BULLETIN
ADEI-813

SEPTEMBER, 1999
NEW

KRAMER

AIR DEFROST EVAPORATORS

LP - LV - MSA - CSA - DSA - C - HSA - CM - CCM - DCM

INSTALLATION, START-UP AND MAINTENANCE INSTRUCTIONS

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SAFETY RECOMMENDATIONS

Disconnect all power sources before servicing.

When uncrating avoid contact with staples, nails, splinters and sharp edges. The sheet metal and coil have sharp edges. Care must be taken when uncrating to prevent damage to the equipment.

This equipment should be installed, started-up, and operated by certified and experienced commercial refrigeration technicians. System piping must be in accordance with good refrigeration practice. Use clean and dry copper tube. Field wiring must conform to the equipment specplate requirements, wiring diagram, and local and national electrical codes. Use only copper conductors.

Read and study this complete installation and service manual before starting to work.

WORK SAFELY!

RECEIVING

A responsible person should inspect the crating or carton for possible shipping damage. Check each shipment with the bill of lading to make sure all items are received in good condition. Report any shortages or damages to the delivering carrier. Damaged material is the responsibility of the carrier and a freight claim should be filed with them. DO NOT return damaged equipment to the manufacturer without prior approval.

APPLICATION OF AIR DEFROST EVAPORATORS

The evaporators covered in this bulletin are designed to operate at room temperatures of + 60°F to +35°F. For air defrost evaporators to operate properly in 35°F to 40°F rooms, the system should be selected based on 16 hours per day compressor run time at design ambient. If suction temperature is 32°F or higher, the system may be selected based on 20 hours per day compressor run time. Air defrost evaporators are not recommended for room temperatures below 35°F. Low velocity (LV) evaporators are recommended for meat cutting and other work process rooms where people will be present or anywhere low air velocity would be beneficial.

Model LP (Low Profile) is the most popular evaporator for small and medium size storage coolers. Models MSA, CSA, and DSA (Medium Silhouette) are ideal for taller medium and large size storage coolers. The KRAMER Coolmaster, CM, CCM, and DCM models are top performers in large coolers, distribution centers, and warehouse storage applications.

System TD should be limited to 25° TD MAXIMUM on low velocity (LV) systems operating at room temperature of 50°F or higher. 17° TD is usually MAXIMUM on normal storage systems. Most air defrost systems in 35°F to 40°F coolers should be selected to operate at 8° to 12° TD. The greater the TD, the faster frost will accumulate on the coil requiring more off cycle defrost time. A wider TD also means reduced system capacity for a given room temperature and therefore, more compressor run time. For storage of products requiring high humidity, select evaporators to operate at 8 to 10° TD. If room humidity is not a concern, or if a lower humidity is desirable select evaporators to operate at 11 to 14° TD. For the lowest humidity obtainable by the refrigeration system, a TD of 15 to 17° may be appropriate.

HANDLING

Move evaporators with care. Use gloves to protect your hands. The sheet metal edges can be sharp. Contact with fins should be avoided. Fins should be protected while the unit is being handled. The fins are easily bent if hit. Damaged fins must be straightened. Use care when lifting not to damage the sheet metal or copper connections. Do not lift against the center of the drain pan.

WORK SAFELY!

PIPING

All refrigerant piping must be done with clean and dry refrigeration grade copper tube. Keep it capped to prevent dirt and moisture from entering. Do not leave piping open to the atmosphere overnight. When brazing, keep dry nitrogen flowing through the lines to prevent internal oxide and scale formation. Use a high temperature silver brazing alloy. An off cycle pump down, with the room thermostat controlling the liquid solenoid, is recommended, and is mandatory to maintain compressor warranty on most systems.

Suction lines should slope a minimum of 1/8 inch per foot in the direction of flow to insure oil return. "P" traps must be used at the bottom of every suction riser and at 15 foot intervals. To control compressor superheat and return gas temperature it may be necessary to insulate the suction line, especially if long line runs are subjected to high ambient temperatures. Brazing the liquid line and suction line together can effectively provide liquid sub-cooling and increase compressor superheat at minimal cost. Insulating them together will supply additional heat exchange. Liquid lines with more than 25 feet of vertical lift usually need special attention for sub-cooling. Manufactured liquid-suction line heat exchangers are sometimes used with air defrost systems to improve system performance. Locate them inside the cooler.

