MK/MV Series Medium Profile Unit Coolers

Operating and Installation Manual

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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.

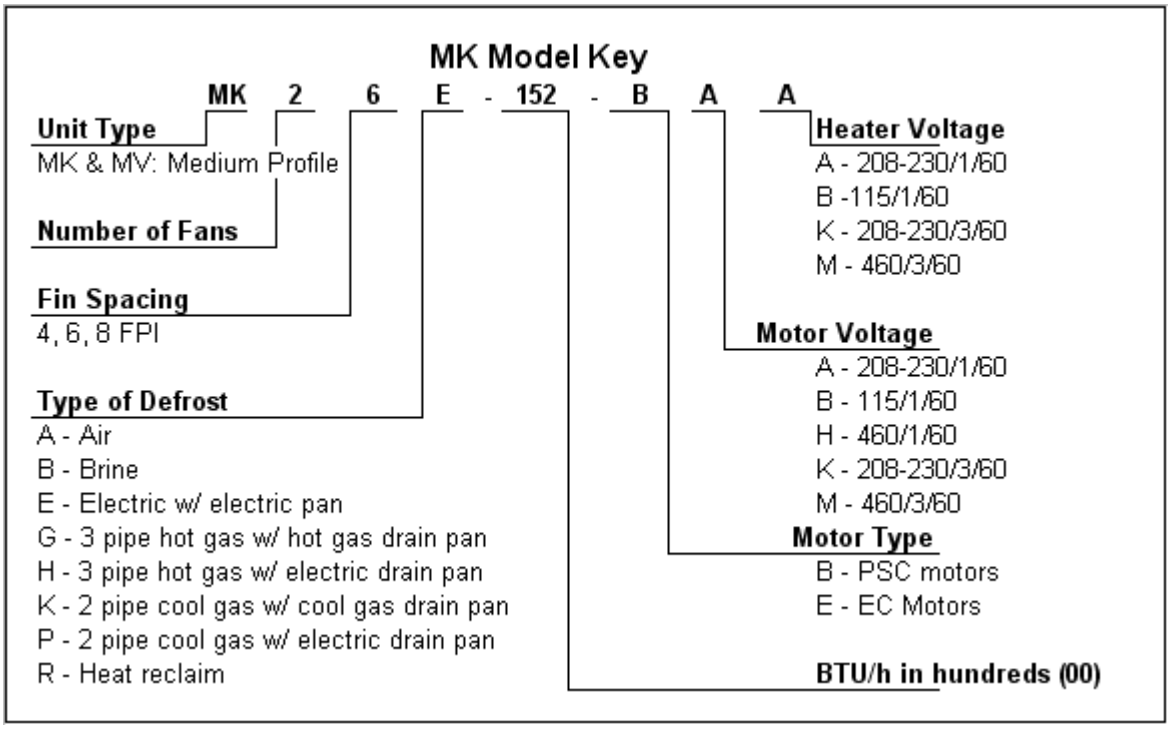
2 UNIT INFORMATION AND DIMENSIONS

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.



2.2 *UNIT DIMENSIONS*

Figure 1 UNIT DIMENSIONS

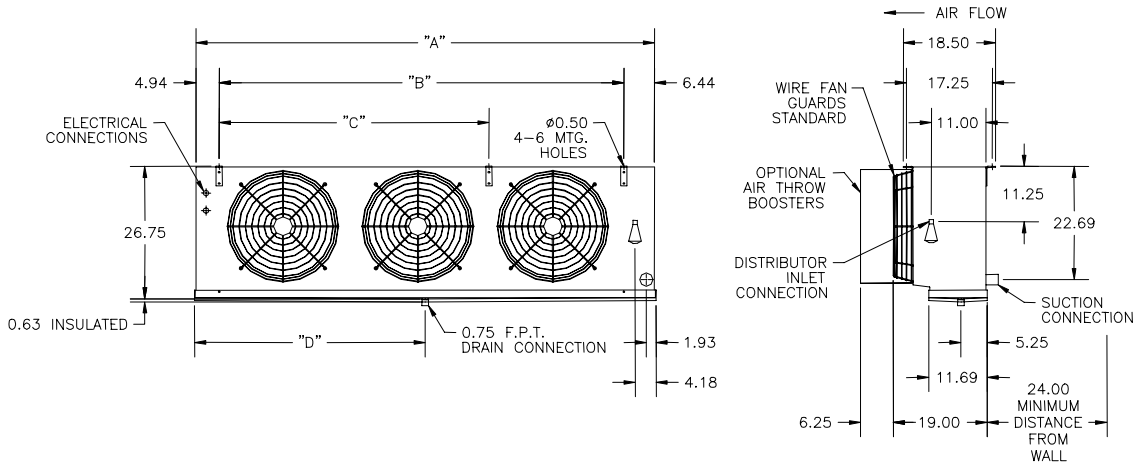


Table 1 UNIT DIMENSIONS

Unit Size	"A"	"B"	"C"	"D"
1 FAN	38.375	27.00	_	19.188
2 FAN	63.375	54.00	_	32.688
3 FAN	92.375	81.00	54.00	46.188
4 FAN	119.375	108.00	54.00	59.688

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

For units with hot gas defrost refer to section 4.4 and figures 2 through 5 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.

