SM/SV Series
Space Master Unit Coolers

Operating
and
Installation
Manual

TABLE OF CONTENTS

TABLE OF CONTENTS

CHARTS

FIGURES

1 RECEIPT OF EQUIPMENT

1.1 *INSPECTION*

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

1.2 *LOSS OF GAS HOLDING CHARGE*

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

2 ASSEMBLY OF COMPONENTS

2.1 *SHIPPED LOOSE PARTS- LONG THROW ADAPTERS*

Long Throw Adapters shipped loose. They should be mounted on the unit before the unit is installed. The evaporator fan cabinet contains through-bolts with the threaded end pointing out away from the fan cabinet. The bolts have two ½" nuts, flat washers, and a lock washer on them. Remove the outer most nuts, lock washer, and one flat washer. Place Long Throw Adapter on the bolts braced against the remaining flat washer. While holding the adapter with one hand place the flat washers, then the lock washers, and then thread the nuts on the top two bolts to hold the guard and adapter in place. Then place the remaining washers and thread the remaining two nuts on the bottom two bolts. Secure with a wrench.

3 RIGGING INSTRUCTIONS

3.1 *RIGGING INSTRUCTIONS*

SM/SV unit tends to be a long and heavy object with about 2/3 of the weight contained in the coil element at the rear of the unit. Jobsite requirements will affect the method of moving and lifting the unit into place. Carefully consider the support that is required to lift and move the unit. Under no circumstances should the shipping skid be used for lifting the unit. To ensure that the unit is not bowed or damaged when being lifted into place from above, all leg or hanger points should be used. If the unit is being lifted into place from underneath, a level support directly under all of the shipping legs is required to adequately steady the unit as it is lifted to the hanger rods.

4 UNIT INFORMATION AND DIMENSIONS

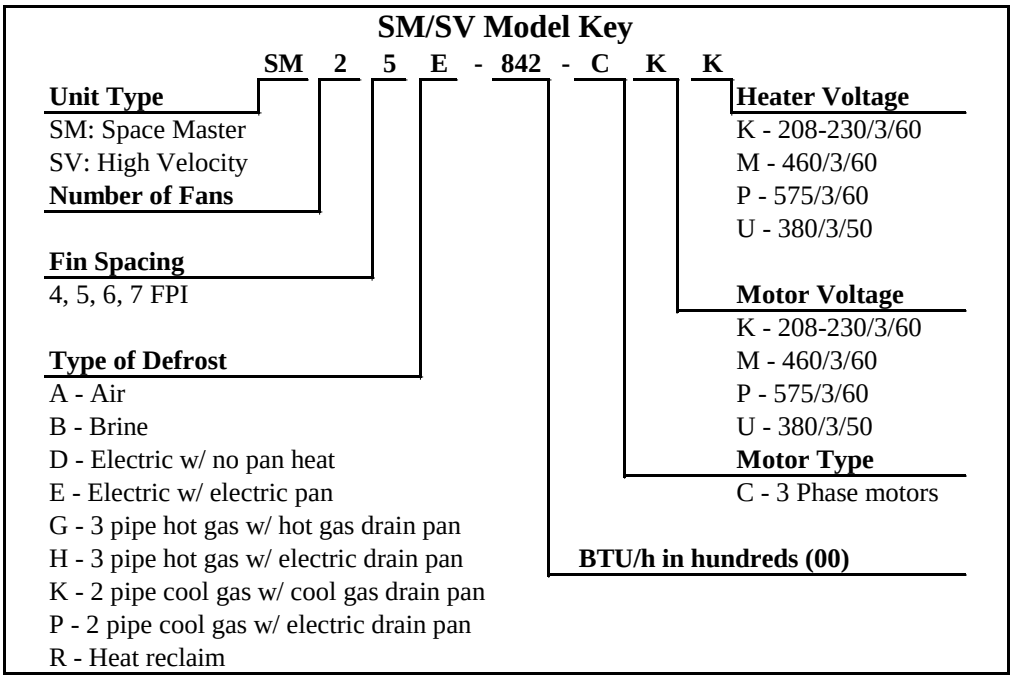
4.1 *MODELS COVERED*

SM Series medium profile unit coolers.
SV Series medium profile unit coolers - low temperature.

The SM and SV series are designed for walk-in coolers with ceiling heights of 12 to 25 feet that require high airflow. SM/SV unit coolers draw air through the coil and discharge it into the room via the unit fans.

The SM/SV series handles medium to low temperature requirements and has three defrost options – air, electric and hot gas. The SV series is designed for low temperatures allowing extra high air discharge velocities. The SV unit coolers are only available with electric defrost.

Figure 1 Model Key



4.2 *UNIT DIMENSIONS*

Figure 2 Unit Dimensions

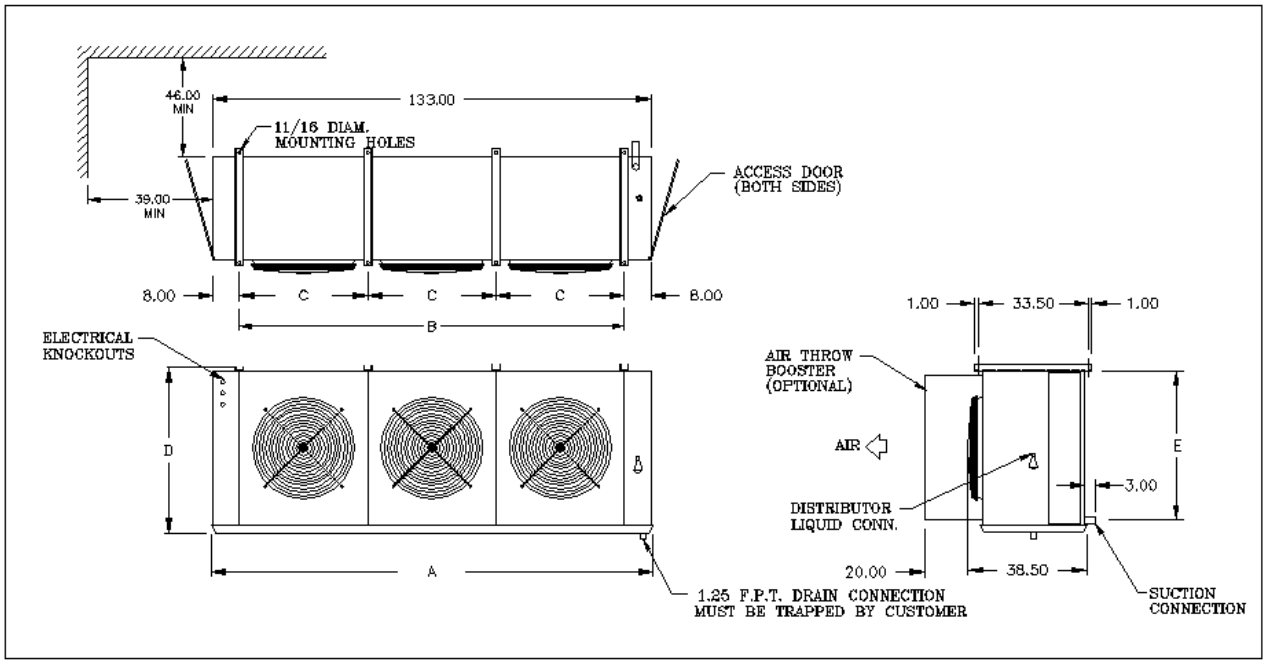


Table 1 UNIT DIMENSIONS

Fan Q-ty	A	B	C	D	E
1	77.00	60.00	60.00	40.50	34.00
2	134.25	117.00	58.50	40.50	34.00
3	134.25	117.00	39.00	52.50	46.00
4	173.00	156.00	39.00	52.50	46.00

5 UNIT LOCATION AND MOUNTING

5.1 *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 34" for 1, 2 fans and 46" for 3, 4 fans from back side to the wall to assure unrestricted air intake.

5.2 *MOUNTING*

Install the expansion valve and equalizer connection before hanging the unit cooler.

