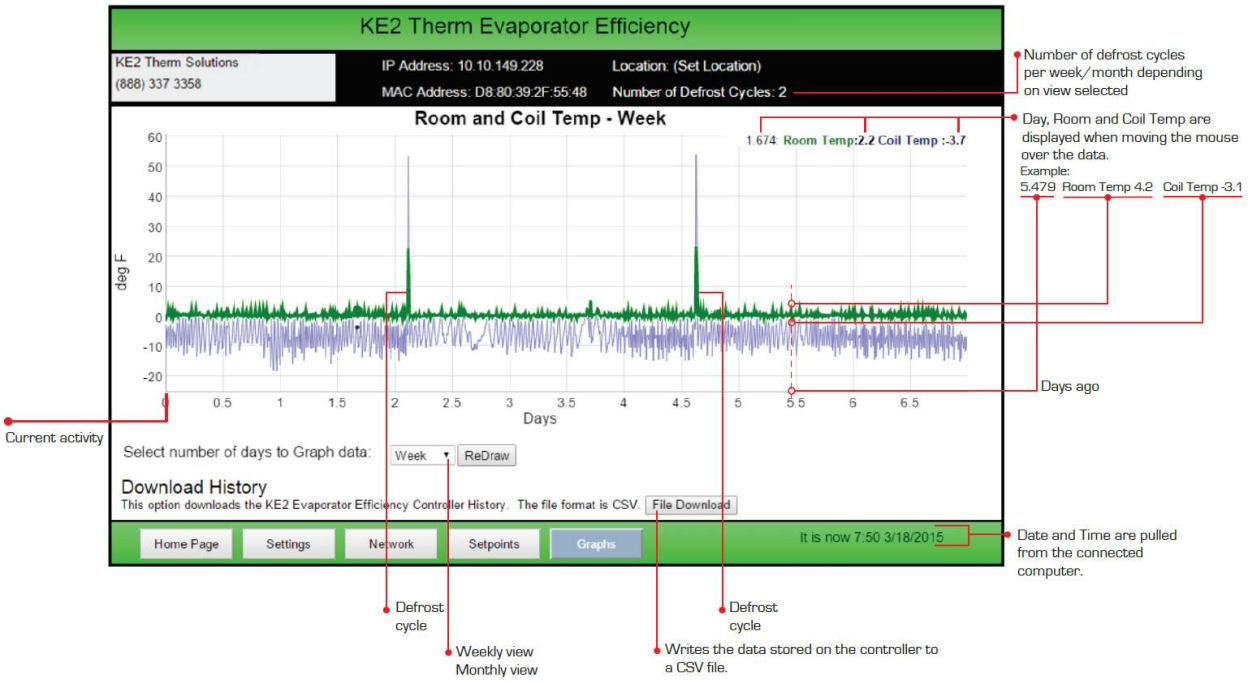
FIGURE 60: KE2 EVAP SETPOINTS PAGE



9.4.6 GRAPHS

The Graphing Snapshot shows the past seven days of Room Temp and Coil Temp readings, as well as the number and duration of defrost cycles.

FIGURE 61: KE2 EVAP GRAPHS PAGE

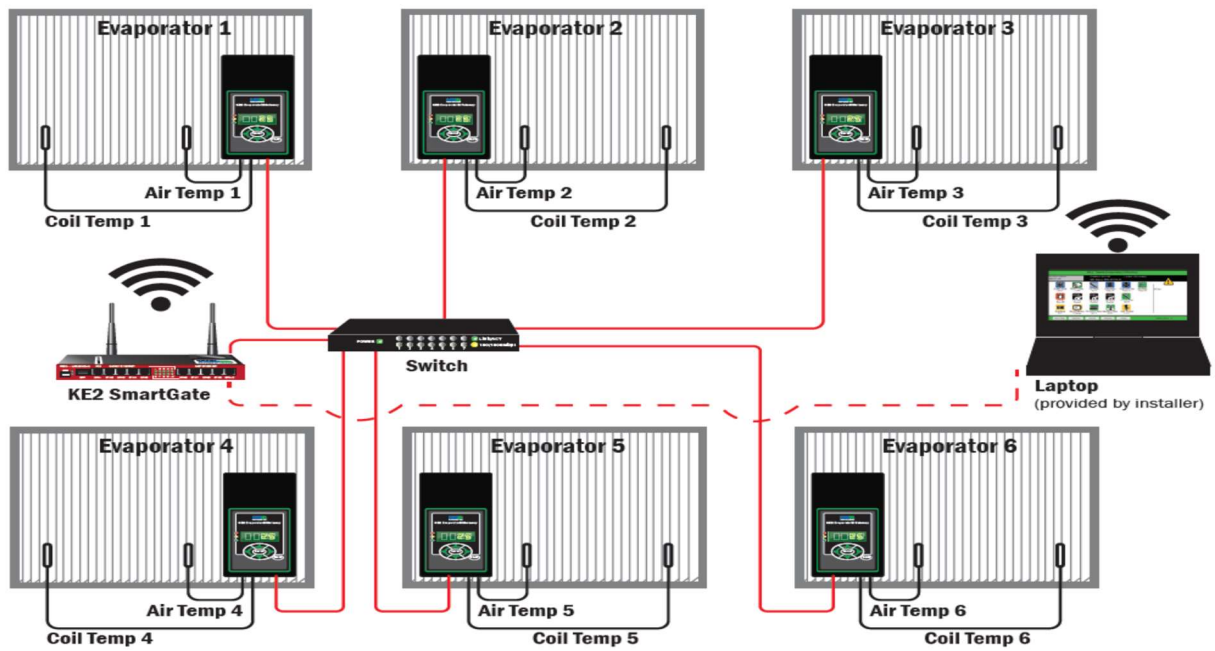


9.5 BONDING

When applied to larger systems (up to 8 evaporators attached to the same condenser), the distributed structure KE2 Evap controllers may be bonded over the TCP/IP network to avail following benefits:

1. Provides built-in system redundancy.
2. Create a system with maximum up time by sharing sensor readings.

FIGURE 62: CONTROLLING SYSTEM WITH 4 TO 8 KE2 EVAP CONTROLLERS



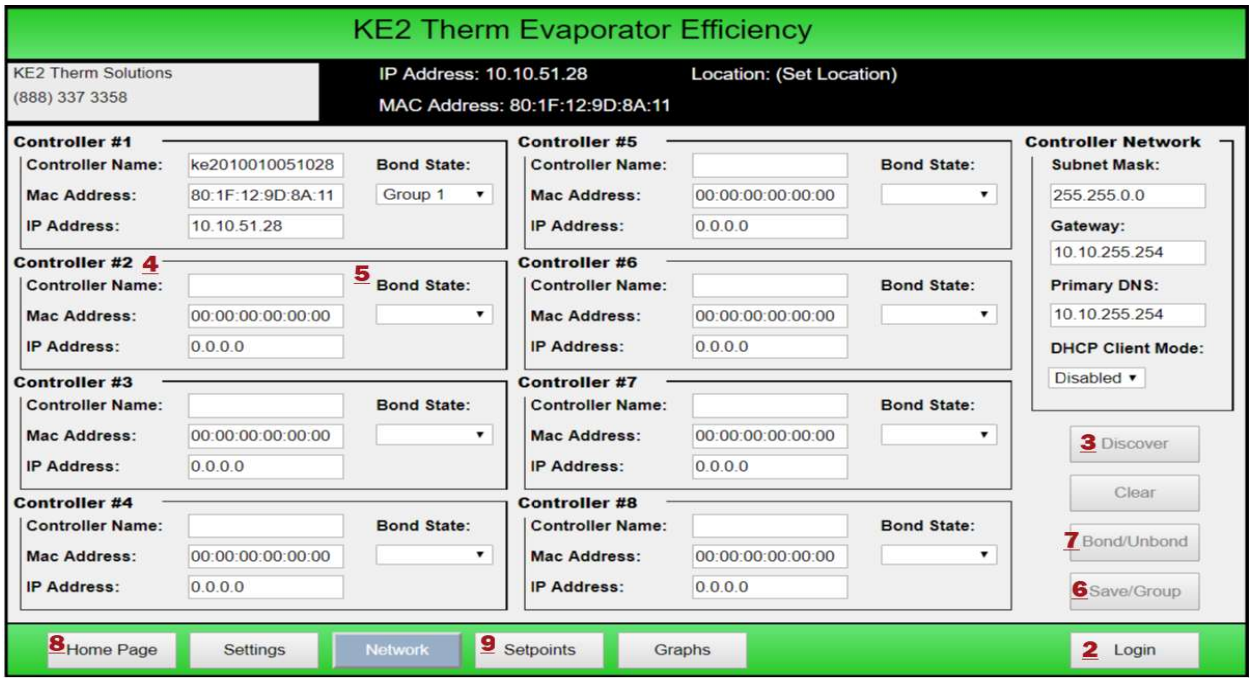
Setup Instructions

1. Open a browser window and type the **IP address** of one of the controllers into the browser address field. When the home page is loaded, click **Network** at the bottom of the screen.

FIGURE 63: HOME PAGE

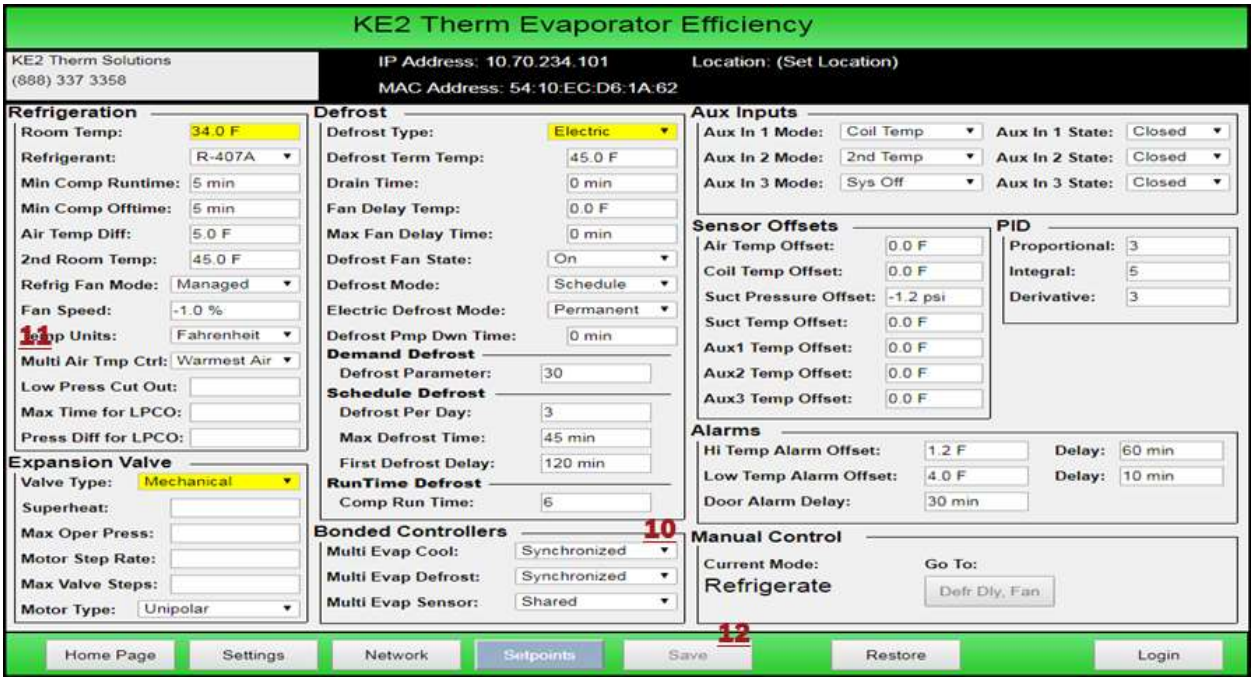
2. Click **Login** to Log into the controller.
3. On the Network Setup Screen, click **Discover**.

FIGURE 64: NETWORK SETUP SCREEN



4. The IP address of the other controller(s) will populate under **Controllers 2-8**.
5. From the **Bond State** dropdown select **Group 1** to bond controller.
6. Click the **Save/Group** button to view the controllers to be Bonded. Controllers with a blank Bond State will be deleted from the list.
7. Then click the **Bond/Unbond** button. The controllers will cycle power. They are now networked.
8. Next, ensure that the controllers are either in synchronous or independent mode for the set up. Click on **Home Page** button.
9. Then select **Setpoints**

FIGURE 65: SETPOINTS SCREEN



10. To put the controllers in **Multi Evap Cool Mode**, find the Bonded Controller section on the SetPoints screen. Click the drop-down arrow at **Multi Evap Cool** and select **Synchronized**. This will cause the controllers to go into cooling mode at the same time.

    Multi Evap Defrost *will make all the bonded controllers go into defrost at the same time when* ***Synchronized*** *or limit the system to one evaporator going into defrost at a time when* ***Independent****.*

    Multi Evap Sensor *tells the controller where or not to share sensor information. When* ***Shared*** *is selected and a controller loses its air temperature sensor, then it could continue running using the temperature read by the other bonded controllers. This should be the default mode. If the controllers are in different spaces therefore, controlling at different temperatures, then "****Independent****" mode should be selected. In this mode if a controller loses a sensor, the controller will continue to run based on the default safety mode for the current alarm.*
11. On the Refrigeration section select **Warmest Air** from the **Multi Air Tmp Ctrl** drop down menu. This tells the controller which method to use to control temperature.
12. Click **Save** and return to the **Home Page.**

13. We need to configure the subsequent controllers one at a time, to match the "**Multi**" settings of the first controller. To accomplish this, enter the IP address of the second controller in the browser and navigate to the **Setpoints** and complete the steps highlighted above.

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 Variable speed motor. Temperature sensor installed in the evaporator and wired to the System 450 control module will be utilized to measure the box temperature.

10.1 System 450 Parameters –

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

End Point (EP) – is the maximum deviation from the target value. Setpoint at which Fan motors will run at Minimum speed **– Target Box Temperature – 5°F**

Output at Setpoint (OSP) – is the signal strength level of the analog output when the input sensor is at Setpoint (SP). The OSP is expressed as a percentage (0 to 100%) of the full-scale output. **Output signal strength at setpoint, 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, so the fans will run at full speed. At Endpoint (EP) fans will receive 10V signal, so the fans will run at minimum speed.

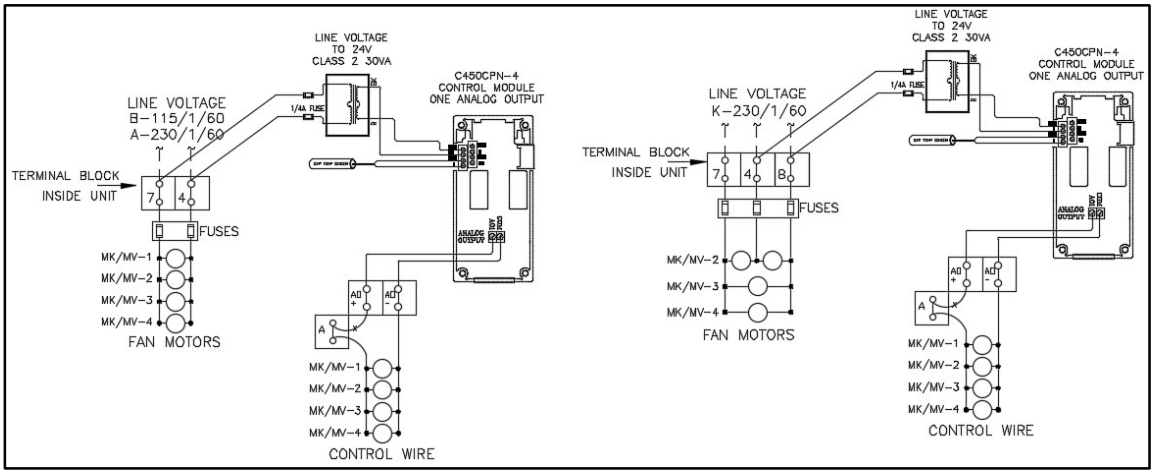
The analog signal varies between setpoint to endpoint proportionally based on the box temperature measured by installed temperature sensor thus varies the fan speed proportionally.