4.3 *EVACUATION AND LEAK TEST*

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

4.4 *MK HOT GAS DEFROST PIPING*

Figure 2 (H) HGE - 3 PIPE HOT GAS COIL WITH ELECTRIC DRAIN PAN DEFROST PIPING

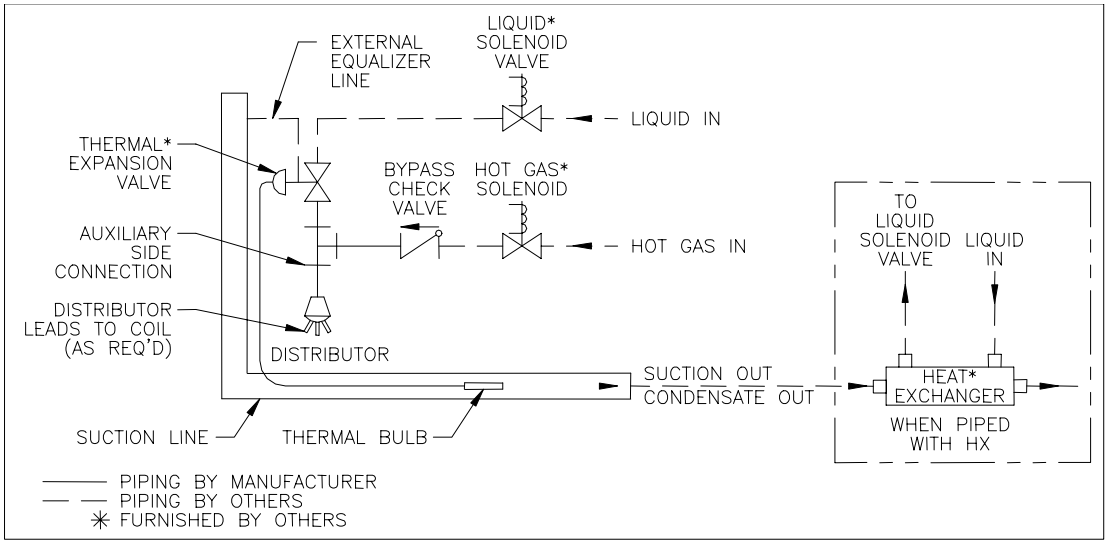


Figure 3 (G)HGG - 3 PIPE HOT GAS COIL WITH HOT GAS DRAIN PAN DEFROST PIPING

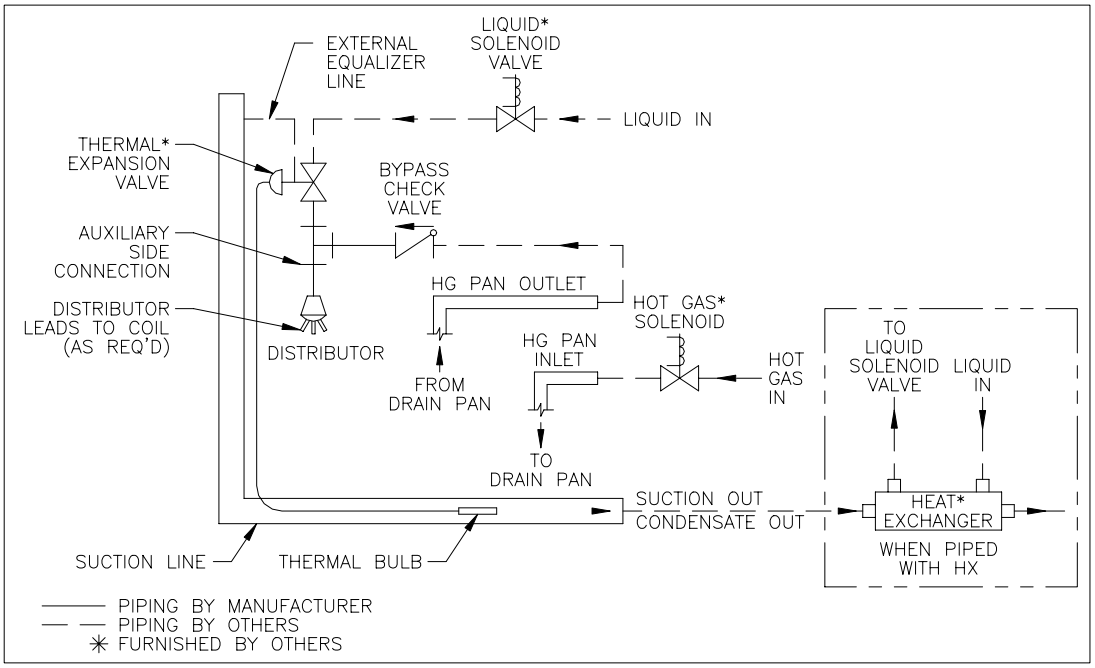


Figure 4 (K) KGE - 2 PIPE REVERSE CYCLE KOOL GAS COIL WITH ELECTR. DP DEFROST PIPING

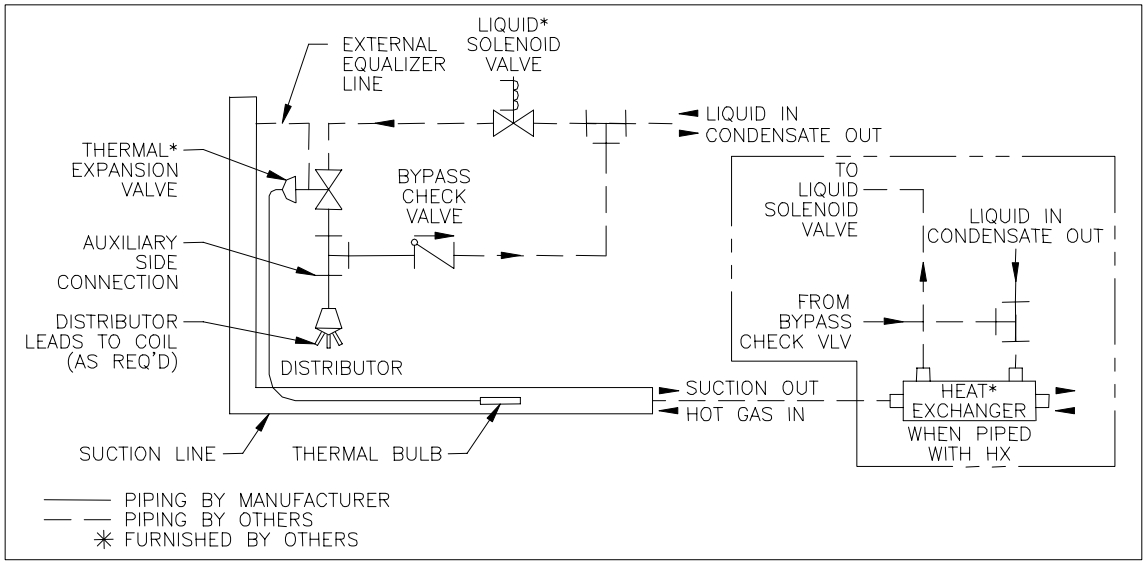


Figure 5 (K) KGG - 2 PIPE REVERSE CYCLE KOOL GAS COIL WITH KOOL GAS DP DEFROST PIPING

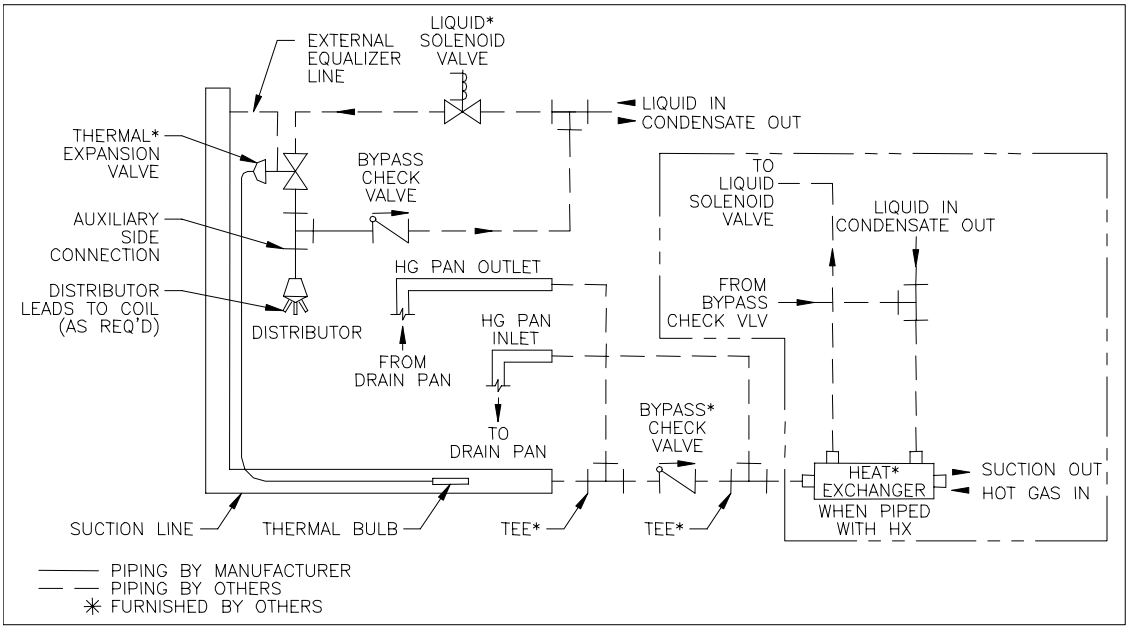


Table 2 SUCTION CONNECTION

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 9°F to 11°F T.D. and 90°F (85°F electric and hot gas defrost) 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

Air defrost distributor nozzle selections are based on +25°F suction temperature, 10°F T.D. and 90°F liquid temperature.