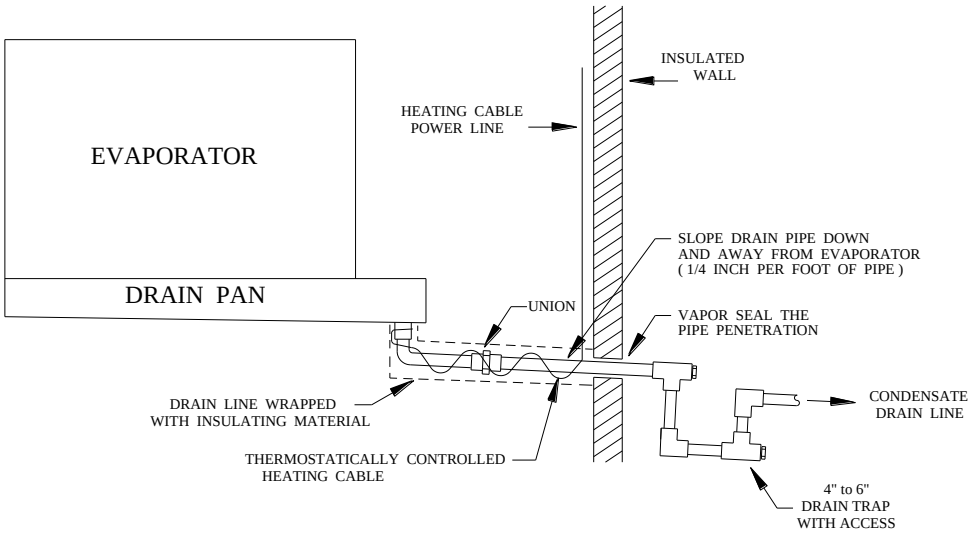
The unit cooler should be suspended with 1/2" or 5/8" diameter hanger rods. Rods should have double nuts on the top and bottom. Adequate support must be provided to hold the weight of the unit.
The unit must be mounted so that the drain pan end is approximately 1" lower then the bottom of the electrical end of the unit. If mounted to a level ceiling the hanging brackets are providing the slope. Mount to ceiling with u-channels provided. Suspended units must have sufficient clearance above for cleaning the top. Remove shipping legs after installation.

6 PIPING INSTALLATION

6.1 *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.

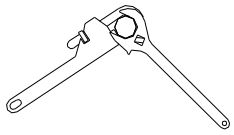
Figure 3 Drain Line



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.

Hangers to avoid damage to the drain pan should support long runs of drain line, i.e. more than a few feet.

Figure 4 Pipe Joining



6.2 *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.

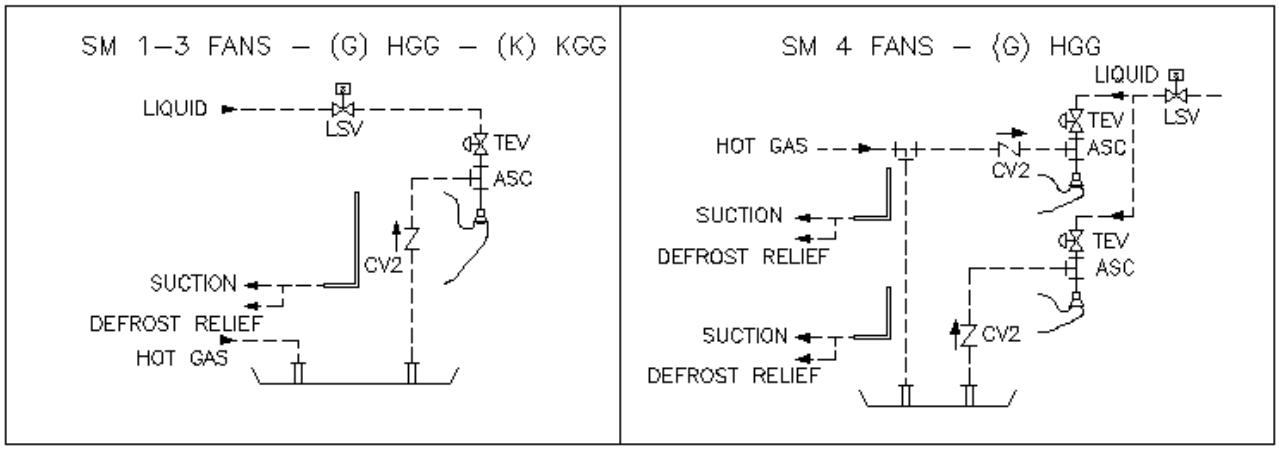
When connecting multiple unit coolers in series using a common suction line, the branch suction lines must enter the top of the common suction line. The branch lines must be sized for the evaporator capacity and the common suction line to be sized for the total system capacity.

6.3 *EVACUATION AND LEAK TEST*

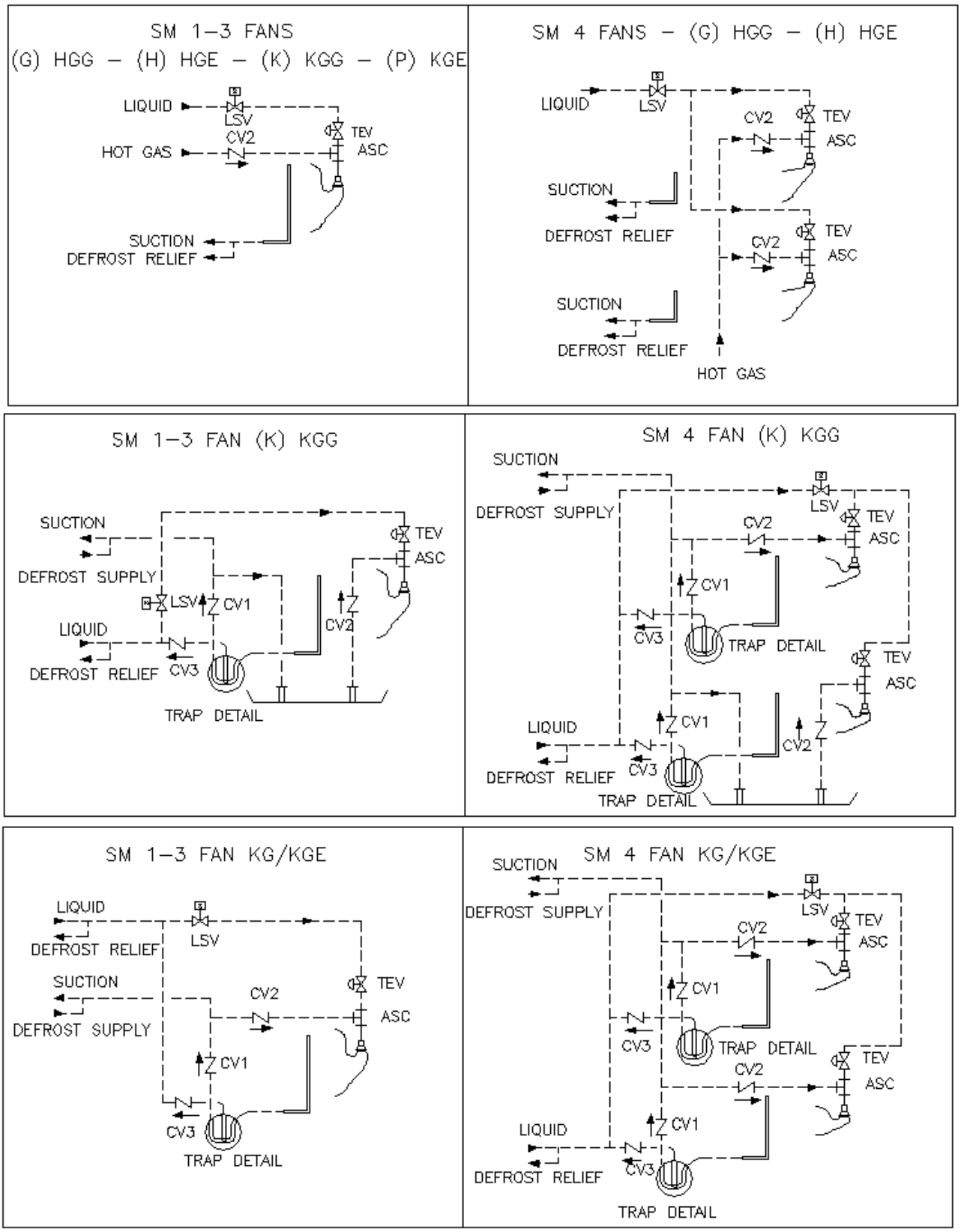
When all refrigeration connections have been completed, the entire system must be tested for leaks and then evacuated. Refer to the instructions provided with your systems condensing unit for information on performing the leak test and evacuation.