See page 6 and 7 for line sizing recommendations. Take caution not to undersize lines. The liquid solenoid should be installed near the expansion valve inlet, inside the refrigerated space or in the evaporator end housing. Secure the liquid line at the evaporator. When the liquid solenoid opens and closes the liquid line experiences a "SHOCK" and tends to move forcefully. Without proper support, the joints at the solenoid, expansion valve, distributor, and distributor leads will fracture. Line supports are inexpensive compared to refrigerant loss and downtime. All piping must be supported to prevent vibration and breaking. Tube clamps should have a cushion surface for protecting the tubing.

Expansion valves should be selected from the valve manufacturers literature. If liquid subcooling is present, be sure to use the correction factor to determine the correct size valve. Balanced port expansion valves are recommended if liquid subcooling will vary. Avoid oversizing the valve which can cause hunting and floodback. On KS Air Defrost Systems, always use the expansion valves supplied with each evaporator. Read and retain the expansion valve instructions. Before installing the expansion valve on the distributor, check the distributor to be sure it has a nozzle orifice installed or is a venturi type. For optimum performance, the expansion valve should be installed directly on the distributor. If reducing couplings or adapters are required keep them close coupled. Do not have elbows between the expansion valve and distributor. The expansion valve bulb must be clamped securely on the side of a horizontal run of suction line, before any traps, preferably at the 4 o'clock or 8 o'clock position. The bulb must be in complete contact with clean copper tube and must not bridge any uneven surface. Use the bulb clamp supplied with the expansion valve. Take care not to distort or crush the expansion valve bulb when tightening the clamp. See page 10 for expansion valve adjustment recommendations.

Evaporators with 1/2 inch flare nut inlet distributors can be converted to a sweat type inlet. There is room to remove the flare with a mini-cutter. The inlet would then be 1/2 inch OD copper and an expansion valve with 1/2 inch ODF copper outlet will fit. Protect sweat valves with a wet rag while brazing.

The drain line would preferably run directly from each evaporator and exit the cooler as quickly as possible. It should be pitched a minimum of 1 inch per foot and preferably 4 inches per foot. The drain line must always be as large as the drain pan connection or larger. Copper tube or plastic pipe is considered acceptable for drain lines within a 35°F or higher temperature cooler providing local codes and inspectors approve. Do not reduce the drain line size. Some evaporators defrost quickly and therefore a large volume of water must be drained rapidly. There should be no sharp changes of direction within the cooler. Drain lines should have a trap where the temperature is always above 33°F or be protected from freezing by heating. Traps are necessary to prevent warm, moist air from being drawn up through the drain line into the cooler where it can form ice on the bottom of the coil and add additional heat load. Drain lines should run to an open drain. They should never be directly connected to a sewer. Never let condensate drain onto walkways, floors, or any traffic area creating a safety hazard. Inspect the drain pan and connection periodically to be sure it is clean and clear for free draining.

The piping chase, or anywhere lines come through the wall or roof, must be sealed to protect the tube and prevent ambient air from entering the refrigerated space. Seal around the drain line where it passes through the wall. Internally seal both ends of electrical conduit to prevent ambient air migration through it.

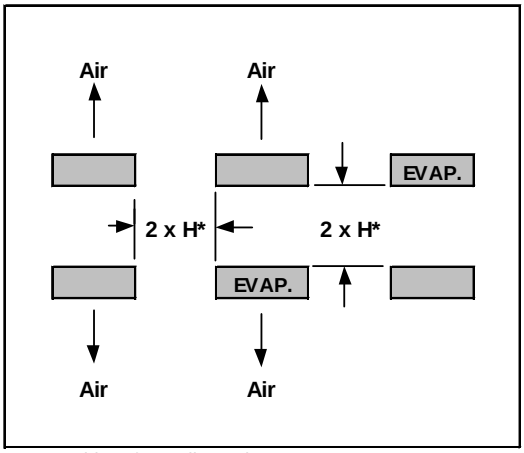
LOCATING EVAPORATORS

Locate evaporators so the air pattern covers the room and air circulates through the product. Do not restrict the inlet or outlet air stream. **Do not place evaporators above or close to doors.** When possible, direct the air stream toward doors or down an aisle. Always leave open space for good air circulation and servicing the unit. Leave space between cartons of product for the fastest temperature reduction and stability. Divide any large mass or pallet by separating the product with open air space. Do not stack product against a wall. Leave space for air to circulate against all walls and the floor. Do not place cartons or crates flat against the floor. Put them on pallets or racks so air can circulate against all surfaces. Baffles may be required to direct air to specific areas of a cooler.