MODEL	CFM	STANDARD CIRCUITS	NOZZLE R404A	NOZZLE R22
MK14A-68	3245	2	L-1/2	L-1/4
MK14A-94	3060	3	L-3/4	L-3/4
MK14A-121	2960	3	L-1.5	L-3/4
MK24A-188	6120	5	L-1.5	L-1
MK24A-242	5920	5	L-2	L-1.5
MK34A-363	8880	13	J-2.5	J-2.5
MK44A-484	11840	13	J-4	J-2.5
MK16A-86	2985	2	L-3/4	L-1/2
MK16A-118	2815	3	L-1	L-3/4
MK16A-145	2725	4	L-1	L-3/4
MK26A-172	5970	4	L-1.5	L-1
MK26A-236	5630	5	L-2	L-1.5
MK26A-290	5450	8	L-2.5	L-1.5
MK36A-354	8445	10	J-2.5	J-2
MK36A-435	8175	13	J-3	J-2
MK46A-580	10900	13	J-4	J-3
MK18A-98	2860	2	L-1	L-1/2
MK18A-133	2710	3	L-1	L-3/4
MK18A-160	2625	4	L-1.5	L-1
MK28A-196	5720	5	L-1.5	L-1
MK28A-266	5420	6	L-2	L-1.5
MK28A-320	5250	10	J-2.5	J-2.5
MK38A-393	8130	10	J-3	J-2.5
MK38A-480	7875	13	J-4	J-3
MK48A-640	10500	13	J-5	J-4

Table 4 MK ELECTRIC OR GAS DEFROST

Electric or hot gas defrost distributor nozzle selections are based on -20°F suction temperature, 10°F T.D. and 85°F liquid temperature. ( )-E, G, H, K, P

MODEL	CFM	CIRCUITS	R404A	R22
MK14( )-60	3245	4	L-3/4	L-1/2
MK14( )-82	3060	5	L-1	L-3/4
MK14( )-105	2960	5	L-1.5	L-1
MK24( )-120	6490	10	J-2	J-1
MK24( )-164	6120	10	J-2.5	J-1.5
MK24( )-210	5920	13	J-3	J-2
MK34( )-246	9180	15	G-3	G-2
MK34( )-315	8880	20	G-4	G-3
MK44( )-420	11840	20	G-6	G-3
MK16( )-76	2985	4	L-1	L-3/4
MK16( )-103	2815	5	L-1.5	L-1
MK16( )-127	2725	5	L-2	L-1
MK26( )-152	5970	10	J-2.5	J-1.5
MK26( )-206	5630	10	J-3	J-2
MK26( )-254	5450	13	J-4	J-2.5
MK36( )-309	8445	15	G-5	G-2.5
MK36( )-381	8175	20	G-6	G-3
MK46( )-508	10900	20	G-8	G-4

Table 5 MV LOW TEMPERATURE/HIGH VELOCITY - ELECTRIC DEFROST

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

MODEL	CFM	STANDARD CIRCUITS	NOZZLE R404A	NOZZLE R22
MV14E-73	4790	5	L-1	L-3/4
MV14E-100	4300	6	L-1.5	L-1
MV14E-128	4130	8	L-2	L-1.5
MV24E-146	9580	10	J-2.5	J-1.5
MV24E-200	8600	10	J-3	J-2
MV24E-256	8260	13	J-4	J-2.5
MV34E-300	12900	15	G-5	G-3
MV34E-383	12390	20	G-8	G-4
MV44E-512	16520	*	-	-
MV16E-93	4405	5	L-1.5	L-1
MV16E-126	3955	6	L-2	L-1.5
MV16E-155	3800	8	L-2.5	L-1.5
MV26E-186	8810	10	J-3	J-2
MV26E-252	7910	10	J-5	J-2.5
MV26E-310	7600	13	J-6	J-3
MV36E-378	11865	15	G-8	G-4
MV36E-465	11400	20	G-10	G-5
MV46E-620	15200	*	-	-

*Consult factory

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 or 8, 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 counter-clockwise. If the superheat is too low it is necessary to increase the superheat setting of the valve by turning the adjusting stem clockwise. It is recommended that for a 10°F to 12°F T.D. system, the valve should be adjusted to maintain 5°F to 6°F superheat.
Expansion valve recommendations are listed in tables 6, 7, and 8.

Table 6 MK SERIES – AIR DEFROST

<table>
<tr><th rowspan="3">MODEL</th><th colspan="4">10°F TEMPERATURE DIFFERENCE</th><th colspan="4">15°F TEMPERATURE DIFFERENCE</th></tr>
<tr><th colspan="4">+25°F EVAPORATING TEMPERATURE</th><th colspan="4">+20°F EVAPORATING TEMPERATURE</th></tr>
<tr><th>BTUH 10°F T.D.</th><th>R-134a , R-401A</th><th>R-22</th><th>R-404A*</th><th>BTUH 15°F T.D.</th><th>R-134a , R401A</th><th>R-22</th><th>R-404A*</th></tr>
<tr><td>MK14A-68</td><td>6,800</td><td>SBFJE-A-C
EGJE-1/2-C</td><td>SBFVE-AA-C
EGVE-1/2-C</td><td rowspan="2">SBFSE-A-C
EGSE-1/2-C</td><td>10,200</td><td rowspan="2">SBFJE-A-C
EGJE-1-C</td><td>SBFVE-A-C
EGVE-3/4-C</td><td rowspan="2">SBFSE-A-C
EGSE-1-C</td></tr>
<tr><td>MK16A-86</td><td>8,600</td><td rowspan="3">SBFJE-A-C
EGJE-1-C</td><td>SBFVE-AA-C
EGVE-3/4-C</td><td>12,900</td><td rowspan="2">SBFVE-A-C
EGVE-1-C</td></tr>
<tr><td>MK14A-94</td><td>9,400</td><td>SBFVE-A-C
EGVE-3/4-C</td><td rowspan="3">SBFSE-A-C
EGSE-1-C</td><td>14,100</td><td>SBFJE-B-C
EGJE-1-C</td><td rowspan="2">SBFSE-B-C
EGSE-1-C</td></tr>
<tr><td>MK18A-98</td><td>9,800</td><td rowspan="3">SBFVE-A-C
EGVE-1-C</td><td>**</td><td>**</td></tr>
<tr><td>MK16A-118</td><td>11,800</td><td>17,700</td><td rowspan="3">SBFJE-B-C
EGJE-1.5-C</td><td>SBFVE-A-C
EGVE-1.5-C</td><td rowspan="3">SBFSE-B-C
EGSE-1.5-C</td></tr>
<tr><td>MK14A-121</td><td>12,100</td><td>18,150</td></tr>
<tr><td>MK18A-133</td><td>13,300</td><td rowspan="4">SBFJE-B-C
EGJE-1.5-C</td><td rowspan="2">SBFSE-B-C
EGSE-1-C</td><td>**</td><td>**</td></tr>
<tr><td>MK16A-145</td><td>14,500</td><td>21,750</td><td>SBFVE-B-C</td></tr>
<tr><td>MK18A-160</td><td>16,000</td><td rowspan="3">SBFVE-A-C
EGVE-1.5-C</td><td rowspan="3">SBFSE-B-C
EGSE-1.5-C</td><td>**</td><td>**</td><td>**</td><td>**</td></tr>
<tr><td>MK26A-172</td><td>17,200</td><td>25,800</td><td>SBFJE-C-C
EGJE-2-C</td><td>SBFVE-B-C
EGVE-2-C</td><td>SBFSE-C-C
EGSE-2-C</td></tr>
<tr><td>MK24A-188</td><td>18,800</td><td>28,200</td></tr>
<tr><td>MK28A-196</td><td>19,600</td><td rowspan="3">SBFVE-B-C
EGVE-2-C</td><td>**</td><td>**</td><td>**</td><td>**</td></tr>
<tr><td>MK26A-236</td><td>23,600</td><td>SBFSE-B-C
EGSE-2-C</td><td>35,400</td><td rowspan="2">SBFJE-C-C</td><td>SBFVE-B-C
EGVE-3-C</td><td rowspan="2">SBFSE-C-C</td></tr>
<tr><td>MK24A-242</td><td>24,200</td><td rowspan="2">SBFJE-B-C
EGJE-2-C</td><td>36,300</td></tr>
<tr><td>MK28A-266</td><td>26,600</td><td>SBFSE-C-C
EGSE-2-C</td><td>**</td><td>**</td><td>**</td><td>**</td></tr>
<tr><td>MK26A-290</td><td>29,000</td><td>43,500</td><td rowspan="4">EBSJE-5-C</td><td>EBFVE-C-C
EGVE-3-C</td><td rowspan="4">EBSSE-6-C</td></tr>
<tr><td>MK28A-320</td><td>32,000</td><td rowspan="2">SBFJE-C-C</td><td rowspan="2">SBFVE-B-C
EGVE-3-C</td><td rowspan="2">SBFSE-C-C</td><td>**</td></tr>
<tr><td>MK36A-354</td><td>35,400</td><td>53,100</td><td rowspan="3">SBFVE-C-C</td></tr>
<tr><td>MK34A-363</td><td>36,300</td><td rowspan="6">SBFVE-C-C</td><td>54,450</td></tr>
<tr><td>MK38A-393</td><td>39,300</td><td rowspan="3">EBSJE-5-C</td><td rowspan="5">EBSSE-6-C</td><td>**</td><td>**</td></tr>
<tr><td>MK36A-435</td><td>43,500</td><td>65,250</td><td rowspan="4">EBSJE-7-C</td></tr>
<tr><td>MK38A-480</td><td>48,000</td><td>**</td><td>**</td><td>**</td></tr>
<tr><td>MK44A-484</td><td>48,400</td><td>72,600</td><td>EBSVE-8-C</td><td>EBSSE-7.5-C</td></tr>
<tr><td>MK46A-580</td><td>58,000</td><td>EBSJE-7-C</td><td>87,000</td></tr>
<tr><td>MK48A-640</td><td>64,000</td><td>**</td><td>**</td><td>**</td><td>**</td></tr>
</table>