6.4 *SM GAS DEFROST PIPING*

Figure 5 Gas Defrost Piping Diagrams



See legend on page 7.



Legend

———	Piping by Manufacturer	- - - -	Piping by Others
CV1	Suction Check Valve	CV2	Gas Inlet Check Valve
CV3	Relief Check Valve	TEV	Expansion Valve
ASC	Aux. Side Connector	LSV	Liquid Solenoid Valve

See Table 2 for Check Valves Kits.

Table 2 CHECK VALVES KITS

Model SM	(K) KGG, (P) KGE Check Valves Kit	Suct line CV diam	Gas inlet CV diam	Gas relief CV diam	(G) HGG, (H) HGE Check Valves Kit	Gas inlet CV diam
384	CE269377	1.625	0.500	0.500	CE269381	0.500
426		1.625	0.500	0.500		0.500
440		1.625	0.500	0.500		0.500
501	CE269378	2.125	0.875	0.875	CE269382	0.875
556		2.125	0.875	0.875		0.875
574		2.125	0.875	0.875		0.875
759		2.125	0.875	0.875		0.875
842		2.125	0.875	0.875		0.875
869		2.125	0.875	0.875		0.875
989	CE269379	2.625	0.875	0.875	CE269382	0.875
1070		2.625	0.875	0.875		0.875
1097		2.625	0.875	0.875		0.875
1132		2.625	0.875	0.875		0.875
1186		2.625	0.875	0.875		0.875
1225	CE269380	2.625	1.125	1.125	CE269383	1.125
1393		2.625	1.125	1.125		1.125
1544		2.625	1.125	1.125		1.125
1594		2.625	1.125	1.125		1.125
1465	2 CE269378	2.125	0.875	0.875	2 CE269382	0.875
1523		2.125	0.875	0.875		0.875
1754		2.125	0.875	0.875		0.875
1769		2.125	0.875	0.875		0.875
1985	2 CE269379	2.625	0.875	0.875		0.875
2307		2.625	0.875	0.875		0.875

6.5 REFRIGERANT DISTRIBUTOR NOZZLES

Direct expansion 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 installed at the factory.

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.

Table 3 DISTRIBUTOR NOZZLE CAPACITIES – TONS OF REFRIGERANT

Distributor nozzle number	R-134A				R-22				
	Evaporator Temperature (F)								
	40	20	0	-20	40	20	0	-20	-40
1/9	0.08	0.06	0.05	0.04	0.14	0.11	0.09	0.07	0.06
1/6	0.12	0.09	0.07	0.06	0.21	0.16	0.13	0.11	0.09
1/4	0.2	0.15	0.12	0.1	0.34	0.26	0.21	0.18	0.15
1/3	0.26	0.2	0.15	0.13	0.44	0.34	0.28	0.23	0.2
1/2	0.36	0.27	0.21	0.17	0.61	0.48	0.38	0.32	0.27
3/4	0.54	0.41	0.32	0.26	0.92	0.72	0.58	0.48	0.41
1	0.72	0.54	0.43	0.35	1.23	0.96	0.78	0.64	0.55
1-1/2	1.05	0.79	0.63	0.51	1.79	1.4	1.13	0.94	0.8
2	1.44	1.09	0.86	0.7	2.46	1.92	1.55	1.29	1.1
2-1/2	1.79	1.35	1.07	0.88	3.07	2.39	1.93	1.6	1.37
3	2.15	1.63	1.28	1.05	3.68	2.87	2.32	1.93	1.65
4	288	2.18	1.72	1.41	4.92	3.84	3.1	2.58	2.2
5	3.55	2.68	2.12	1.74	6.07	4.74	3.83	3.18	2.72
6	4.26	3.22	2.54	2.08	7.28	5.68	4.59	3.81	3.26
8	5.13	3.88	3.06	2.51	8.77	6.84	5.52	4.59	3.93
10	5.75	4.35	3.43	2.81	9.83	7.67	6.19	5.15	4.4
12	7	5.37	4.24	3.47	12.1	9.47	7.65	6.36	5.43
15	8.81	6.65	5.25	4.3	15.1	11.7	9.48	7.88	6.74
17	9.85	7.44	5.87	4.81	16.8	13.1	10.8	8.81	7.54
20	11.9	8.97	7.08	5.8	20.3	15.8	12.8	10.6	9.08
25	14.9	11.3	8.91	7.3	25.5	19.9	16.1	13.4	11.4

Distributor nozzle number	R-404A					R-507				
	Evaporator Temperature (F)									
	40	20	0	-20	-40	40	20	0	-20	-40
1/9	0.09	0.07	0.05	0.04	0.04	0.09	0.07	0.05	0.04	0.03
1/6	0.14	0.11	0.08	0.07	0.05	0.14	0.11	0.08	0.07	0.05
1/4	0.23	0.17	0.13	0.11	0.09	0.23	0.17	0.13	0.11	0.09
1/3	0.3	0.23	0.18	0.14	0.11	0.29	0.22	0.17	0.14	0.11
1/2	0.41	0.31	0.24	0.19	0.16	0.41	0.31	0.24	0.19	0.16
3/4	0.62	0.47	0.37	0.29	0.24	0.61	0.47	0.36	0.29	0.23
1	0.83	0.63	0.49	0.39	0.32	0.82	0.62	0.49	0.39	0.31
1-1/2	1.2	0.92	0.71	0.57	0.46	1.2	0.91	0.71	0.56	0.46
2	1.65	1.26	0.98	0.78	0.64	1.64	1.25	0.97	0.77	0.62
2-1/2	2.06	1.57	1.22	0.97	0.79	2.05	1.56	1.21	0.96	0.78
3	2.47	1.88	1.47	1.17	0.95	2.46	1.87	1.45	1.15	0.93
4	3.31	2.52	1.96	1.56	1.27	3.29	2.5	1.94	1.54	1.25
5	4.08	3.11	2.42	1.93	1.57	4.06	3.08	2.4	1.9	1.54
6	4.89	3.72	2.91	2.31	1.88	4.86	3.69	2.87	2.28	1.85
8	5.89	4.49	3.5	2.79	2.27	5.86	4.45	3.46	2.75	2.23
10	6.6	5.03	3.92	3.12	2.54	6.57	4.99	3.88	3.08	2.5
12	8.16	6.21	4.84	3.86	3.14	8.11	6.16	4.79	3.8	3.08
15	10.1	7.7	6.01	4.78	3.89	10.1	7.64	5.94	4.72	3.83
17	11.3	8.61	6.72	5.35	4.35	11.2	8.54	6.64	5.27	4.28
20	13.6	10.4	8.1	6.45	5.24	13.6	10.3	8.01	6.38	5.16
25	17.1	13.1	10.2	8.11	6.6	17.1	12.9	10.1	8	6.48

6.5 *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 tight 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.

7 ELECTRICAL

7.1 *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 3, 4, and 5 for motor and heater electrical information.

7.2 *ELECTRICAL DATA*

Table 4 SM MOTOR ELECTRICAL DATA (AMPS)

FAN Q-ty	230/60/3	460/60/3	575/60/3
1	4.00	2.00	1.45
2	8.00	4.00	2.90
3	12.00	6.00	4.35
4	16.00	8.00	5.80

Table 5 SV MOTOR ELECTRICAL DATA (AMPS)

FAN Q-ty	230/60/3	460/60/3	575/60/3
1	7.00	3.50	2.60
2	14.00	7.00	5.20
3	21.00	10.50	7.80
4	28.00*	14.00	10.40

*Total 24 amps wired in two circuits.