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

Sensor Failure Mode –

System 450 allows you to select the mode of operation for your 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 Setpoint (OSP). i.e., Analog output will fail at OSP setpoint. Sending 0V signal to motor.

10.2 FIGURE 66: - WIRING DRAWING OF EVAPORATOR WITH SYSTEM 450 –

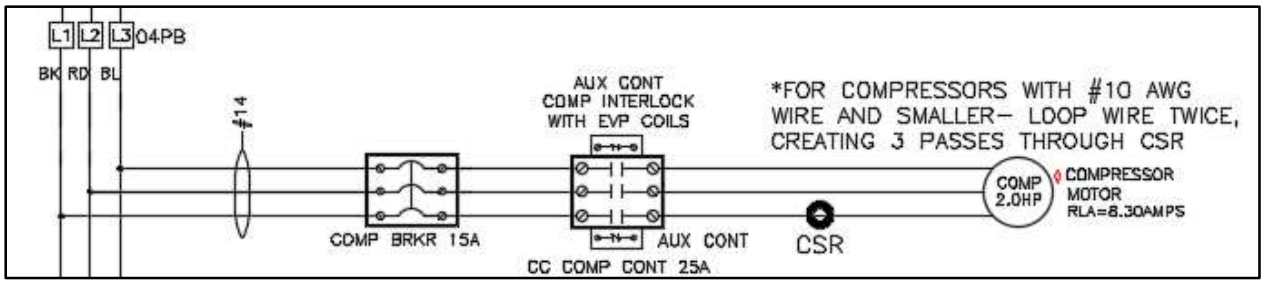


11 INTERLOCKING SINGLE COMPRESSOR UNIT WITH KRACK COIL

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

FIGURE 67: – SETUP IN SINGLE COMPRESSOR UNIT:



Aux contact in Single compressor unit wired to terminal pins.

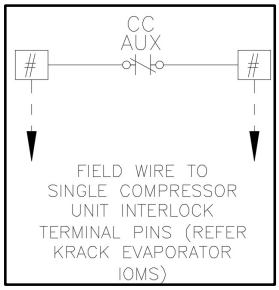
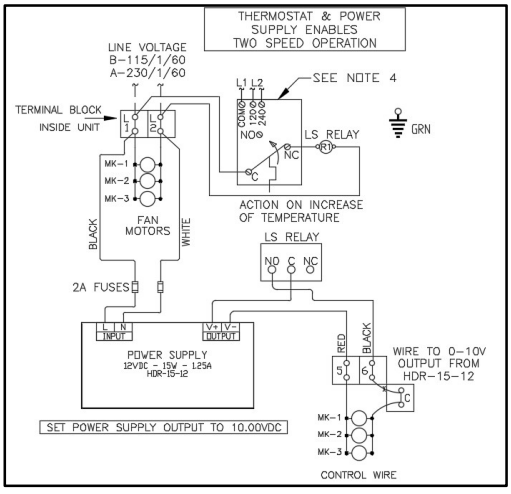


FIGURE 68: - 2 SPEED MOTOR EVAPORATER COILS – (MOTORS WITH 10V EXTERNAL POWER SUPPLY)

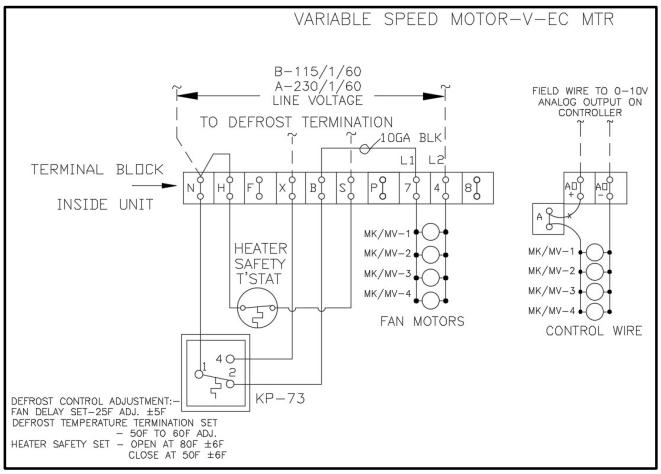


Aux contact in Single compressor unit wired to terminal pins.

In case of DUAL SPEED Motor coils with 10V power supply – the Jumper between terminal 6 and C should be removed and aux contact from single compressor unit wired in series. Whenever the compressor contactor energized the Aux contact energizes, and NC contacts changes state to NO, there

by OPEN the 10V power supply circuit. So, whenever compressor is ON, fans will never go to low speed mode, even getting signal from Room thermostat or filed controller.

FIGURE 69: - VARIABLE SPEED MOTOR EVAPORATER COILS –



In Case of Variable speed motor coils – the Jumper between terminal A0+ and A should be removed and aux contact from single compressor unit wired in series.

Whenever the compressor contactor energized the Aux contact energizes, and NC contacts changes state to NO, there by OPEN the analog 10V signal circuit. So, whenever the Controller sends the 10V signal it goes through Aux contact, and make sure that compressor is ON and there by deactivates the analog signal circuit. So, when compressor is ON then fans will never be able to modulate, though Controller telling fans to modulate.

12 START UP

12.1 PRE-STARTUP

After the installation is completed, 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. Be sure 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 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.

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” or “N” and “B” depending on the unit wiring arrangement. Once the box temperature is below +25°F the jumper wire should be removed.

12.2 OPERATION CHECKOUT

Check the room thermostat setting. Be sure 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 4.6 for making expansion valve adjustments. As much as 30 minutes may be required for the new balance to take place after an adjustment is made.

On 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 build up is 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.

13 PREVENTATIVE MAINTENANCE

A preventative maintenance schedule should be set up as soon as the Unit Cooler is installed. The unit should be inspected periodically for proper operation.

 **WARNING - All power must be disconnected before cleaning.**

1. Inspect and clean the drain pan to insure 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.

14 TROUBLESHOOTING CHART

TABLE 15: UNIT 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. Room temperature too high for use of fan delay switch.	Check wiring. Replace motor. Replace defective component. Jumper fan delay switch. Terminals F to B.
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.