*If R507 is used, change S to P. Example: SBFSE-B-C (R404A) becomes SBFPE-B-C for R507).

** 15°F T.D. application not recommended for 8 fin per inch models.

Table 7 MK SERIES – ELECTRIC DEFROST

MODEL	10°F TEMPERATURE DIFFERENCE -20°F EVAPORATING TEMPERATURE			10°F TEMPERATURE DIFFERENCE +20°F EVAPORATING TEMPERATURE			
	BTUH 10°F T.D.	R-22	R-404A, R-502, R-507, R-402A	BTUH 10°F T.D.	R-134a, R-401A	R-22	R-404A*
MK-14E-60	6,000	SBFVE-AA-ZP40 EGVE-3/4-ZP40	SBFSE-A-ZP EGSE-1/2-ZP	6,800	SBFJE-AA-C EGJE-1/2-C	SBFVE-AA-C EGVE-1/2-C	SBFSE-AA-C EGSE-1/2-C
MK16E-76	7,600	SBFVE-A-ZP40 EGVE-1-ZP40	SBFSE-A-ZP EGSE-1-ZP	8,600	SBFJE-A-C EGJE-1-C	SBFVE-AA-C EGVE-3/4-C	SBFSE-A-C EGSE-1/2-C
MK14E-82	8,200			9,400			SBFSE-A-C EGSE-1-C
MK16E-103	10,300	SBFVE-A-ZP40 EGVE-1.5-ZP40		11,800		SBFVE-A-C EGVE-1-C	
MK140E-105	10,500			12,100			
MK24E-120	12,000			13,600			
MK16E-127	12,700			14,500			
MK26E-152	15,200	SBFVE-B-ZP40 EGVE-2-ZP40	SBFSE-B-ZP EGSE-1.5-ZP	17,200	SBFJE-B-C EGJE-1.5-C	SBFVE-A-C EGVE-1.5-C	SBFSE-B-C EGSE-1.5-C
MK24E-164	16,400			18,800			
MK26E-206	20,600		SBFSE-C-ZP EGSE-2-ZP	23,600	SBFJE-B-C EGJE-2-C	SBFVE-B-C EGVE-2-C	SBFSE-B-C EGSE-2-C
MK24E-210	21,000			24,200			
MK34E-246	24,600	SBFVE-B-ZP40 EGVE-3-ZP40		28,200			
MK26E-254	25,400			29,000	SBFJE-C-C		SBFSE-C-C
MK36E-309	30,900	SBFVE-C-ZP40		35,400		SBFVE-B-C EGVE-3-C	
MK34E-315	31,500		EBSSE-6-ZP	36,300			
MK36E-381	38,100			43,500	EBSJE-5-C	SBFVE-C-C	EBSSE-6-C
MK44E-420	42,000		EBSSE-7.5-ZP	48,400			
MK46E-508	50,800	EBSVE-8-ZP40		58,000	EBSJE-7-C		

*If R507 is used, change S to P. Example: SBFSE-B-C (R404A) becomes SBFPE-B-C for (R507).

Table 8 MV SERIES – LOW TEMPERATURE – HIGH VELOCITY

MODEL	10°F TEMPERATURE DIFFERENCE -20°F EVAPORATING TEMPERATURE		
	BTUH 10°F T.D.	R-22	R-404A, R-502, R-507, R-402A
MV14E-73	7,300	SBFVE-AA-ZP40 EGVE-3/4-ZP40	SBFSE-A-AP EGSE-1/2-GP
MV16E-93	9,300	SBFVE-A-ZP40 EGVE-1-ZP40	SBFSE-A-ZP EGSE-1-ZP
MV14E-100	10,000		
MV16E-126	12,600	SBFVE-A-ZP40 EGVE-1.5-ZP40	
MV14E-128	12,800		
MV24E-146	14,600		SBFSE-BA-ZP EGSE-1.5-ZP
MV16E-155	15,500	SBFVE-B-ZP40 EGVE-2-ZP40	
MV26E-186	18,600	SBFVE-B-ZP40 EGVE-2-ZP40	SBFSE-B-ZP EGSE-2-ZP
MV24E-200	20,000		
MV26E-252	25,200	SBFVE-B-ZP40 EGVE-3-ZP40	SBFSE-C-ZP
MV24E-256	25,600		
MV34E-300	30,000	SBFVE-C-ZP40	
MV26E-310	31,000		
MV36E-378	37,800		EBSSE-6-ZP
MV34E-384	38,400		
MV36E-465	46,500	EBSVE-8-ZP40	EBSSE-7.5-ZP
MV44E-512	51,200		
MV46E-620	62,000	EBSVE-11-ZP40	

5 ELECTRICAL

5.1 *FIELD WIRING*

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 and 12 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 9 MK MOTOR AMPS – 1/4 HP MOTOR

FANS	115/60/1	230/60/1	230/60/3	460/60/1	460/60/3
1 Fan	2.6	1.6	N/A	0.9	N/A
2 Fan	5.2	3.2	2.8	1.8	1.6
3 Fan	7.8	4.8	4.2	2.7	2.4
4 Fan	10.4	6.4	5.6	3.6	3.2

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	0.96
3 Fan	12.9	6.9	6.0	3.3	2.88
4 Fan	17.2	9.2	8.0	4.4	3.84

*Total 24 amps wired in two circuits.