Table 6 SM (D) ED & (E) EDL HEATERS ELECTRICAL DATA

Fan Q-ty	Model	V	Hz	Ph	Coil Heaters V	Coil Heaters Watts ea	Coil Heaters Q-ty	Pan Heaters V	Pan Heaters Watts ea	Pan Heaters Q-ty	Total Watts Circ #1	Total Watts Circ #2	Total Watts Circ #3	Total Amps Circ #1	Total Amps Circ #2	Total Amps Circ #3
(E) EDL (SM & SV) – Coil and Drain Electrical Defrost																
1	384,426,440,501,556,574	230	60	3	130	750	15	130	850	3	13800	-	-	34.70	-	-
		460	60	3	265	750	15	265	850	3	13800	-	-	17.30	-	-
		575	60	3	330	750	15	330	850	3	13800	-	-	13.87		
1	422,468,664,550,611,684	230	60	3	130	750	15	130	850	3	13800	-	-	34.70	-	-
		460	60	3	265	750	15	265	850	3	13800	-	-	17.30	-	-
		575	60	3	330	750	15	330	850	3	13800	-	-	13.87		
2	759,842,869,989,1097,1132	230	60	3	130	1400	15	130	1500	3	16800	8700	-	42.20	21.9	-
		460	60	3	265	1400	15	265	1500	3	25500	-	-	32.00	-	-
		575	60	3	330	1400	15	330	1500	3	25500	-	-	25.63		
2	834,926,1005,1088,1206,1311	230	60	3	130	1400	15	130	1500	3	16800	8700	-	42.20	21.9	-
		460	60	3	265	1400	15	265	1500	3	25500	-	-	32.00	-	-
		575	60	3	330	1400	15	330	1500	3	25500	-	-	25.63		
3	1070,1186,1225,1393,1544,1594	230	60	3	130	1400	18	130	1500	3	16800	12900	-	42.20	32.5	-
		460	60	3	265	1400	18	265	1500	3	29700	-	-	37.40	-	-
		575	60	3	330	1400	18	330	1500	3	29700	-	-	29.86		
3	1177,1304,1418,1530,1698,1843	230	60	3	130	1400	18	130	1500	3	16800	12900	-	42.20	32.5	-
		460	60	3	265	1400	18	265	1500	3	29700	-	-	37.40	-	-
		575	60	3	330	1400	18	330	1500	3	29700	-	-	29.86		
4	1465,1523,1754,1769,1985,2307	230	60	3	130	1800	18	130	950	6	16200	16200	5700	40.71	40.7	14.3
		460	60	3	265	1800	18	265	950	6	38100	-	-	47.80	-	-
		575	60	3	330	1800	18	330	950	6	38100	-	-	38.30		
4	1699,1883,2047,2052,2274,2472	230	60	3	130	1800	18	130	950	6	16200	16200	5700	40.71	40.7	14.3
		460	60	3	265	1800	18	265	950	6	38100	-	-	47.80	-	-
		575	60	3	330	1800	18	330	950	6	38100	-	-	38.30		
(D) ED (SM ONLY) – Coil Electrical Defrost																
1	384,426,440	230	60	3	130	750	9	-	-	-	6750	-	-	17.00	-	-
		460	60	3	265	750	9	-	-	-	6750	-	-	8.50	-	-
		575	60	3	330	750	9	-	-	-	6750	-	-	6.79	-	-
1	501,556,574	230	60	3	130	750	12	-	-	-	9000	-	-	22.60	-	-
		460	60	3	265	750	12	-	-	-	9000	-	-	11.30	-	-
		575	60	3	330	750	12	-	-	-	9000	-	-	9.05	-	-
2	759,842,869,989,1097,1132	230	60	3	130	1400	12	-	-	-	16800	-	-	42.20	-	-
		460	60	3	265	1400	12	-	-	-	16800	-	-	21.10	-	-
		575	60	3	330	1400	12	-	-	-	16800	-	-	16.89	-	-
3	1070,1186,1225	230	60	3	130	1400	12	-	-	-	16800	-	-	42.20	-	-
		460	60	3	265	1400	12	-	-	-	16800	-	-	21.10	-	-
		575	60	3	330	1400	12	-	-	-	16800	-	-	16.89	-	-
3	1393,1544,1594	230	60	3	130	1400	15	-	-	-	16800	4200	-	42.20	10.6	-
		460	60	3	265	1400	15	-	-	-	21000	-	-	26.40	-	-
		575	60	3	330	1400	15	-	-	-	21000	-	-	21.11	-	-
4	1465,1523,1754	230	60	3	130	1800	12	-	-	-	16200	5400	-	40.70	13.5	-
		460	60	3	265	1800	12	-	-	-	21600	-	-	27.10	-	-
		575	60	3	330	1800	12	-	-	-	21600	-	-	21.71	-	-
4	1769,1985,2307	230	60	3	130	1800	15	-	-	-	16200	10800	-	40.70	27.1	-
		460	60	3	265	1800	15	-	-	-	27000	-	-	33.90	-	-
		575	60	3	330	1800	15	-	-	-	27000	-	-	27.14	-	-

Table 7 SM (P) KGE & (H) HGE HEATERS ELECTRICAL DATA

Fan Q-ty	V	Hz	Ph	Pan Heaters			Total Watts	Total Amps
				V	Watts ea	Amount		
1	230	60	3	130	850	3	2550	6.41
	460	60	3	265	850	3	2550	3.20
	575	60	3	330	850	3	2550	2.56
2,3	230	60	3	130	1500	3	4500	11.31
	460	60	3	265	1500	3	4500	5.65
	575	60	3	330	1500	3	4500	4.52
4	230	60	3	130	950	6	5700	14.95
	460	60	3	265	950	6	5700	7.16
	575	60	3	330	950	6	5700	5.73

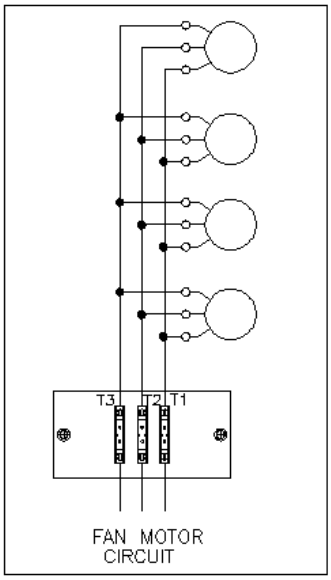
7.3 *AIR DEFROST SEQUENCE OF OPERATION*

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 (A) Air Defrost Wiring Diagram



7.4 *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 4 and 5 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 a predetermined interval. 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 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 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 7 ELECTRIC DEFROST WIRING WITH DEFROST TIMER