15 KE2 OEM EVAP TROUBLESHOOTING CHART

TABLE 16: KE2 TROUBLESHOOTING

Alarm	Alarm Name	Description	Parameter in VARIABLES menu to diagnose further.	Corrective Action
Blank Display	N/A	No LEDs are illuminated on the display.	N/A	**Note:** While not an alarm condition, the controller may or may not be operational if nothing is shown on the Remote Display. The KE2 Evap OEM can continue to operate the system even while the Remote Display is disconnected. **If controller is still powered and system is running troubleshoot the Remote Display:** • Make sure the plugs are fully inserted into the jacks at both the KE2 Evap OEM and the Remote Display. • Check the connection between the KE2 Evap OEM board and the Remote Display for any burned, chaffed, cut or otherwise damaged sections. If damaged, replace cable. • There are two jacks on the Remote Display. Switch the jack used on the Remote Display and check for functionality. • Check to see if Remote Display cable is longer than 5ft. Maximum cable length between Remote Display and KE2 Evap OEM board is 5ft. **If system is not running and there are no LEDs lit on the KE2 Evap OEM board, check:** • Incoming voltage to the board. Voltage should be between 100VAC – 240VAC, if not address supply voltage issue. • Remove power to controller and check fuse located on board. The fuse cannot be checked visually; remove fuse from board and check resistance across the fuse. An open reading indicates the fuse has blown and points to a supply voltage issue or short on the board or connected devices. The fuse will blow in order to protect the controller from permanent damage. Check for proper incoming power, examine all cables for burned, cut, chaffed or otherwise damaged insulation/wire and repair. Replace fuse (PN 21375). • Remove all connections to controller except for power and the Remote Display; see if the Remote Display illuminates. **Note:** Power injected into the controller's Ethernet port may reuslt in the display going blank and other unexpected problems. Power over Ethernet (POE) switches connected to the KE2 Evap OEM should have the power output feature disabled.
Ed	Intro	"Ed" is blinking on the Remote Display, yellow and red LEDs are flashing.	N/A	Not an alarm condition, controller is in introduction mode. Please refer to Q.1.45 for controller setup.
PSA	Pressure Sensor Alarm	ONLY ACTIVE WHEN AN ELECTRONIC EXPANSION VALVE IS SELECTED: Suction pressure sensor is shorted, open or pressure is out of range.	Red LED is illuminated. System cannot operate while this alarm is present. PrS - SUCTION PRESSURE • If wiring connects Signal terminal (G) to Ground terminal (B) or open, PrS will read -15. •If wiring connects Signal terminal (G) to the +5 VDC terminal (R), PrS will read 154. • If actual pressure is over the range of the transducer, PrS will read over 150*. * 300 psig or 500 psig depending on range of the pressure transducer.	The majority of sensor alarms and inaccurate readings are caused by cut, burned, chaffed or otherwise damaged sensor cables. Inspect the length of the cable for any burned, chaffed or otherwise damaged sections. Repair any damaged sections; take care not to swap colors when repairing. • Check that the pressure transducer cable wires are inserted into the proper position on the board (gray connector) and that the colors are inserted into the proper screw down terminal gates. The bare stranded wire of the transducer cable should be inserted so that the wire is directly touching the gate of the connector. If the gate is contacting the insulation of the wire, it will not allow the controller to read the sensor. • If wires have been extended, check that colors have not been swapped when extended. Check for any bad splices, crimps or solder joints where extended. • Check that the pressure transducer cable is fully inserted into the pressure transducer. The cable should click when fully inserted into the transducer. • Confirm that the proper transducer is being used for the system. 0-150psia for most common refrigerants, 0-300psig for R-410A and 0-500psig for R-744 (CO_2). Confirm that the proper refrigerant **(rFG)** is selected in the setpoints menu. • To verify the accuracy of the transducer, remove the transducer from the system. The controller should read suction pressure as approximately 0 psig when measuring atmosphere. **Note:** If PrS shows -15 when transducer is measuring atmosphere, the wrong pressure transducer/refrigerant combination has been selected.

<table>
<tr><th>Alarm</th><th>Alarm Name</th><th>Description</th><th>Parameter in VARIABLES menu to diagnose further.</th><th>Corrective Action</th></tr>
<tr><td>SSA</td><td>Suction Temperature Sensor</td><td>ONLY ACTIVE WHEN AN ELECTRONIC EXPANSION VALVE IS SELECTED:

Red LED is illuminated. System cannot operate while this alarm is present.

Temperature sensor is shorted or open (not connected).</td><td>SUt - T1 SUCTION TEMP
• If SUt reads -88 the sensor is open, or not connected.
• If SUt reads 180+ the sensor is shorted.</td><td rowspan="5">• The majority of sensor alarms and inaccurate readings are caused by cut, burned, chaffed or otherwise damaged sensor cable. Inspect the length of the cable for any cut, burned, chaffed or otherwise damaged sections. Repair any damaged sections
• Check that the sensor is inserted into the proper position on the board. The sensor is not polarized; black and white wires can be inserted in either position on the connector:
Suction Temp: black connector labeled TSUC.
Air Temp: blue connector labeled TAIR.
Coil Temp: yellow connector labeled TCOIL.
2nd Coil Temp/Aux 1 Temp: green connector labeled AUX1.
Aux 2 Temp: black connector labeled AUX2.
Aux 3 Temp: black connector labeled AUX3.
• The bare stranded wire of the temperature sensor should be inserted so that the wire is directly touching the gate of the connector. If the gate is contacting the insulation of the wire, it will not allow the controller to read the sensor.
• If wires have been extended, check for any bad splices, crimps or solder joints where extended.
• Check the sensor probe. If the sensor cable has been pulled, the sensor probe may have been damaged, and needs to be replaced.
• To verify accuracy of the sensor, the preferred method is to place the sensor in a proper ice bath while connected to the controller. View SUt on variables menu, temperature should read around 32.0°F. If adjustment is necessary, an offset can be applied via the browser interface.
• Sensor accuracy can also be verified using a third party thermometer, however, it must be calibrated and rated to measure low temperatures.
• Unplug the connector and check that the resistance reading of the sensor matches the temperature vs. resistance table.
<table><tr><th>Temperature °F</th><th>Ohms</th></tr><tr><td>-22</td><td>19480</td></tr><tr><td>-4</td><td>12110</td></tr><tr><td>14</td><td>7763</td></tr><tr><td>32</td><td>5114</td></tr><tr><td>50</td><td>3454</td></tr><tr><td>68</td><td>2387</td></tr><tr><td>77</td><td>2000</td></tr><tr><td>86</td><td>1684</td></tr><tr><td>104</td><td>1231</td></tr><tr><td>122</td><td>885</td></tr></table>• If temperature appears to be within the proper operating range, swap a non-alarming sensor with the sensor being diagnosed.
• If the new sensor is read properly by the controller, the sensor being diagnosed will need to be replaced.
• If the sensor was disconnected for diagnostic purposes, return the sensor to the appropriate location on the controller once diagnostics are complete.</td></tr>
<tr><td>ASA</td><td>Air Temperature Sensor Alarm</td><td rowspan="4">Yellow LED is illuminated.
Controller will attempt to continue to operate system while this alarm is present.

Temperature sensor is shorted or open (not connected).</td><td>rtP - ROOM TEMP
• If rtP reads -88 the sensor is open, or not connected.
• If rtPt reads 180+ the sensor is shorted.</td></tr>
<tr><td>CSA</td><td>Coil Temperature Sensor Alarm</td><td>CLt - COIL TEMP
• If CLt reads -88 the sensor is open, or not connected.
• If CLt reads 180+ the sensor is shorted.</td></tr>
<tr><td>A1A</td><td>Auxiliary 1 Temperature Sensor Alarm</td><td>AU1 - AUX TEMP 1
• If AU1 reads -88 the sensor is open, or not connected.
• If AU1 reads 180+ the sensor is shorted.</td></tr>
<tr><td>A2A</td><td>Auxiliary 2 Temperature Sensor Alarm</td><td>AU2 - AUX TEMP 2
• If AU2 reads -88 the sensor is open, or not connected.
• If AU2 reads 180+ the sensor is shorted.</td></tr>
<tr><td>A3A</td><td>Auxiliary 3 Temperature Sensor Alarm</td><td>AU3 - AUX TEMP 3
• If AU3 reads -88 the sensor is open, or not connected.
• If AU3 reads 180+ the sensor is shorted.</td></tr>
</table>