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

FANS	115/60/1	230/60/1
1 Fan	4.5	2.516
2 Fan	9	5.032
3 Fan	13.5	7.548
4 Fan	18	10.064

Table 12 MK HEATER AMPS

E(EDL) HEATER AMPS						P(KGE),H(HGE) DRAIN PAN		
MODEL	MODEL	230/1	230/3	460/3	230/460V Watt	115/1	230/1	WATTS 230V
MK14E-60	MK16E-76	10.0	5.8	2.9	2300	4.3	2.2	500
MK14E-82	MK16E-103	10.0	5.8	2.9	2300	4.3	2.2	500
MK14E-105	MK16E-127	12.6	7.3	3.6	2900	4.3	2.2	500
MK24E-120	MK26E-152	19.1	11.1	5.5	4400	7	3.5	800
MK24E-164	MK26E-206	19.1	11.1	5.5	4400	7	3.5	800
MK24E-210	MK26E-254	24.3	14.1	7.0	5600	7	3.5	800
MK34E-246	MK36E-309	28.7	16.6	8.3	6600	10.4	5.2	1200
MK34E-315	MK36E-381	36.5	21.1	10.6	8400	10.4	5.2	1200
MK44E-420	MK46E-508	47.8	27.6	13.8	11000	12.2	6.1	1400

Table 13 MV HEATER AMPS

E(EDL) HEATER AMPS					
MODEL	**MODEL**	**230/1**	**230/3**	**460/3**	**230/460V Watt**
MV14E-73	MV16E-93	10.0	5.8	2.9	2300
MV14E-100	MV16E-126	10.0	5.8	2.9	2300
MV14E-128	MV16E-155	12.6	7.3	3.6	2900
MV24E-146	MV26E-186	19.1	11.1	5.5	4400
MV24E-200	MV26E-252	19.1	11.1	5.5	4400
MV24E-256	MV26E-310	24.3	14.1	7.0	5600
MV34E-300	MV36E-378	28.7	16.6	8.3	6600
MV34E-384	MV36E-465	36.5	21.1	10.6	8400
MV44E-512	MV46E-620	47.8	27.6	13.8	11000

5.3 *AIR DEFROST SEQUENCE OF OPERATION*

SEQUENCE OF OPERATION

1. The unit cooler fan motors are energized and the fans operate continually.
2. The room thermostat calls for cooling. The liquid solenoid valve opens allowing liquid to flow to the unit cooler. The suction pressures rises and starts the compressor.
3. When the room temperature is satisfied the thermostat opens and closes the liquid solenoid. The compressor continues to run until the suction pressure reaches the low-pressure cutout setting and shuts off the compressor.
4. The fan circulates air over the coil and frost melts.

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

Figure 6 AIR DEFROST WIRING 1 PH

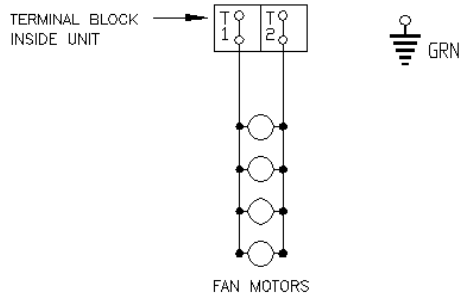
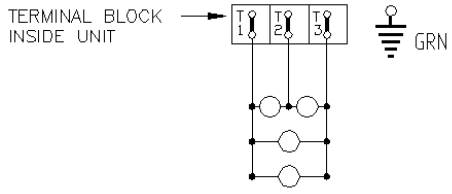


Figure 7 AIR DEFROST WIRING 3 PH



5.4 *ELECTRIC DEFROST SEQUENCE OF OPERATION*

The electric defrost cycle is time clock initiated and temperature terminated with a timer and or high temperature 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 6, 7, 8 9 and 10 for electric defrost wiring diagrams.

SEQUENCE OF OPERATION

STEP A: Normal Refrigeration Cycle

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

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.

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 closed, 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 it’s 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 of time. If the fan delay time is too long, it is permissible to install a jumper wire between terminals “F” and “B” at the unit cooler. This allows the fans to turn on immediately after the defrost period.