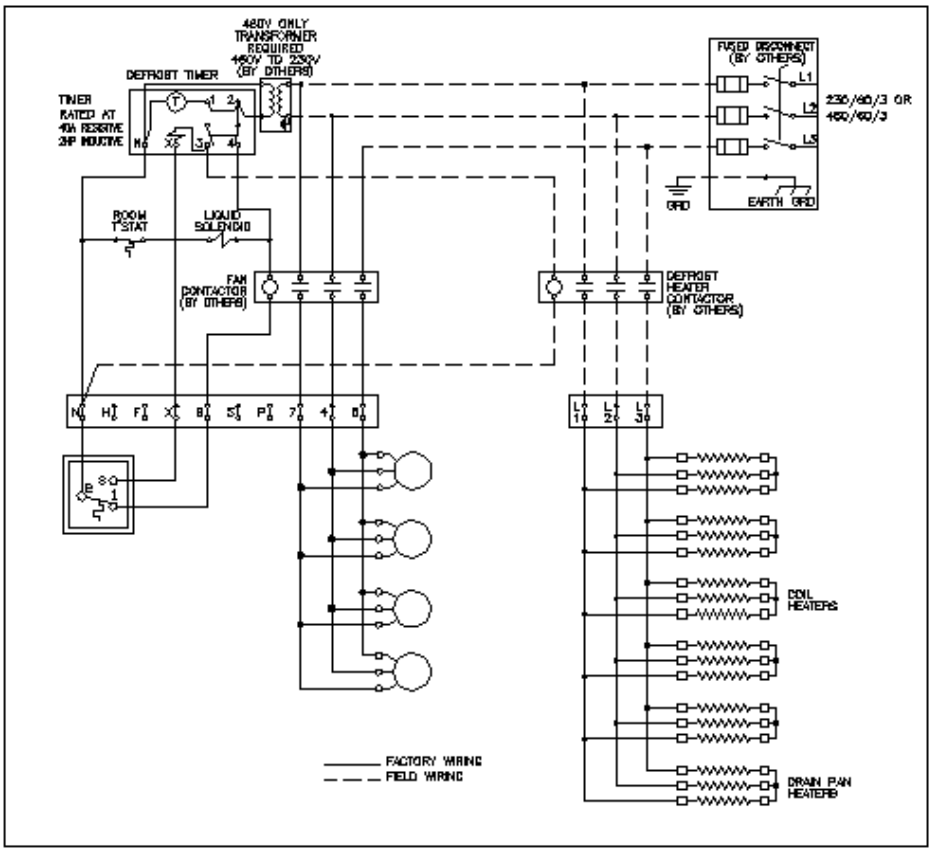


Figure 8 (E) EDL Electrical Defrost Wiring 208-230/3/60

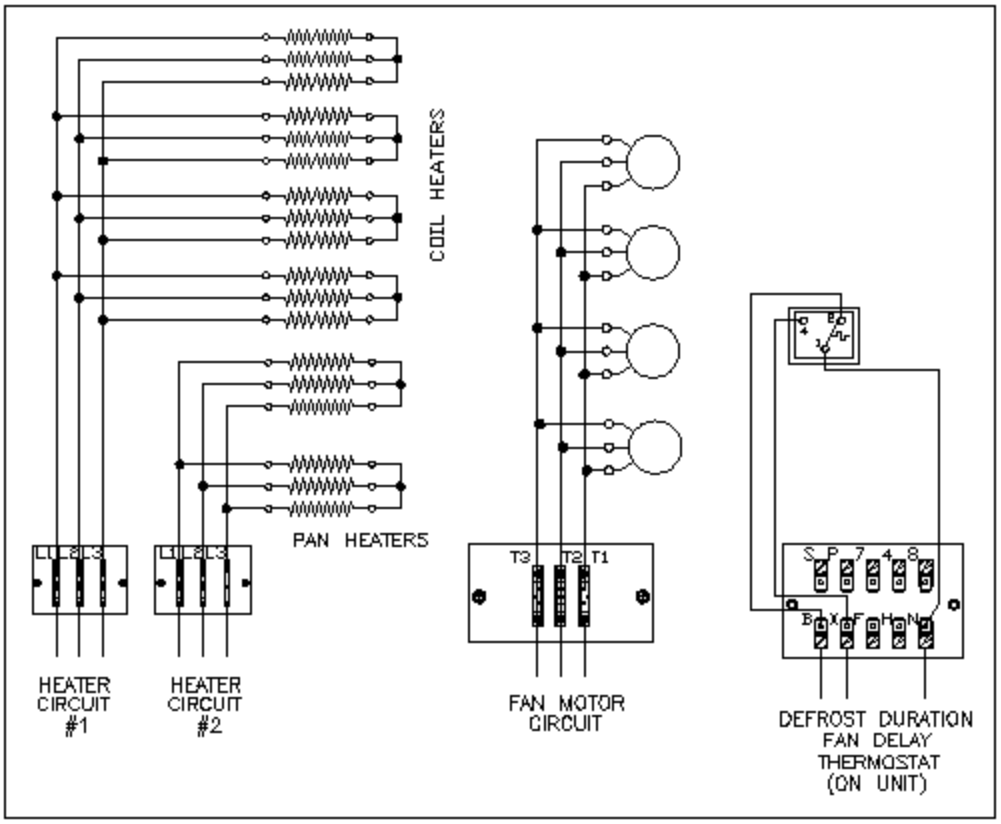
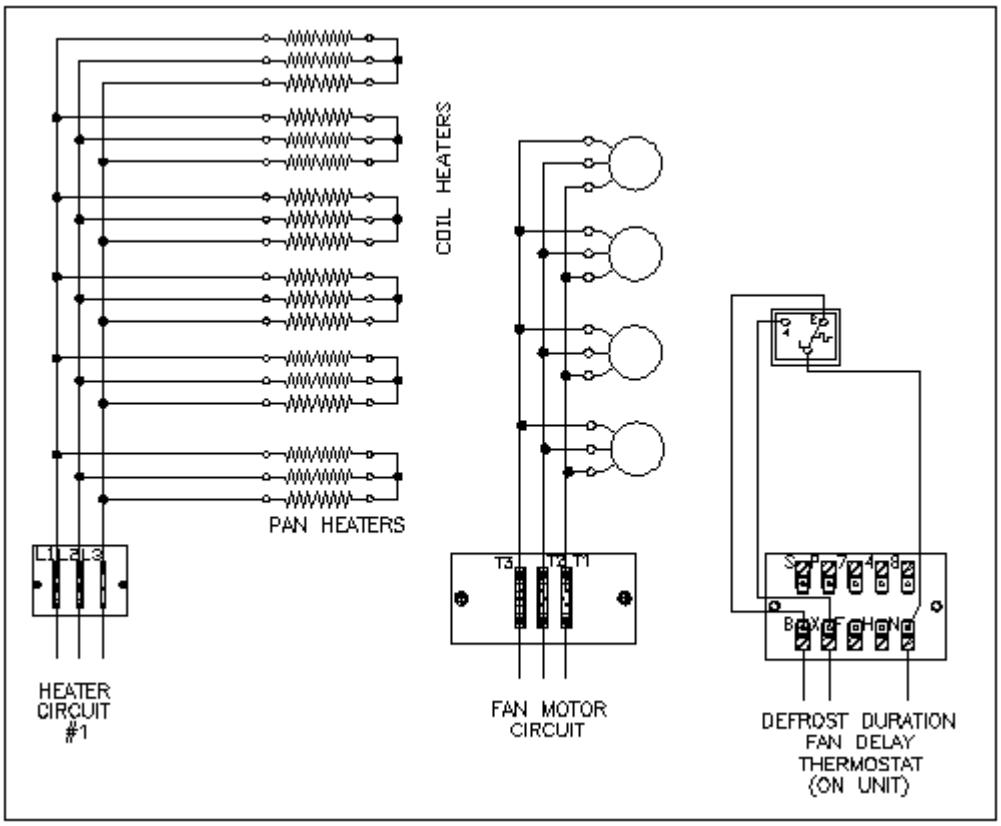


Figure 9 (E) EDL Electrical Defrost Wiring 380/460/575/3/60



7.5 *HOT GAS DEFROST SEQUENCE OF OPERATION*

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

(H) HGE/(G) HGG THREE PIPE HOT GAS DEFROST

Three pipes 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 outside the SM/SV unit 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 10 (H) HGE (3 Pipe) Hot Gas and Electrical Drain Pan Wiring