Alarm	Alarm Name	Description	Parameter in VARIABLES menu to diagnose further.	Corrective Action
EdF	Excess Defrost Alarm	Exceeds maximum number of allowable defrosts.	Yellow LED is illuminated. Controller will attempt to continue to operate system while this alarm is present. CLt - COIL TEMP dEr - DEFROST RELAY	**Excess Defrost Alarm and Defrost Termination on Time Alarm are closely linked;** both often indicate issues with the defrost process. Excess defrost alarm only occurs when using defrost based on evaporator efficiency, and is the only alarm condition that does not clear automatically when alarm conditions are resolved. Do not clear the Excess Defrost Alarm until diagnostics have been performed and the source of the excess defrost alarm is resolved. **Air/ Electric / Hot Gas Defrost -** Check solenoid valve. While the controller is in refrigeration or satisfied on temperature, initiate a defrost from the Remote Display by pressing and holding the ENTER and ▼ buttons until **ddF** (defrost delay Fan) or **dEF** appears. The solenoid valve should close and the flow of liquid refrigerant to the evaporator stopped for the entire defrost. **Note:** For electric and hot gas defrost, the controller should run fans only for several minutes while the system pumps down in **ddF** (defrost delay Fan) mode. In **ddF**, solenoid valve and heaters should be off. The display will change to **dEF** (dEFrost) after the fan operation is complete. Fans should turn off, solenoid valve should remain off, and all heaters should turn on. **Electric Defrost -** Verify that the heaters are working properly. Measure amperage of the heaters while heaters are energized and check that it matches the nameplate of the evaporator. If less than the nameplate, check for damaged heaters and any cut, burned, chaffed or disconnected wires in the heater circuit. Repair damage and check for proper defrost operation. **Note:** Controller periodically turns heaters on and off during defrost to reduce steaming and overall heat of defrost toward the end of the defrost cycle. **Air/ Electric / Hot Gas Defrost -** Verify coil sensor location. An excessive number of defrosts is often due to coil sensor location. The coil sensor, or sensors, serve as defrost termination sensors. If in an improper location (such as close to a heater), or if a coil sensor has been pulled out, defrost will terminate too soon or will take too long to terminate. The controller will respond by initiating another defrost shortly after the irregular defrost, and the cycle will continue until the Excess Defrost Alarm is triggered. Relocate the coil sensor to where frost has built up the heaviest on the coil and initiate a defrost. Check to make sure the defrost terminates in a reasonable amount of time (less than 30-35 minutes for air defrost, less than 18-22 minutes for electric defrost) and the coil is completely clear of frost. If there is any frost remaining on the coil after the defrost, relocate a coil sensor to that location. The proper location for the coil sensor is always the last place frost disappears. **Air/ Electric / Hot Gas Defrost -** Verify door has not been left open for an extended period by viewing graphs page. Add door switch (PN 20543) to reduce excess frost caused by door openings. **Air/ Electric –** Cold air from an evaporator in refrigeration in the same space may prevent a defrosting coil from reaching termination temperature within a reasonable amount of time. Bonding and synchronizing defrost on the evaporators allows the evaporators to defrost more quickly. Please refer to Q.5.10 for information on multi-evaporator applications. **Air Defrost -** The KE2 Evap OEM keeps the room temperature much tighter than is typically seen in the industry. The KE2 Evap OEM's default air temperature differential is 1.0°F, while the system is still protected from short cycling by minimum off and minimum run times if temperature fluctuation is larger than normal. If the room temperature setpoint on the KE2 Evap OEM is set to the same temperature cut-out as traditional mechanical controls where differentials of 4.0°F or 5.0°F are common, it will result in a much colder room temperature on average. Considered this when setting the room temperature setpoint. If receiving Defrost Termination on Time or Excess Defrost Alarm with air defrost, the room air heat alone may not be sufficient to complete the air defrost. The room temperature setpoint should be raised, or electric heat added to the evaporator. Alternatively, the **dtP** (defrost term temP) can be lowered to one degree above **rTP** (room TemP), however, the coil sensor MUST be in the spot on the coil where frost disappears last during defrost to ensure a completely clean coil after every defrost. Otherwise, set **ind** (initiate defrost Mode) to **SCH** (SCHedule), and set **dPd** (defrost Per day) and **dtL** (defrost time Length) to the number of times per day and length of defrost to completely clear the coil of frost. If the maximum defrost time is still not sufficient to clear the coil of frost, the Defrost Termination on Time Alarm will continue to trigger. **Return Defrost Mode to Demand after resolving the issue.**
dtt	Defrost Termination on Time Alarm	Defrost terminated on time instead of temperature for two consecutive defrosts	Yellow LED is illuminated. Controller will attempt to continue to operate system while this alarm is present. CLt – COIL TEMP dEr – DEFROST RELAY	

<table>
<tr><th>Alarm</th><th>Alarm Name</th><th>Description</th><th>Parameter in VARIABLES menu to diagnose further.</th><th>Corrective Action</th></tr>
<tr><td>HSH</td><td>High Superheat Alarm</td><td>ONLY ACTIVE WHEN AN ELECTRONIC EXPANSION VALVE IS SELECTED:

System has been running with a higher than expected superheat.</td><td rowspan="2">Yellow LED is illuminated.
Controller will attempt to continue to operate system while this alarm is present.

SHt - SUPERHEAT
PrS - SUCTION PRESSURE
SUt - SUCTION TEMP
oPn - VALVE % OPEN</td><td rowspan="2">• Check the system suction pressure using either the Remote Display (PrS) or the controller's browser interface and validate the suction pressure is within the range of the system design. If a new install, confirm valve is properly sized for the system.
• Check refrigerant type. Press and hold ENTER or BACK until tS appears. Press ▼ to rFG. Press ENTER to see currently selected refrigerant. To change refrigerant press ▼ until the correct refrigerant is shown. Press and hold ENTER to save correct refrigerant type. To exit the menu hit.

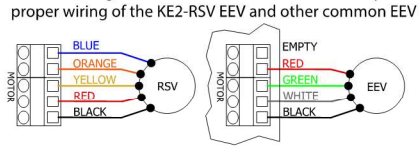
Refrigerants
<table><tr><th>Abbreviation</th><th>Full Name</th></tr><tr><td>R22</td><td>R-22</td></tr><tr><td>134</td><td>R-134a</td></tr><tr><td>42d</td><td>R-422D</td></tr><tr><td>42A</td><td>R-422A</td></tr><tr><td>40C</td><td>R-407C</td></tr><tr><td>40A</td><td>R-407A</td></tr><tr><td>507</td><td>R-507</td></tr><tr><td>404</td><td>R-404A</td></tr><tr><td>513</td><td>R-513A</td></tr><tr><td>450</td><td>R-450A</td></tr></table><table><tr><th>Abbreviation</th><th>Full Name</th></tr><tr><td>449</td><td>R-449A</td></tr><tr><td>448</td><td>R-448A</td></tr><tr><td>744</td><td>R-744</td></tr><tr><td>410</td><td>R-410A</td></tr><tr><td>407</td><td>R-407F</td></tr><tr><td>409</td><td>R-409A</td></tr><tr><td>408</td><td>R-408A</td></tr><tr><td>438</td><td>R-438A</td></tr><tr><td>717</td><td>R-717</td></tr><tr><td>452</td><td>R-452A</td></tr></table>• Check valve type. Press and hold ENTER or BACK until tS appears. Press ▼ to Edt. Press ENTER to see currently selected valve. To change the valve type press ▼ until the correct valve is shown. Press and hold ENTER to save. Controller will reset. Confirm proper system operation with the variables menu.