Figure 8 ELECTRIC DEFROST WIRING 208-230/60/1

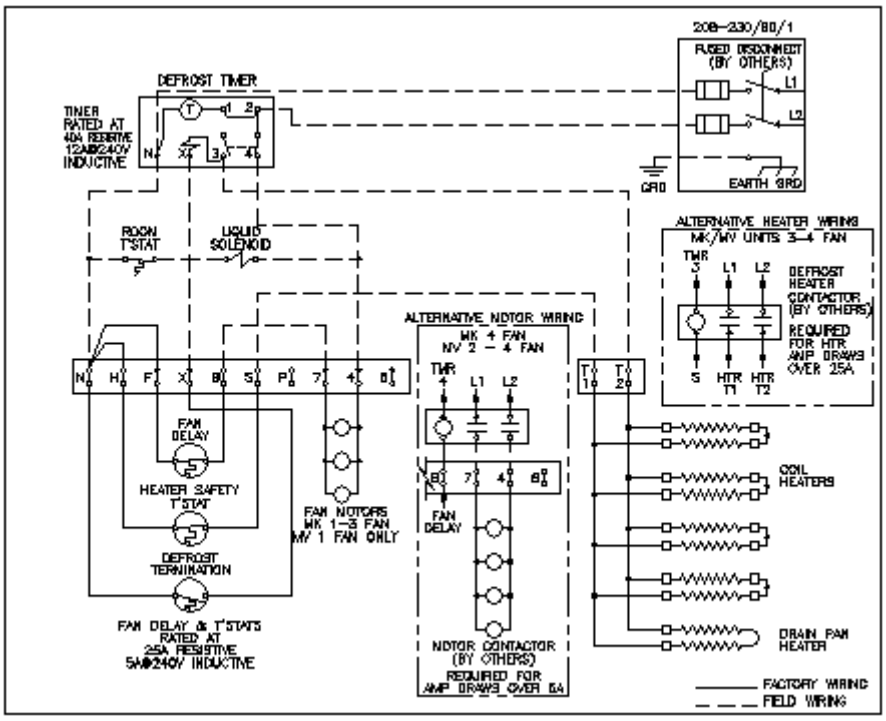


Figure 9 ELECTRIC DEFROST WIRING 208-230/60/3

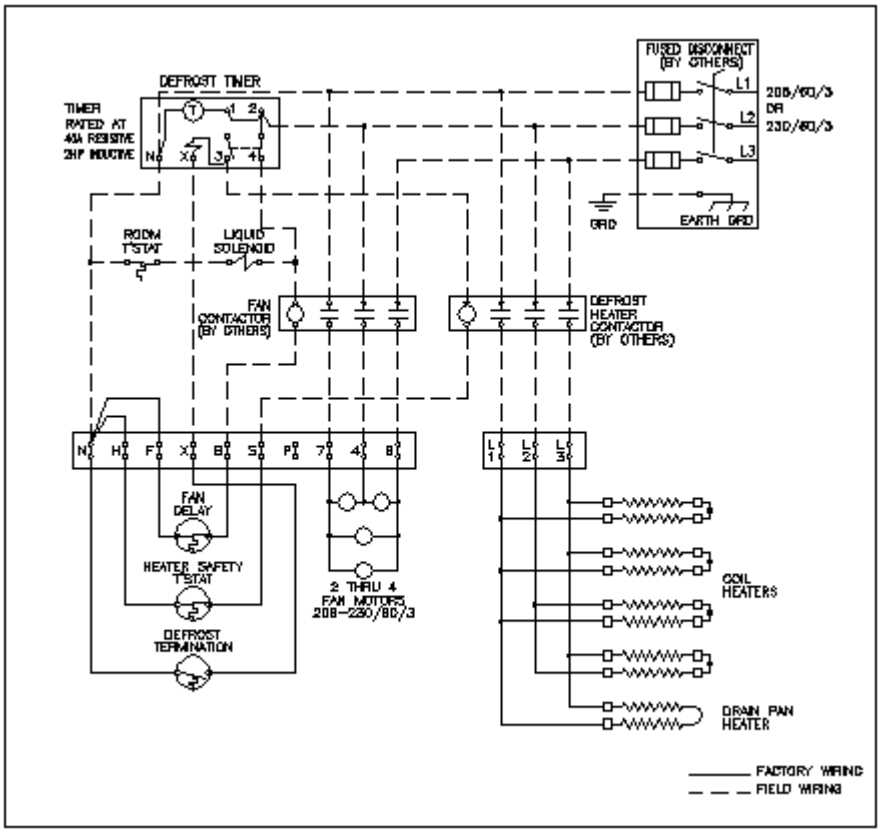


Figure 10 ELECTRIC DEFROST WIRING 460/60/3

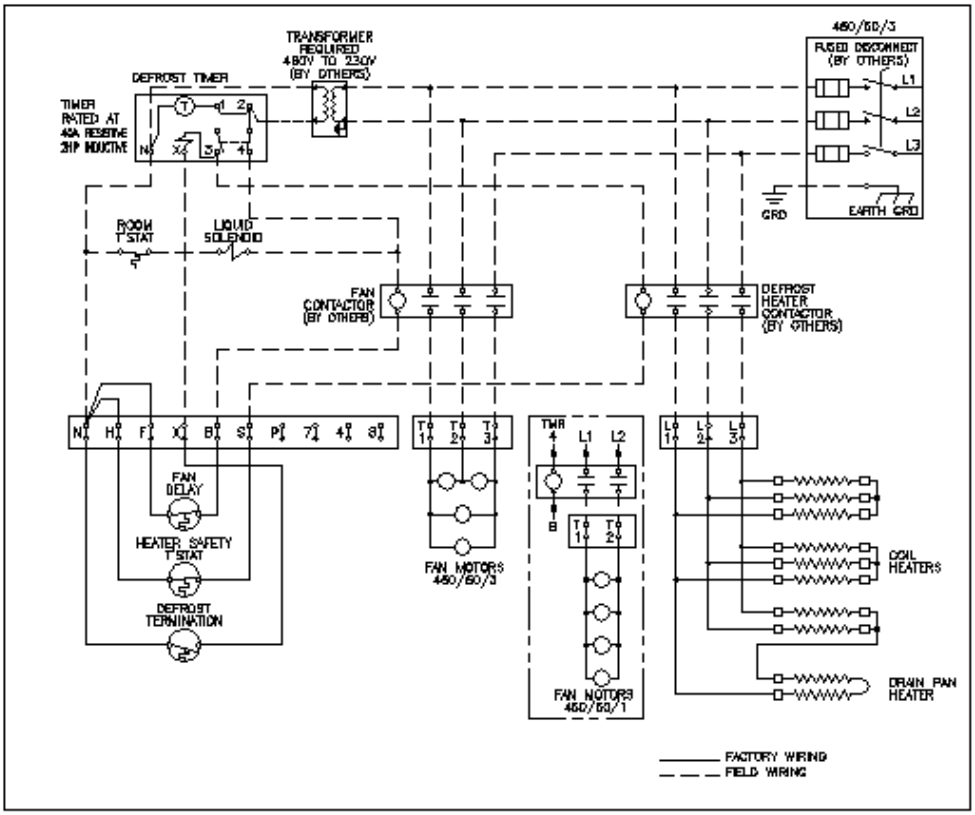


Figure 11 MULTIPLE UNIT COOLERS, ELECTRIC DEFROST 460/60/3

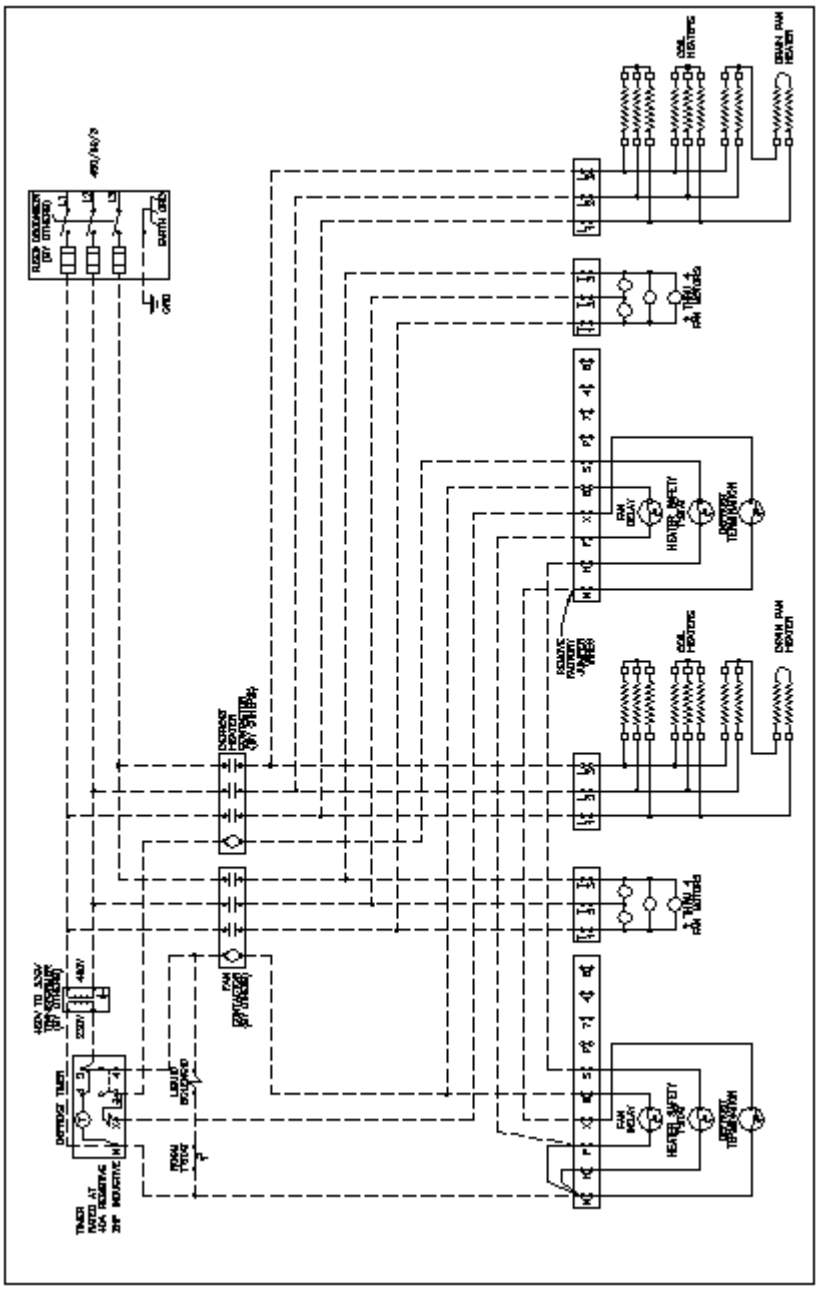
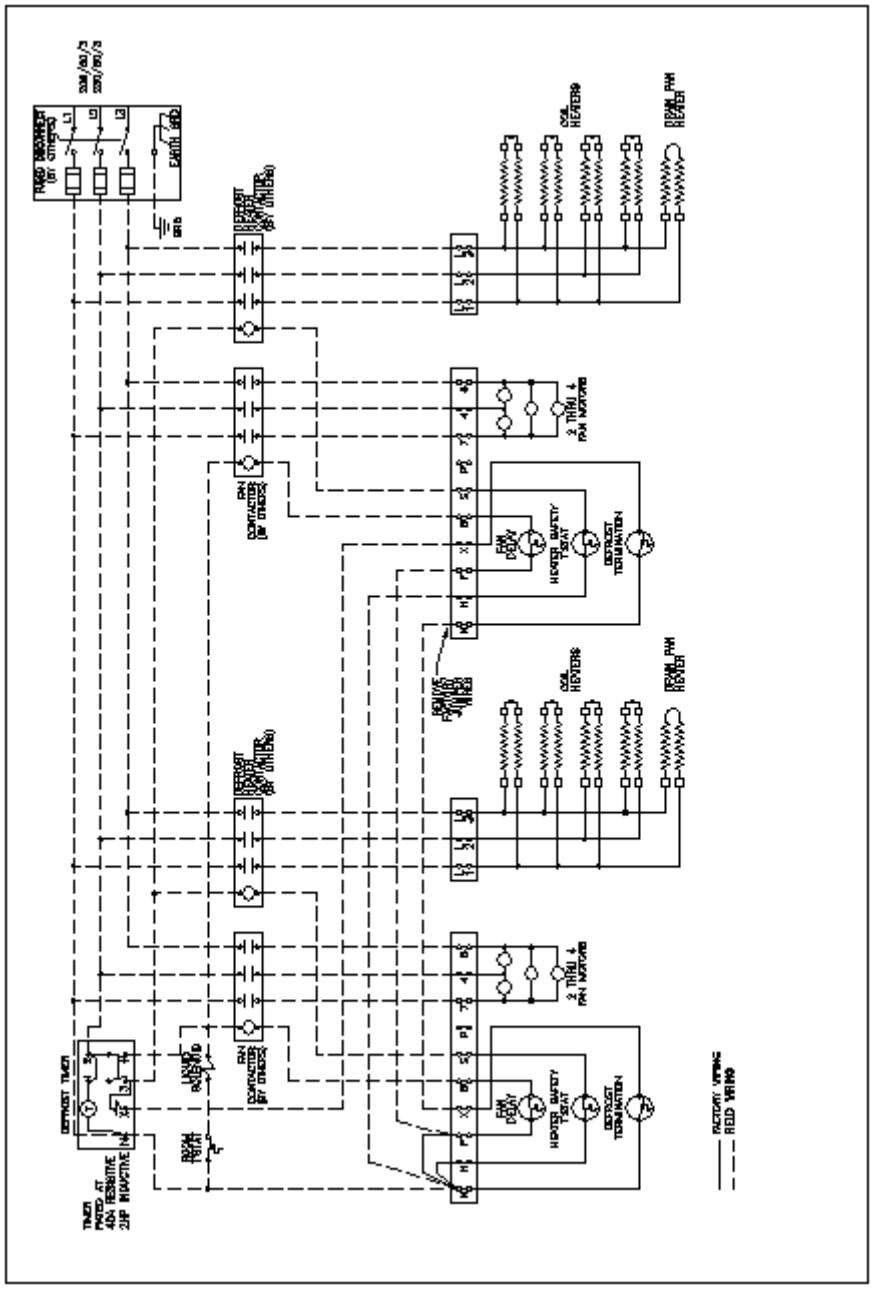


Figure 12 MULTIPLE UNIT COOLERS, ELECTRIC DEFROST 208-230/60/3



5.5 *GAS DEFROST SEQUENCE OF OPERATION*

The hot gas defrost cycle is time clock initiated and terminated.

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 and gas vapor is evaporated in a re-evaporator prior to returning to the compressor through the suction line.

SEQUENCE OF OPERATION

1. Upon initiation of the cycle, the timer contacts “1” and “4” opens thus de-energizing the liquid solenoid valve and the fan motors. If the unit has electric drain pan heater, contacts “4” and “5” close, thus energizing the drain pan heater. The compressor pumps the refrigerant out of the coil.

2. The timer contacts “4” and “2” closes, thus energizing the hot gas solenoid valve and allows hot gas to flow into the coil through a check valve and the refrigerant distributor auxiliary side connection.
3. After the timer timeouts contacts “4” and “2” open, thus de-energizing the hot gas solenoid valve. During this period the coil pressure will vent down to the compressor suction pressure.
4. Upon termination of the vent down cycle the contacts between “4” and “ 1” close, thus de-energizing the drain pan heater if the unit is equipped with one. The contacts between “4” and “1” close, thus opening the liquid line solenoid valve and starts the fan motors.