MOUNTING EVAPORATORS

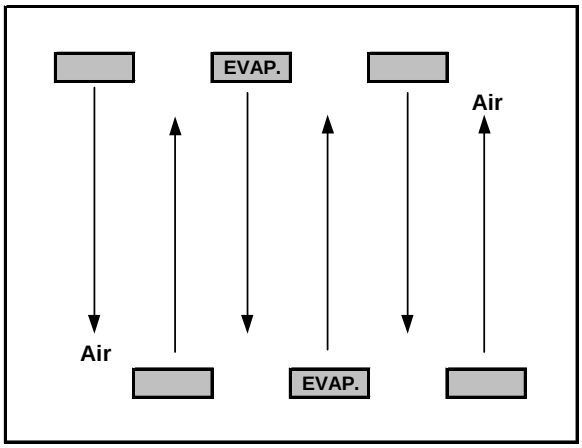
The ceiling structure must have adequate strength to support the refrigeration equipment. Weight of evaporators, piping, controls, accessories, and refrigerant must always be calculated and considered. Stainless steel fasteners are recommended for mounting evaporators when daily cleaning or corrosive atmosphere may be possible. Heavy zinc coated fasteners are suitable for common dry storage coolers. Use 5/16 inch fasteners with LP, HSA and LV models. Use 3/8 inch fasteners with C, MSA, CSA, and DSA models. Use 1/2 inch fasteners with CM, CCM and DCM evaporators. Use large flat washers next to the hanger bars and tighten securely to the ceiling. If evaporators are suspended or hang below the ceiling they must also have a nut and washer above the hanger bar to positively secure the unit to the threaded fastener or rod. Tighten all fasteners to prevent coming loose during operation.

Drawing 4



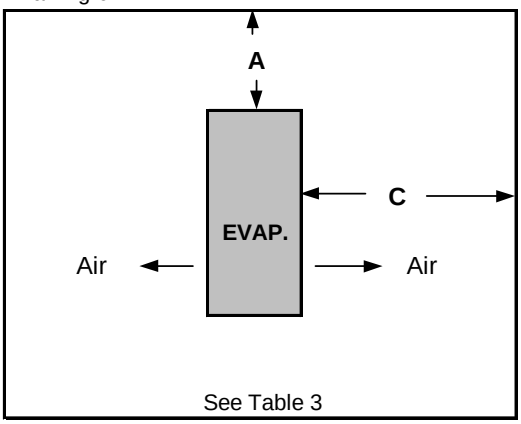
* See Table 2 for H dimension

Drawing 5



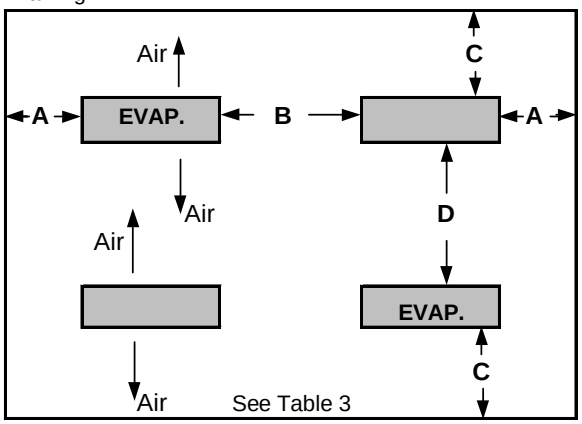
Top View of large coolers or freezers where one wall will not accomodate all evaporators or air throw is a concern

Drawing 6



Top view of single Centermount unit

Drawing 7



Top view of multiple Centermount units

RECOMMENDED SPACING FOR CENTERMOUNT EVAPORATORS

Table 3

A		B		C		D	
Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1’	8’	2’	16’	3’	12’	8’	24’