Valve Types
<table><tr><th>Abbreviation</th><th>Scrolling Text* & Full Name</th><th>Description</th></tr><tr><td>tHr</td><td>MECHANICAL</td><td>Thermostatic Expansion Valve</td></tr><tr><td>HS</td><td>HSV</td><td>KE2 Therm's Hybrid Stepper Valve</td></tr><tr><td>rS</td><td>RSV</td><td>KE2 Therm's Refrigeration Stepper Valve</td></tr><tr><td>SEi</td><td>SEI</td><td>Sporlan Valve with 1,600 steps</td></tr><tr><td>SEr</td><td>SER</td><td>Sporlan Valve with 2,500 steps</td></tr><tr><td>CrL</td><td>CAREL</td><td>Carel Valve with 500 steps</td></tr></table>*Scrolling Text is available when using the KE2 Combo Display.

• If system operation has not improved, re-initialize the valve. This can be done by clicking the "Reset" button on the Settings page of the browser interface, or power may also be cycled to the controller.
• Check the valve position in the variables menu (oPn). If the valve is fully open, verify the valve is operating properly by manually operating the valve from the Remote Display. Press BACK and ▼ at the same time on the Remote Display until a number with the rightmost number blinking displays. This is the valve percent open, and the EEV is now under manual control. Press ▲ to open and ▼ to close the valve. Press ENTER to change how much the valve opens with each button press (0.1%, 1.0% or 10.0%). The valve should start to move immediately to the position indicated on the display. While verifying suction pressure either from the controller's browser interface or with gauges, begin closing the valve 10.0% at a time. The suction pressure should decrease somewhat with each 10% closure. Completely close the valve to 0.0%; system should pump down. If suction pressure responds to closing the valve, valve should be operating correctly and a system issue is likely present: low charge, restriction in the liquid line, dirty condenser etc. If suction pressure does not respond to manually operating the valve, proceed to next step.</td></tr>
<tr><td>LSH</td><td>Low Superheat Alarm</td><td>System has been running with a lower than expected superheat.</td></tr>
</table>

HSH / LSH Corrective Action - *Continued*

• Check wiring to the EEV terminal on the KE2 Evap OEM board. Refer below for proper wiring of the KE2-RSV EEV and other common EEV wiring.



• The bare stranded wire of the EEV cable should be inserted so that the wire is directly touching the gate of the connector. If the gate is contacting the insulation of the wire, it will not allow the controller to correctly operate the valve.

• If wires have been extended, check that colors have not been swapped

• **Measure resistance across the EEV leads.** This will measure the resistance from entire length of the lead wire, through the windings of the EEV and back to the other lead. Remove the EEV leads from the terminals, and for KE2 RSV measure:

Check resistance across EEV leads:

Wire Colors	RSV-100 to 320	RSV-400 to 550
Blue - Orange	36 ohms	32 ohms
Blue – Yellow	36 ohms	32 ohms
Blue – Red	36 ohms	32 ohms
Blue – Black	36 ohms	32 ohms

Also check resistance between the windings:

Wire Colors	RSV-100 to 320	RSV-400 to 550
Orange – Yellow	96 ohms	65 ohms
Orange – Red	96 ohms	65 ohms
Orange – Black	96 ohms	65 ohms
Yellow – Red	96 ohms	65 ohms
Yellow – Black	96 ohms	65 ohms
Red – Black	96 ohms	65 ohms

For Sporlan SER-AA to L, measure:

Wire Colors	
Black – White	100 ohms
Red – Green	100 ohms
Black – Green	Open
Red – White	Open

All values should be within 10% of stated values, otherwise indicating a wiring issue. If absolutely sure of no wiring issue, the external coil may need to be replaced. For valves with internal windings, the valve may need to be replaced.

• If electrical diagnosis reveals no issues, and no system issues are present, there may be debris in the valve port. The valve can be driven open/closed several times through the manual control, while also lightly tapping the valve in an attempt to dislodge any debris. If valve has a strainer, strainer may need to be cleaned.

HSH / LSH Corrective Action - *Continued*

Low Superheat Alarm Only

The Low Superheat Alarm is most commonly caused by the compressor failing to start/ compressor not running. There is a common misconception in the industry that the low pressure switch cut-in and cut-out pressure control on the condensing unit is set correctly for the application from the factory.

The equipment manufacturers' installation instructions recommend that the installing contractor adjust the low pressure cut-in and cut-out to recommended settings for the application. The low pressure cut-in and cut-out set point should be set to either the ambient or space temperature, whichever is lower.

When the controller calls for refrigeration, if suction pressure is not able to rise to the cut-in pressure before the EEV closes due to low superheat, the system will not start, and a Low Superheat Alarm triggered.

Our technical support team typically sees an increase of these alarms in the fall when the ambient temperatures begins to decrease. If the low superheat alarm is intermittent, this is the most likely source of the alarm. Check the following:

• **Low Pressure Control Pressure Switch.** Reduce the cut-out pressure to meet the equipment manufacturer's specification for the coldest ambient or box temperature, whichever is lower.

• **Measure continuity across the low pressure control,** if it indicates a closed circuit, next check the compressor start components and continue diagnosis at the condensing unit.

• **Verify all fans are moving.** Check if there is a mechanical service switch for the fans in the space being used inappropriately. If only one fan is not moving, verify whether the fan is operational. Replace the motor if necessary.

• **Check fan motor rotational direction and fan blade pitch** to ensure air is flowing in the proper direction.

• **Check for diminished load due to low air movement across the coil.** This can be caused by excessive frost build-up on the coil on the air entering and/or air exiting sides of the coil. The fans should be turned off while checking for frost buildup to allow a clear view of the coil. Product that is stacked too close to the coil and impedes airflow through the coil can also be a source of diminished load.

• **Check EEV and EEV wiring/cables** – Please see previous steps.

Alarm	Alarm Name	Description	Parameter in VARIABLES menu to diagnose further.	Corrective Action
dor	Door Open Alarm	Door is open and room temperature is 5.0°F degrees above rtP (ROOM TEMP) + AIR TEMP DIFF for dAd (DOOR ALARM DELAY) time.	Yellow LED is illuminated. Controller will attempt to continue to operate system while this alarm is present.	• **Verify that the door is closed.** • **Verify which auxiliary input is being used for the door switch** (AU1, AU2 or AU3). Press and hold BACK until **tS** appears. Press ▼ until **AU1, AU2** or **AU3** appears. Press ENTER to view what the auxiliary input is currently set to, door switch will display **dor** on the Remote Display. Press BACK to return to the advanced setpoints menu and check the other inputs. Verify the leads of the door switch are connected to the correct auxiliary input, and that the bare stranded wire of door switch lead is inserted so that the wire is directly touching the gate of the connector. If the gate is contacting the insulation of the wire, it will not allow the controller to read the door switch. Inspect the length of the cable for any cut, burned, chaffed or otherwise damaged wire. Repair if there is damage and verify operation. • **Verify that the door switch is in proper working order.** Door switches provided by KE2 Therm are normally closed switches. To test them, move the two pieces of the switch close together, remove the leads from the connector on the board and check that the circuit is continuous using a multimeter. Move the two pieces of the switch apart more than 6 inches. Check continuity again; it should be open. If the door switch is operating in an opposite manner, the switch is an open switch and the controller should be reconfigured appropriately: select the correct input, **A1A, A2A** or **A3A** (indicating Aux In 1, 2 or 3 state) as **CLo** for activate on closed circuit. If the switch is verified to be inoperable, replace the switch. • **Confirm proper door switch operation** by opening the door, fans should turn off and refrigeration should stop shortly after. Close door, the controller should resume refrigeration and fans. If there is a blinking green light on the controller, it has not cleared the time for short cycle protection and should resume refrigeration in a few minutes.
CoA	**Communication Alarm**	ONLY FOR BONDED CONTROLLERS: No communication between controllers for one minute or more.		•Communication Error is most commonly caused by local network issues. • Verify all network switches are connected and functioning properly. Check that all controllers in a bonded group are powered up. • Verify communication to each individual controller using whatever method is usually used to communicate to the controllers in question. If one or more are unreachable, investigate those controllers and their network cabling further. • Ensure all cables are inserted fully into their respective jacks. Check for any damaged cable. • On new installations, where the cables are built in the field, check network cables for proper wire color code (Ethernet standard A or B, see Q.5.5 Making Ethernet Cable for more information). Also make sure copper for each wire goes fully into the clip. If one or more wires is out of order or doesn't fully insert into the clip, it needs to be fixed before it can be used to communicate. • Attempt to break and re-bond the controllers. If any of the controllers are not discoverable from the Network page, investigate those controllers further.
PrF	Process Failure Alarm	Remote Display is not communicating to the controller.		The Remote Display is not properly communicating with the KE2 Evap OEM board. The KE2 Evap OEM can continue to refrigerate without the Remote Display, but setpoints can only be changed via the browser interface. • Check that cable is inserted into the correct location on the board. • Check that cable between board and display is firmly inserted at both ends. • Check that cable is not cut, burned, chaffed, disconnected or otherwise damaged. • Cable should not be extended over 5ft.