Figure 13 (H) HGE - 3 PIPE HOT GAS COIL AND ELECTRIC DRAIN PAN DEFROST WIRING

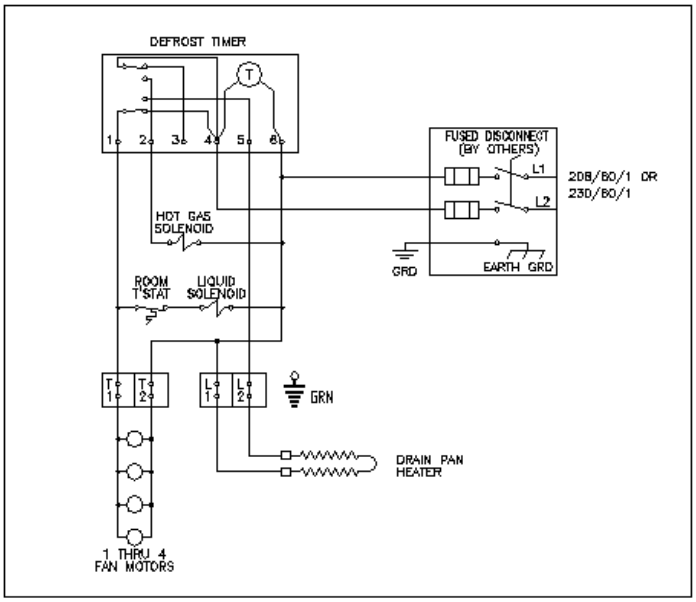
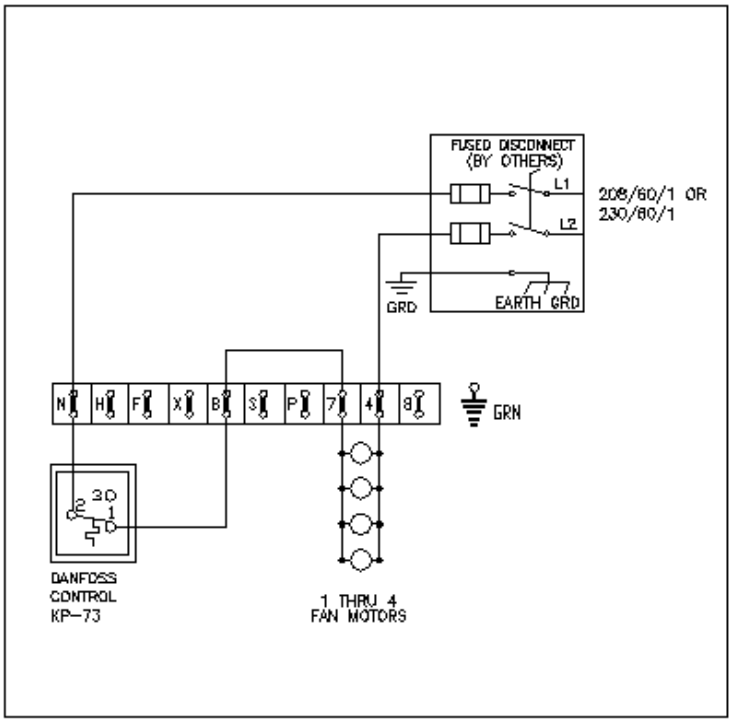


Figure 14 (G) HGG - 3 PIPE HOT GAS COIL AND HOT GAS DRAIN PAN DEFROST WIRING



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.

SEQUENCE OF OPERATION

1. Power is supplied to the unit cooler continuously.
2. Hot gas is supplied to the unit via the suction line. A factory-mounted thermostat senses a rise in 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.
3. When the defrost is complete the hot gas supply is stopped. The liquid line solenoid is energized and the coil temperature begins to fall.
4. The factory-mounted thermostat senses the drop in coil temperature. The SPDT thermostat opens the circuit to the drain pan heater (when supplied) and closed the circuit to the fan motors.

Figure 15 (P) KGE - 2 PIPE KOOL GAS COIL AND ELECTRIC DRAIN PAN DEFROST WIRING

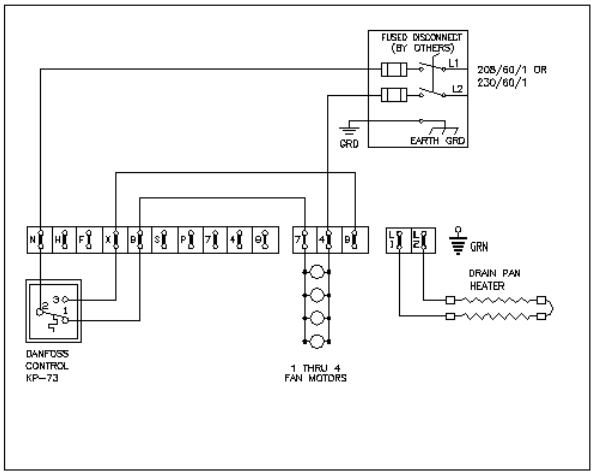
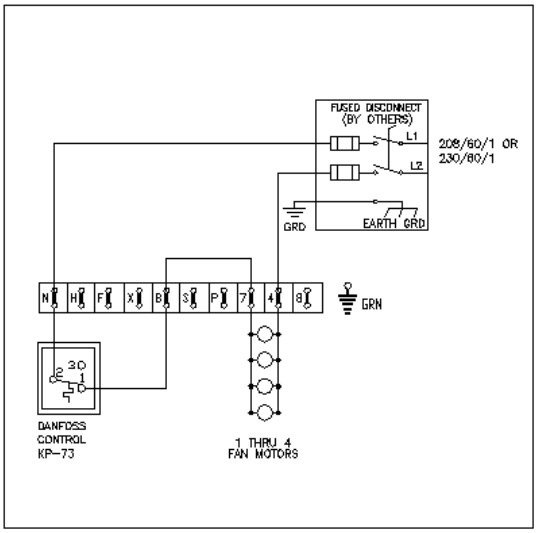


Figure 16 (K) KGG - 2 PIPE KOOL GAS COIL WITH KOOL GAS DRAIN PAN DEFROST WIRING



RECOMMENTED (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

6 START UP

6.1 *PRE-STARTUP*

After the installation is completed, a review of the following items should be preformed 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.

6.2 *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 is impedes the airflow through the coil. The defrost requirements will vary on each installation and may change depending on the time of the year and other conditions.

7 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.

Table 14 REPLACEMENT PARTS LIST

MOTOR AND FANS	PART NO.
MK Motor 115/220V	11513
MK Motor 460V	11524
MV Motor 115/220V	E205693
MV Motor 460V	E205782
MK & MV EC Motor 115V	E106032
MK & MV EC Motor 230V	E106033
MK Fan Blade	E205691
MV Fan Blade	E205692
MK/MV Fan Guard	E205672
MK/MV Air Booster	E105018

DRAIN PAN HEATERS	1 FAN	2 FAN	3 FAN	4 FAN
Drain Pan Heater 115V	E201886	E201892	E201908	E201901
Drain Pan Heater 230V	E201905	E201893	E202909	E201902
Drain Pan Heater 460V	E201888	E201894	E201910	E201903

COIL HEATERS	PART NO.	6 ELEMENTS PER UNIT*		8 ELEMENTS PER UNIT	
Coil Heaters 230V, 1 Fan	E102024	MK14-60	MV14-73	MK14-105	MV14-128
Coil Heaters 460V, 1 Fan	E102025	MK14-82	MV14-100	MK24-210	MV24-256
Coil Heaters 230V, 2 Fan	E101932	MK24-120	MV24-146	MK34-315	MV34-384
Coil Heaters 460V, 2 Fan	E101938	MK24-164	MV24-200	MK44-420	MV44-512
Coil Heaters 230V, 3 Fan	E201696	MK34-246	MV34-300	MK16-127	MV16-155
Coil Heaters 460V, 3 Fan	E202697	MK16-76	MV16-93	MK26-254	MV26-310
Coil Heaters 230V, 4 Fan	E101935	MK16-103	MV16-126	MK36-381	MV36-465
Coil Heaters 460V, 4 Fan	E101941	MK26-152	MV26-186	MK46-508	MV46-620
		MK26-206	MV26-256		
		MK36-309	MV36-378		

*5 ELEMENTS PER UNIT FOR 3 PHASE VOLTAGE

DEFROST CONTROLS	Part No.
Fan Delay Thermostat - EDL	E201818
Heater Safety Thermostat - EDL	10956
Defrost Termination Thermostat Fixed (Klixon) - EDL	E206100
Defrost Termination Adjustable – KGE/KGG`+	E205004
Check Valve 1/2”	10668
Check Valve 5/8”	11853
Check Valve 7/8”	10930
Check Valve 1-18”	11804
Check Valve 1-5/8”	E150087
Check Valve 2-1/8”	E205552

8 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 and build up of soil

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.

WARNING - All power must be disconnected before cleaning.

9 TROUBLESHOOTING CHART

Table 15 TROUBLESHOOTING CHART

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