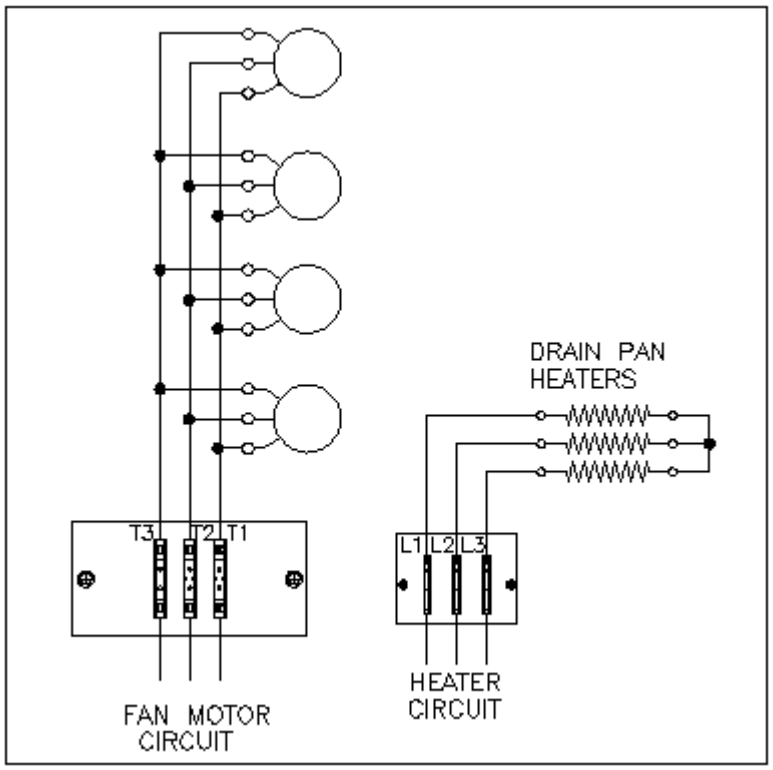
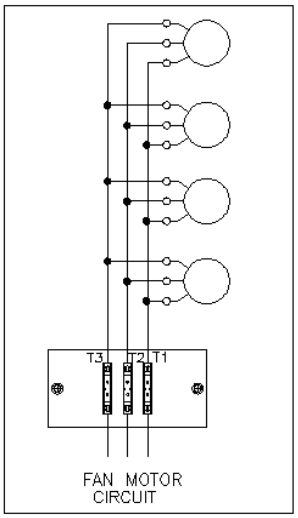


Figure 11 (G) HGG (3 Pipe) Hot Gas Coil and Hot Gas Drain Pan Wiring



(P) KGE/(H) KGG REVERSE CYCLE (2 PIPE) HOT GAS DEFROST

SEQUENCE OF OPERATION

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.

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 12 (P) KGE (2 Pipe) Kool Gas Coil and Electrical Drain Pan Wiring

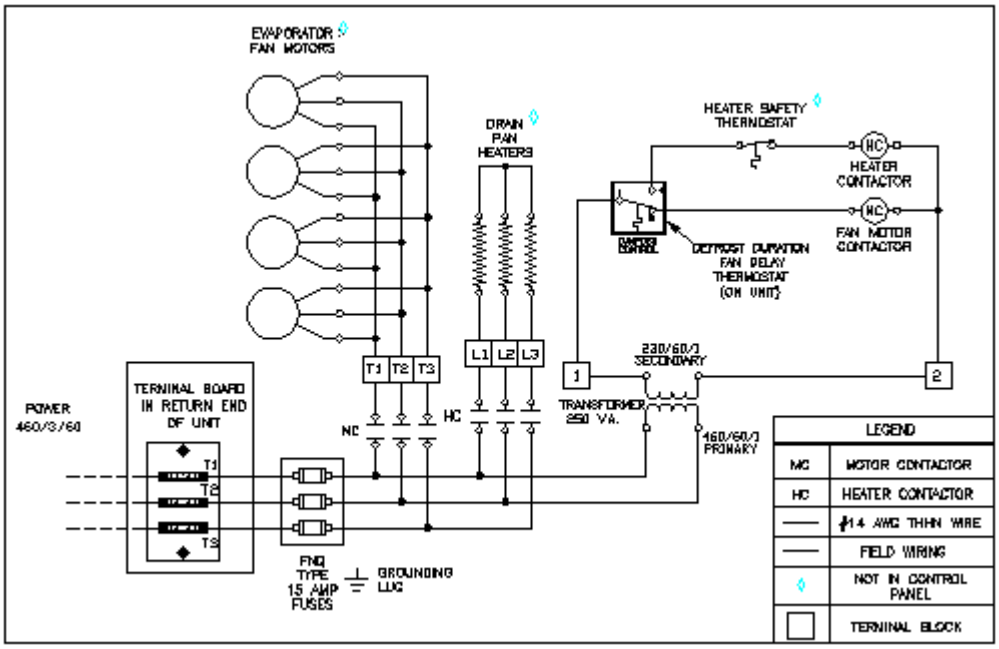
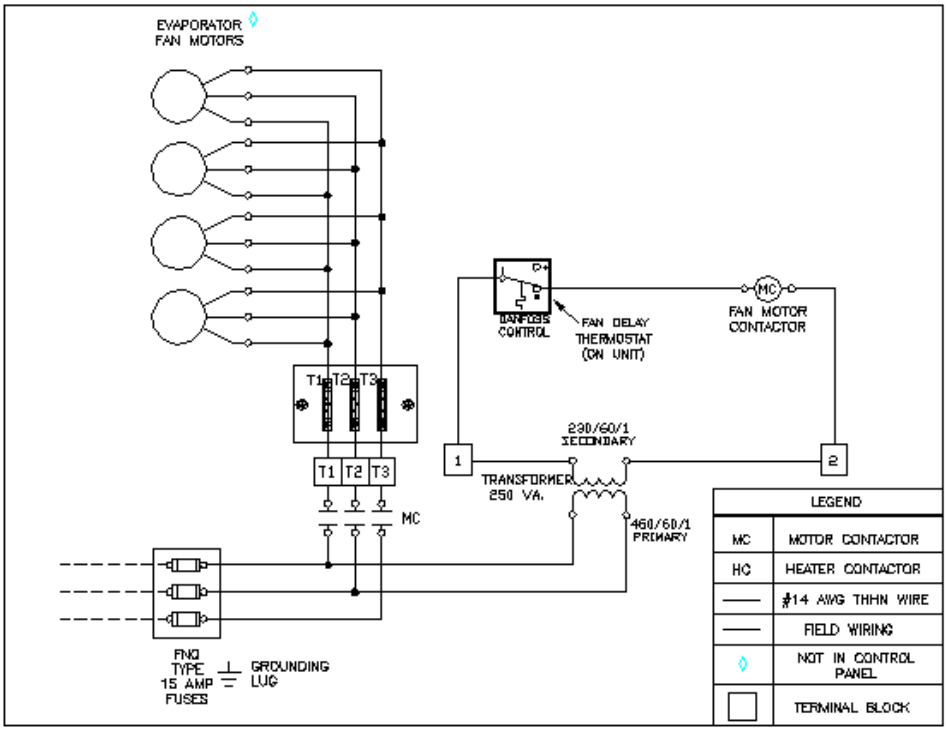


Figure 13 (K) KGG (2 Pipe) Cool Gas Coil and Drain Pan Wiring



Single Pole Single Throw (SPST) contacts Fan Delay Thermostat mounted on the unit.

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

8 START UP

8.1 *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 it 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. See Figure 7, 8, 9

8.2 *OPERATION CHECKOUT*

With the system operating, check the supply voltage. The voltage must be within +/- 10% of the voltage marked on the unit nameplate and the phase to phase unbalance should be 2% or less.

LISTEN CAREFULLY to the unit to make sure there are no unusual sounds. Sounds such as a noisy motor, the fan(s) scraping on the housing, or loose fasteners allowing parts to rattle need to be addressed immediately before continued unit operation.

Check the room THERMOSTAT setting. Be sure it functions properly.

For DIRECT EXPANSION systems let the system balance out at the desired room temperature and check the operation of the expansion valve by properly measuring the superheat at the sensing bulb. As much as thirty minutes may be required for the new balance to take place after an adjustment is made.

For BRINE or GLYCOL COOLING systems keep the closest vent to the coil open while the fluid fills the coil to allow trapped air to escape. Close the vent valve once fluid flows out of the valve and check for water hammer in the coil.

With HOT GAS DEFROST systems allow the coil to frost, then manually advance the defrost timer to initiate a defrost cycle. 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. Adjust the time clock pins if necessary. 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.

With ELECTRIC DEFROST systems allow the coil to frost then manually advance the defrost timer to initiate a defrost cycle. 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. Adjust the time clock pins if necessary. 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.

9 PREVENTATIVE MAINTENANCE

A preventive maintenance schedule should be established as soon as the SM/SV Series unit is installed. The unit should be inspected periodically for proper operation and build up of frost and debris.

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

9.1 *DRAIN PAN*

Inspect and clean the drain pan to insure free drainage of condensate. The drain pan should be cleaned regularly with warm water and soap.