Alarm	Alarm Name	Description	Parameter in VARIABLES menu to diagnose further.	Corrective Action
EA1	External Alarm 1	If AU1 (AUX IN 1 MODE) = EA1 (EXT ALARM 1): The digital input is in an active state.		• Troubleshoot the device connected to the auxiliary input to discover why it is in alarm condition and resolve the issue. • If the device is not in alarm, check to make sure the device is connected to the appropriate position (AUX 1, AUX 2 or AUX 3). • Review the KE2 Evap OEM settings to make sure they match the type of device connected to the controller. **AU1, AU2** or **AU3** should be set to **EA1, EA2** or **EA3** respectively to set the aux input to be an external alarm. • Verify the aux input state (**A1A, A2A** or **A3A**) is appropriately set to **oPn** (open) or **CLo** (closed) to match the input's functionality. If the controller is displaying the opposite of what is expected, changing the state will reverse the logic.
EA2	External Alarm 2	If AU2 (AUX IN 2 MODE) = EA2 (EXT ALARM 2): The digital input is in an active state.		
EA3	External Alarm 3	If AU3 (AUX IN 3 MODE) = EA3 (EXT ALARM 3): The digital input is in an active state.		
EFL	E-mail Failure Alarm	E-mail alert was not confirmed by email server provided after seven consecutive attempts.	N/A	• Ensure the controller has Internet access. If possible plug a laptop into the Ethernet cable at the controller to test Internet connection. • E-mail Failure Alarm is a function of the controller attempting to send out an e-mail alert using the information entered in the Alert Notifications section of the Settings Page, and failing to communicate successfully with the e-mail server provided. • Servers requiring basic authentication should provide User name and Password, and ensure it is correctly entered. • Servers without authentication requirements should not enter information in the User name or Password field. If unsure of server requirements and alarm occurs, ensure both User name and Password are blank and retry.

Alarm Name	Description	Corrective Action
Disconnect	Controller has been disconnected from KE2 SmartAccess for over 10 minutes.	• The Disconnect Alarm indicates the controller has lost connection to the portal site, and is only generated if Disconnect Alarms are enabled from the portal site dashboard. The KE2 Evap OEM requires Internet access to connect to KE2 SmartAccess, and a Disconnect Alarm typically indicates the controller has lost connection to the Internet, or the controller that is connected to the portal site has lost power. •Verify that the controller is powered, if not, troubleshoot incoming power. •Check the Ethernet cable between the IT equipment and the KE2 Evap OEM board. Make sure both ends are firmly inserted into the jacks. •If possible, check connectivity to the Internet through the Ethernet cable at the KE2 Evap OEM. Contact local IT staff to have the local network diagnosed. Once the KE2 Evap OEM is able to reconnect to the portal site, it will send an e-mail notifying that the controller has reconnected to KE2 SmartAccess.
Reconnect	Controller has been reconnected to KE2 SmartAccess.	
Access Denied	Response from https://smartaccess.ke2therm.net when trying to login with invalid Site and/or Password.	Site name and Password are case sensitive and must be entered exactly as originally set by the user. • If site and password are correct, the controller(s) have stopped communicating to KE2 Therm's server. The local network's functionality should be validated to ensure the controller is communicating properly. The Internet connection should also be checked to ensure it is working properly. The KE2 Evaporator Efficiency must be configured to register on KE2 SmartAccess from the Settings page on the Masterview screen. The default site is installer and the password is the MAC address exactly as shown on the controller label, e.g., 12:34:56:AB:CD:EF. The user may change the site and password on the Settings page to something more convenient.
Controller Communication Failure. Retry in XX Seconds.	Clicking on any controller from the KE2 SmartAcces Services screen should redirect to that controller. This error will prevent viewing the controller's webpage.	After connection to KE2 SmartAccess, the dashboard will show all registered controllers, clicking on any controller will redirect to that controller's Masterview webpage. • Browsers commonly maintain a cache to improve the user experience. After changes to the user view, like a firmware update, the webpage view stored in the browser's cache may be falsely displayed. To resolve, the browser's cache must be cleared completely. Some browsers refer to this as 'from the beginning of time'. Refer to your browser's help for more information on clearing the brower's cache.