All dimensions in feet

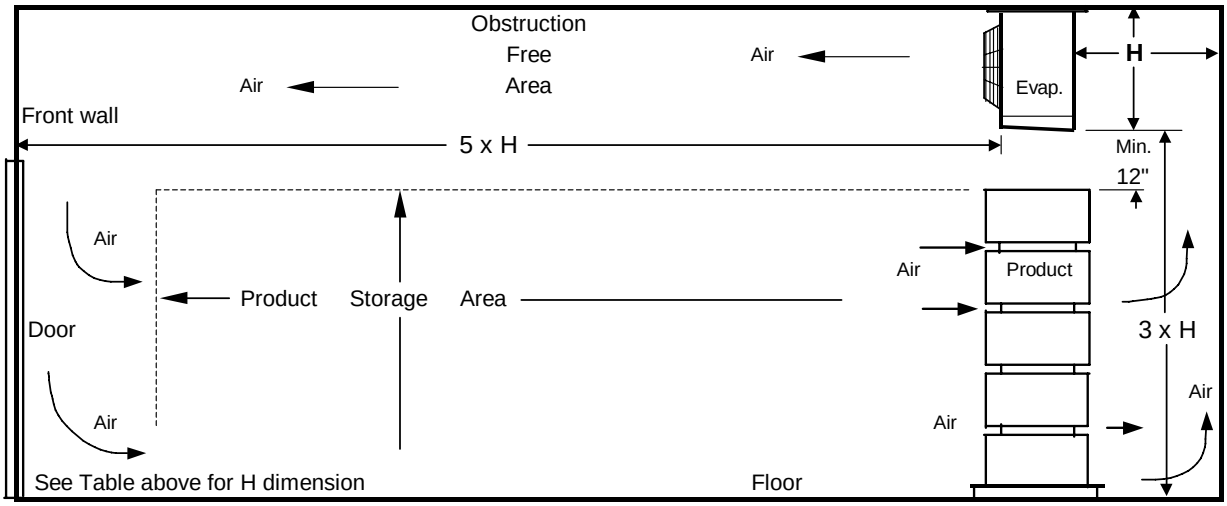
Table 2

LOCATING WALK-IN EVAPORATORS

MINIMUM DIMENSION FOR GOOD AIR CIRCULATION AND EVAPORATOR PERFORMANCE

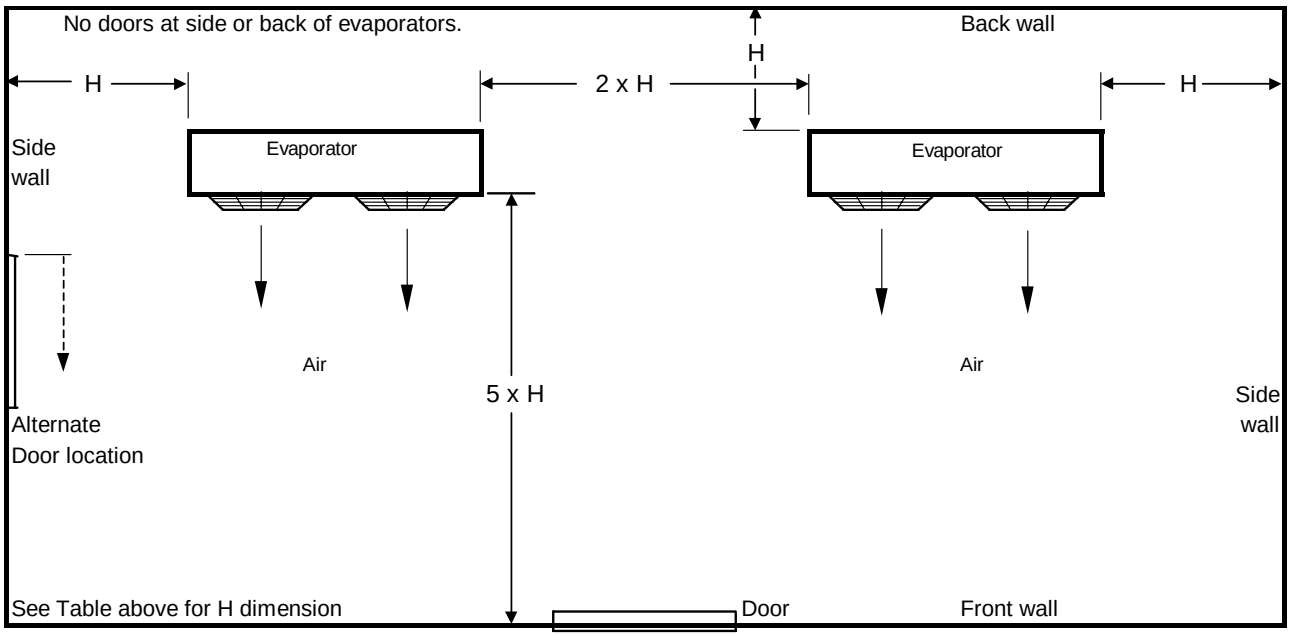
EVAPORATOR HEIGHT (Key Dim.) ***H***	**Unit to Back Wall *** ***1 x H***	**Unit to Side Wall** ***1 x H***	**Unit to Unit** ***2 x H***	**Unit to Front Wall** ***5 x H***	**Unit to Floor** ***3 x H***
12"	12"	12"	24"	60"	60" ‡
15"	15"	15"	30"	75"	60" ‡
18"	18"	18"	36"	90"	60" ‡
24"	24"	24"	48"	120"	72"
30"	30"	30"	60"	150"	90"
36"	36"	36"	72"	180"	108"
42"	42"	42"	84"	210"	126"
48"	48"	48"	96"	240"	144"