If the drain pan needs to be removed, support the long dimension of the pan from underneath with a minimum of two 4x4s for one and two fan units, or two 6x6s for three and four fan units, so the outer sheet metal skin does not buckle and become damaged. **Do not point load the center of the support beam.** For longer pans more than one lifting device may be needed to keep the pan balanced when lifting. If the drain pan uses hot gas defrost make sure the coil is completely pumped out and isolated with hand valves to prevent refrigerant from escaping to the atmosphere. Remove electric wires if the unit has an electric defrost drain pan. Remove the drain line so that it is out of the way of the pan when it is being lowered. Remove the drain pan attachment bolts from the bottom of the evaporator unit and slowly lower the pan from the unit. Assemble pan in reverse order. Replace hot gas interpiping gaskets before tightening flange bolts.

9.2 *COIL AND CABINET*

Clean the coil, fan cabinet, fans, and fan guards with warm water and soap. A low-pressure water hose is recommended to avoid water entering into electrical components and causing equipment failure.

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 or processed, 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 and it may be necessary to change the number of defrost cycles seasonally.

9.3 *FAN GUARD OR LONG THROW ADAPTER REPLACEMENT*

To remove a fan guard or long throw adapter for fan-motor maintenance, or for guard or adapter replacement, make sure all electrical power to the unit has been turned off before any work is performed. Remove the two nuts on the lowest part of the guard or adapter first. While supporting the guard or adapter to the unit remove the top two nuts. Remove the guard or adapter. Reassemble in the reverse order.

9.4 *FAN REPLACEMENT*

If a fan is out of balance, damaged, or needs to be replaced, the unit does not need to be at floor level for maintenance. Make sure all electrical power to the unit has been turned off before any work is performed. Remove the fan guard as described in Section 10.3. Loosen the two bolts from the bushing that hold the fan onto the motor shaft. Remove the fan. Clean and debar the motor shaft if necessary.

Place the new fan, onto the motor shaft, tighten bolts. Reattach the fan guard and motor assembly to the unit.

9.5 *UNIT MOTOR REPLACEMENT*

Make sure all electrical power to the unit has been turned off before any work is performed. To replace a motor a lifting device may be required for the heavy motors. Remove the fan guard and fan as described in Sections 10.3 and 10.4. The motor is wired to the disconnect switch, or control panel, through flexible conduit. Remove the motor cover and disconnect the motor leads. Unscrew the flexible conduit from the motor move the conduit out of the way.

For safety, the motor should be supported before the fan guard bolts and nuts are taken apart. Remove the fan guard bolts and remove the motor assembly from the housing.

Assemble the replacement motor in fan guard. Reinstall assembly in the unit. Connect the wires to the motor following the wiring schematic for the motor. Make certain the motor is wired for the correct supply voltage. Replace the motor electrical cover. Center the fan in the orifice. When the motor assembly is centered tighten bolts and nuts to hold the motor guard assembly in place. Only slightly tighten the bolts at this time in case the motor needs to be adjusted after the fan is installed.

When starting the motor make sure the fan is rotating in the proper counter clockwise direction. If the fan rotates clockwise, stop the motor, shut off all power to the unit, and change the motor wiring for counter clockwise rotation.

9.6 *ELECTRIC DEFROST HEATERS*

Inspect the electric defrost heater ends to determine if they are operating. A heater will be operating properly when the heater is observed to be glowing during the defrost cycle. If a heater rod is cold during the defrost cycle it will need to be replaced.

Coil heaters require horizontal removal from ends of the unit. On two or three fan units heater rods are on both ends of the unit. Turn off all electrical power on the unit. Remove heater wire from terminal block and note where original wires were located. Rotate the heater rod so that the heater and retainer clip can be slid through the coil endplate slot. Remove clip from the old heater rod and install on the new heater rod in approximately

the same location as the original heater. Install new heater rod in the coil original coil slot, rotate the rod 90°, and replace the wires in the positions of the original wires in the terminal block.

Turn off all electrical power on the unit.
Drain pan heaters require the drain pan to be removed. Support the long dimension of the pan from underneath with a minimum of two 4x4s for one and two fan units or two 6x6s for three and four fan units so the outer sheet metal skin does not buckle and become damaged. For longer pans more than one lifting device may be needed to keep the pan balanced when lifting. Remove heater's wires from terminal blocks. Remove the drain line so that it is out of the way of the pan when it is being lowered. Remove the drain pan attachment bolts from the bottom of the evaporator unit and slowly lower the pan from the unit. Remove clips from the heater's hold down brackets and remove brackets. Replace the heater. Replace the hold down brackets and assemble the pan in reverse order. Rewire heaters in original terminal blocks.

10 TROUBLESHOOTING CHART

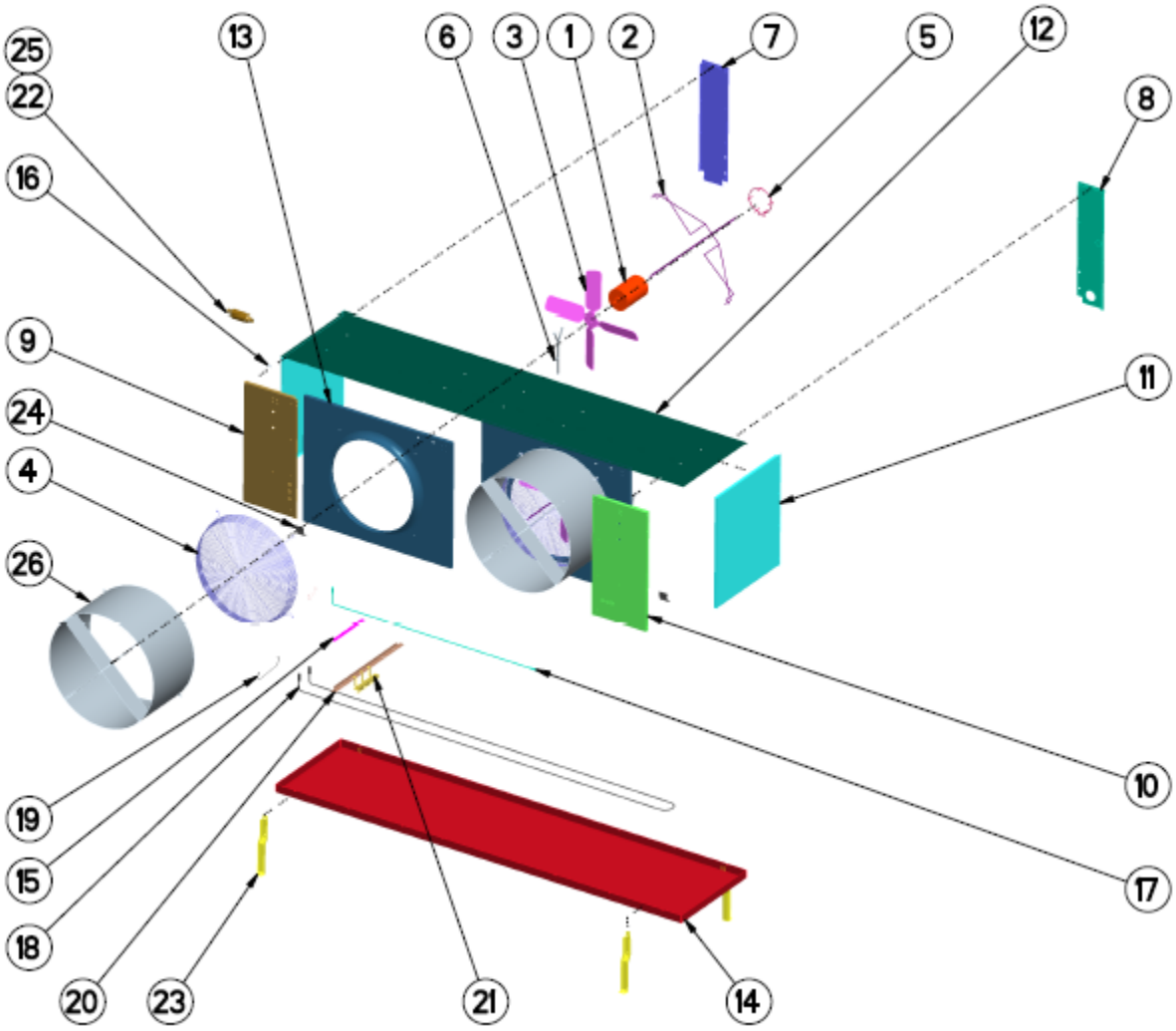
Table 9 TROUBLESHOOTING CHART

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. Too long defrost cycle. 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.