16 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 67 REPLACEMENT PARTS

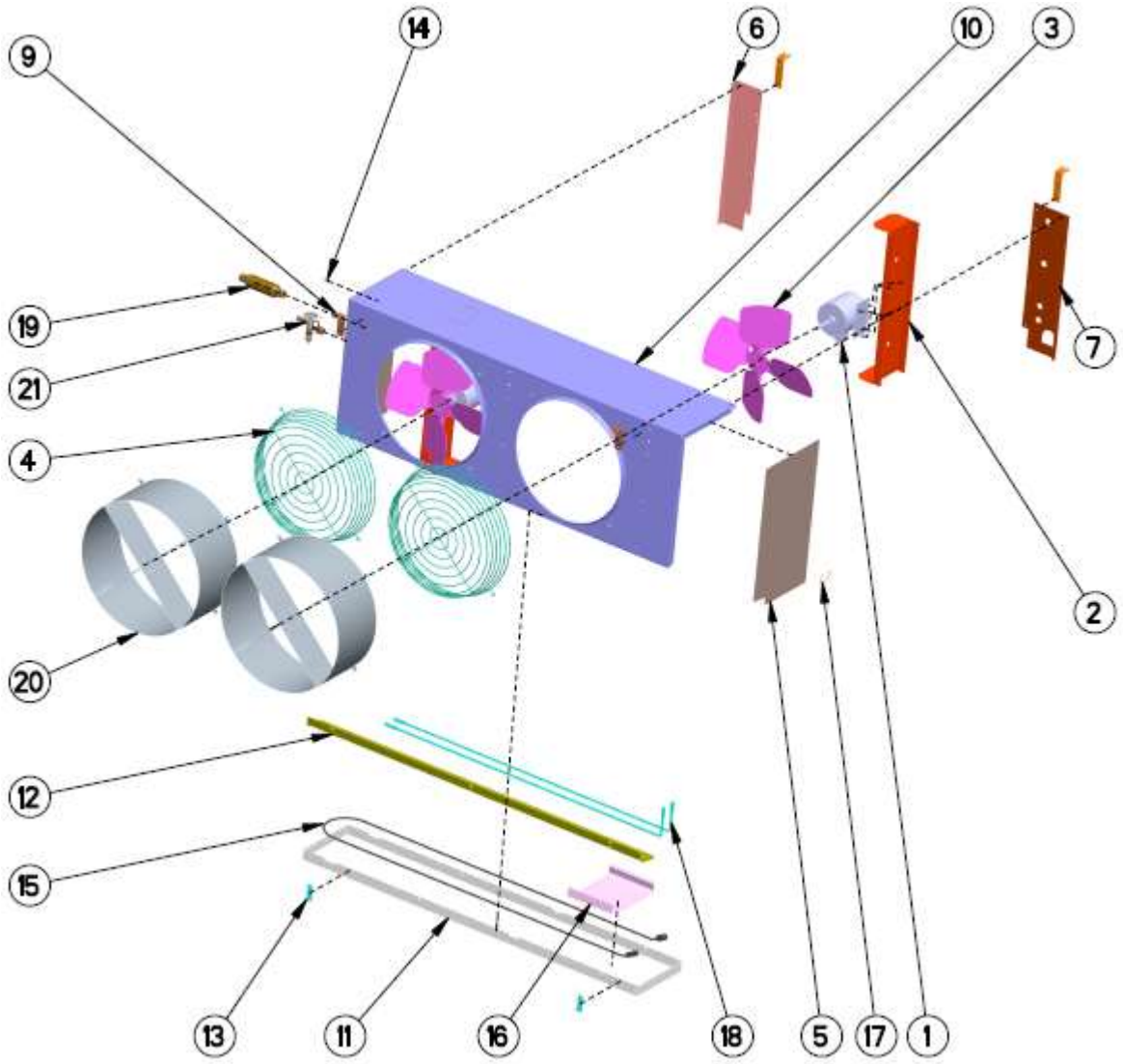


TABLE 17 REPLACEMENT PARTS

Item	General Description	Options Description	Hussmann Aftermarket Part Number
1	MK PSC MOTOR	MK 115/230V 1/4HP 1135RPM	11513N
		MK 460V 1/4HP 1140RPM	11524N
	MV PSC MOTOR	MV 115/220V 1/3HP 1135RPM	E205693
		MV 460V 1/3HP 1075RPM	E205782
	MK/MV EC VS MOTOR	EC 115V-230V 1/3HP 500-1150RPM	3064516
2	MOTOR MOUNT		E105004
3	FAN BLADE MK (PSC)	MK 20" 17 DEG CW 5/8"BORE	E205691
	MV (PSC)	MV 20" 32 DEG CW 5/8"BORE	E205692
	FAN BLADE MK (EC)	MK 20" 17 DEG CW 1/2" BORE	E106034
	MV (EC)	MV 20" 32 DEG CW 1/2" BORE	E106035
	SWEPT WING BLADE MK QUIET (EC)	MK 20" 23 DEG CW 1/2"BORE	3072623
4	FAN GUARD		E205672
5	END COVER		E105008
6	BACK LEFT CORNER PANEL		E105005
7	BACK RIGHT CORNER PANEL		E105006
8	HANGER	FRONT HANGER	660220
		REAR HANGER	E105044
9	HOUSING	1 FAN	E105007
		2 FAN	E105015
		3 FAN	E105016
		4 FAN	E105017
10	DRAIN PAN	1 FAN	CE105267I
		2 FAN	CE105268I
		2 FAN NON-INSOLATED	CE105269
		3 FAN	CE105269I
		4 FAN	CE105270I
11	FAN DRAIN PANEL	1 FAN	E105009
		2 FAN	E105040
		3 FAN	E105041
		4 FAN	E105042
12	DRAIN PAN HANGER		E107098
13	THERMOSTATS	DEFROST TERM (14T32)	E206100
		HEATER SAFETY (14T21)	109560
		FAN DELAY (14T31)	E201818
		KP-73	E205004
14	PAN HEATERS	1 FAN 115V	E201886
		1 FAN 230V	E201905
		1 FAN 460V	E201888
		2 FAN 115V	E201892
		2 FAN 230V	E201893
		2 FAN 460V	E201894

		3 FAN 115V	E201908
		3 FAN 230V	E201909
		3 FAN 460V	E201910
		4 FAN 115V	E201901
		4 FAN 230V	E201902
		4 FAN 460V	E201903
15	DRAIN PAN HEATER BRACKET		E102473
16	SUPPORT BRACKET	FACE HEATER SUPPORT BRACKET	E105045
		BOTTOM HEATER SUPPORT BRACKET	E105046
		2 ROW BOTTOM HTR SUPPORT	E205738
		3 ROW BOTTOM HTR SUPPORT	E205739
		4 ROW BOTTOM HTR SUPPORT	E205740
17	COIL HEATERS	1 FAN 230V	E102024
		1 FAN 460V	E102025
		2 FAN 230V	E101932
		2 FAN 460V	E101938
		3 FAN 230V	E201696
		3 FAN 460V	E202697
		4 FAN 230V	E101935
		4 FAN 460V	E101941
18	CHECK VALVE	1/2”	118520
		5/8”	118530
		7/8”	109300
		1-18”	118040
		1-5/8”	E150087
		2-1/8”	E205552
19	AIR BOOSTER		CE105018
20	EXPANSION VALVE	EBFVE-C-C	E205550
		EBSJE-5-C	E206822
		EBSJE-7-C	E206007
		EBSSE-6-C	E314439
		EBSSE-6-ZP	E206821
		EBSSE-7.5-C	E206019
		EBSSE-7-1/2-ZP	E313631
		EBSVE-11-ZP40	E205886
		EBSVE-8-C	E206824
		EBSVE-8-ZP40	E206826
		EGJE-1/2-C	E205915
		EGJE-1-1/2-C	E206131
		EGJE-1-C	E205916
		EGJE-2-C	E205987
		EGSE-1/2-C	E205984
		EGSE-1/2-ZP	E206212
		EGSE-1-1/2-C	E205983
		EGSE-1-1/2-ZP	E206317
		EGSE-1-C	E205982
		EGSE-1-ZP	E206178
		EGSE-2-C	E205985

		EGSE-2-ZP EGVE-1/2-C EGVE-1-1/2-C EGVE-1-1/2-ZP40 EGVE-1-C EGVE-1-ZP40 EGVE-2-C EGVE-2-ZP40 EGVE-3/4-C EGVE-3/4-ZP40 EGVE-3-C EGVE-3-ZP40 SBFJE-AA-C SBFJE-A-C SBFJE-B-C SBFJE-C-C SBFSE-AA-C SBFSE-A-C SBFSE-A-ZP SBFSE-B-C SBFSE-B-ZP SBFSE-C-C SBFSE-C-ZP SBFVE-AA-C SBFVE-AA-ZP40 SBFVE-A-C SBFVE-A-ZP40 SBFVE-B-C SBFVE-B-ZP40 SBFVE-C-C SBFVE-C-ZP40	E206165 E205717 E205723 E205792 E205721 E205821 E205781 E205735 E205719 E205838 E205803 E206058 E205991 E205992 E205993 E205994 E206015 E206013 E205360 E206014 E205920 E206016 E311124 E205501 E205973 E311117 E205324 E205500 E205927 E311118 E206600
21	CONTROLLER	CONTROLLER-EVAPORATOR FAN KE2	3069208
22	SENSORS	SENSOR-TEMPERATURE KE2 BLACK	3083470
23	RELAY 240V	RELAY-30AMP DP/ST N.O. 120V RELAY TYCO T92P7A22-240V	0459304 1804241
24	10V Power Supply	POWER SUPPLY-10 VDC HDR-15-12	3115218
25	MOTOR CONTROL WIRE HARNESS	1 FAN 2 FAN 3 FAN 4 FAN	3082703 3082704 3082705 3082706
26	AUX CONTACT FOR SINGLE COMP INTERLOCK	C320KG2 AUX CONT 1 NC 25-75A C320DPG01 AUX CONT 1 NC 90A	E209975002 E209976002

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