11 REPLACEMENT PARTS LIST

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

Table 8 REPLACEMENT PARTS LIST



Item	General Description	Options Description	Krack BOM Part Number	Hussmann Aftermarket Part Number
1	MOTOR	SM 1 HP 208-230/460/60/3 850 RPM	11503	MO.4410138
		SM 1 HP 575/60/3 850 RPM	E205307	MO.4410180
		SM 1.5 HP 380/60/3 1140 RPM	E205492	MO.4410139
		SV 1.5 HP 230/460/60/3 1140 RPM	E205492	MO.4410139
		SV 1.5 HP 575/60/3 1140 RPM	E206689	MO.4410314
2	MOTOR MOUNT BRACKET		E280793	BR.4910143
3	FAN BLADE	SM	11273	FB.4780320
		SV	E205493	FB.4780142
4	FAN GUARD		E280792	FG.4910218
5	MOTOR RING 56 FRAME		80034	BR.4910148
6	WIRE HARNESS	1 FAN	80576	EP.4441235
		2 FAN	80578	EP.4481760
		3 FAN	80580	EP.4441385
		4 FAN	80582	EP.4481761
7	LEFT BACK CORNER PANEL	1-2 FAN	690180	CALL
		3-4 FAN	690190	CALL
8	RIGHT BACK CORNER PANEL	1-2 FAN	690200	CALL
		3-4 FAN	690210	CALL
9	LEFT FRONT CORNER PANEL	1 FAN	690250	CALL
		2 FAN	690260	CALL
		3-4 FAN	690270	CALL
10	RIGHT FRONT CORNER PANEL	1 FAN	690220	CALL
		2 FAN	690230	CALL
		3-4 FAN	690240	CALL
11	ACCESS DOOR	1-2 FAN	69031	DO.4969766
		3-4 FAN	69032	CALL
12	TOP PANEL	1 FAN	69033	CALL
		2-3 FAN	69034	CALL
		4 FAN	E269492	CALL
13	FAN PANEL	1-2 FAN	69029P	TP.4967704
		3-4 FAN	69030P	TP.4991975
14	DRAIN PAN	SM-1 INNER PAN VERT DRAIN	C69036	DP.4916566
		SM-2/3 INNER PAN VERT DRAIN	C69037	DP.4967634
		SM-1 DP INS 230V H/KGE,EDL	CE269322	DP.4967679
		SM-2/3 DP INS 230V H/KGE,EDL	CE269324	DP.4915065
		SM-1 DP INS 460V H/KGE,EDL	CE269323	DP.4917001
		SM-2/3 DP INS 460V H/KGE,EDL	CE269325	DP.4967681
		SM-1 K/HGG INS DRAIN PAN ASY	CE269105A	DP.4915062
		SM-2/3 K/HGG INS DRAIN PAN ASY	CE269110A	DP.4915591
		SM-1 DRAIN PAN INSULATED	CE269141	DP.4915063
		SM-2/3 DRAIN PAN INSULATED	CE269142	DP.4915064
		SM-4 INNER DRAIN PAN	E269495	CALL
		SM-4F DP INS 230V H/KGE EDL	E269490	CALL
		SM-4F DP INS 460V H/KGE EDL	CE269490A	DP.4917472
		SM4 INS.DRAIN PAN ASSY K/HGG	CE269520A	DP.4915067
		SM-2/3 DP INS 575V H/KGE,EDL	E269525	CALL
		SM-4F DP INS 575V H/KGE EDL	E269490B	CALL
		SM-1 DP INS 575V H/KGE,EDL	CE269545	DP.4915068
		DRAIN PAN SS VERT CONN	69036S	CALL
		DRAIN PAN SM-2/3 SS	69037SS	CALL

		SM-2/3 SS DPINS 460V H/KGE,EDL	CE269325S	DP.4915066
		SM-1 K/HGGINS DRAIN PAN ASY SS	E269105AS	CALL
		SM-1 DRAIN PAN INSULATED SS	E269141S	CALL
		SM-2/3 SS DRAIN PAN INSULATED	E269142S	CALL
		SM-4 INNER DRAIN PAN SS	E269495S	CALL
		SM-4F DP INS	E269490C	CALL
		DT ERH HEATER 4.65 KW 230 VOLT	E313359	CALL
		DT ERH HEATER 4.65 KW 460 VOLT	E313360	HE.4850769
		DT ERH HEATER 4.65 KW 575 VOLT	E313361	CALL
		DT ERH HEATER 4.65 KW 380 VOLT	E313428	CALL
		HTR BRKT ERH 58.5" FAN SECT.	D255020	CALL
		HTR BRKT ERH 39" FAN SECTION	D255020A	CALL
		KR95222 CK CTRL TERM BLOCK 10P	E206482	EP.4440864
		KR07233 TERM BOARD 3P 10 LUG	E313576	CC.4440873
15	BRACKET FOR DRAIN PAN		E269334	BR.4915180
16	THERMOSTATS	DEFROST TERM (14T32)	E206100	CT.4480288
		HEATER SAFETY (14T21)	10956	CT.4480289
		FAN DELAY (14T31)	E201818	CT.4480287
		KP-73	E205004	CT.4480147
		TSTAT A19ABC-37 PENN SPDT	E312488	CT.4481734
17	COIL HEATERS	1 FAN 230V	69000	HE.4850752
		1 FAN 380V	E201922	HE.4850972
		1 FAN 460V	69001	HE.4850254
		1 FAN 575V	E269546	HE.4850768
		2-3 FAN 230V	69002	HE.4850255
		2-3 FAN 380V	E201924	CALL
		2-3 FAN 460V	69003	HE.4850256
		2-3 FAN 575V	E201305	HE.4850816
		4 FAN 230V	E269502	CALL
		4 FAN 380V	E269503	CALL
		4 FAN 460V	E269504	HE.4850766
		4 FAN 575V	E269505	CALL
18	DRAIN PAN HEATERS	1 FAN 230V	E269328	HE.4850306
		1 FAN 380V	E269329	HE.4850973
		1 FAN 460V	E269330	HE.4850307
		1 FAN 575V	E269544	HE.4850767
		2-3 FAN 230V	E269331	HE.4850308
		2-3 FAN 380V	E269332	CALL
		2-3 FAN 460V	E269333	CALL
		2-3 FAN 575V	E269524	HE.4850820
		4 FAN 230V	E269498	CALL
		4 FAN 380V	E269499	CALL
		4 FAN 460V	E269500	CALL
		4 FAN 575V	E269501	CALL
19	HEATER CLIP	FACE	66317	HH.4914775
		BOTTOM	66318	HH.4914776
20	HEATER ANGLE		69120	HE.4851041
			69119	TP.4915603
21	HEATER SUPPORT BRACKET		E269562	BR.4915181

22	CHECK VALVE	1/2” 5/8” 7/8” 1-1/8” 1-3/8” 1-5/8” 2-1/8”	11852 11853 10930 11804 11086 E150087 E205552	VR.4612280 VR.4612281 CALL VR.4612527 MO.4410727 VR.4612316 CALL
23	SHIPPING LEG GLV 3.563 X 19.25		21776P	TP.4915354
24	1X2.25X2.5 HINGE ZP		69113	HH.4914888
25	CHECK VALVE KIT	0.5" 0.875" 1.125" 1.625" 2.125" 2.625" 2.625"	CE269381 CE269382 CE269383 CE269377 CE269378 CE269379 CE269380	CALL CALL CALL CALL CALL CALL CALL
26	AIR BOOSTER		CE269292	TP.4967623