* Critical Minimum Dimension H = Height of Evaporator ‡ Minimum walk-in height of 7'-0"



SIDE VIEW

Drawings are not to scale



TOP VIEW

See previous page for more locating instructions

RECOMMENDED LINE SIZES R-22

SYSTEM	+45°F SUCTION				+35°F SUCTION				+25°F SUCTION				*LIQUID LINE*				SYSTEM
BTUH	30'	60'	100'	150'	30'	60'	100'	150'	30'	60'	100'	150'	30'	60'	100'	150'	BTUH
3,000	3/8	3/8	1/2	1/2	3/8	1/2	1/2	1/2	3/8	1/2	1/2	5/8	1/4	1/4	1/4	3/8	3,000
4,000	3/8	1/2	1/2	1/2	1/2	1/2	1/2	5/8	1/2	1/2	5/8	5/8	1/4	1/4	1/4	3/8	4,000
6,000	1/2	1/2	1/2	5/8	1/2	1/2	5/8	5/8	1/2	1/2	5/8	5/8	1/4	1/4	3/8	3/8	6,000
9,000	5/8	5/8	5/8	7/8	5/8	5/8	5/8	7/8	5/8	5/8	5/8	7/8	1/4	3/8	3/8	3/8	9,000
12,000	5/8	5/8	5/8	7/8	5/8	5/8	7/8	7/8	5/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	12,000
15,000	5/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	15,000
18,000	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	18,000
24,000	7/8	7/8	7/8	1 1/8	7/8	7/8	7/8	1 1/8	7/8	7/8	7/8	1 1/8	3/8	3/8	3/8	1/2	24,000
30,000	7/8	7/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	3/8	3/8	1/2	1/2	30,000
36,000	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	3/8	1/2	1/2	1/2	36,000
42,000	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	3/8	1/2	1/2	1/2	42,000
48,000	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 1/8	1 1/8	1 1/8	1 3/8	1/2	1/2	1/2	5/8	48,000
60,000	1 1/8	1 1/8	1 1/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1/2	1/2	5/8	5/8	60,000
75,000	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 5/8	1/2	1/2	5/8	5/8	75,000
90,000	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	1/2	5/8	7/8	7/8	90,000
120,000	1 3/8	1 3/8	1 5/8	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	2 1/8	5/8	5/8	7/8	7/8	120,000
150,000	1 3/8	1 5/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	2 1/8	1 5/8	1 5/8	2 1/8	2 1/8	5/8	7/8	7/8	7/8	150,000
180,000	1 5/8	1 5/8	2 1/8	2 1/8	1 5/8	1 5/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	7/8	7/8	7/8	7/8	180,000
210,000	1 5/8	1 5/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	7/8	7/8	7/8	1 1/8	210,000
240,000	1 5/8	2 1/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	7/8	7/8	1 1/8	1 1/8	240,000
300,000	2 1/8	2 1/8	2 1/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	7/8	1 1/8	1 1/8	1 1/8	300,000
360,000	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 5/8	2 5/8	2 5/8	1 1/8	1 1/8	1 1/8	1 1/8	360,000
480,000	2 1/8	2 5/8	2 5/8	2 5/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	1 1/8	1 1/8	1 1/8	1 3/8	480,000
600,000	2 5/8	2 5/8	2 5/8	3 1/8	2 5/8	2 5/8	3 1/8	3 1/8	2 5/8	3 1/8	3 1/8	3 5/8	1 1/8	1 1/8	1 3/8	1 3/8	600,000

All line lengths are "equivalent feet" and must include all fittings, valves, and accessories.
Sizes shown are for O.D. type "L" copper tube.
Liquid line is from receiver to expansion valve.
Shaded size indicates MAXIMUM suction line size for risers. Riser size must not be larger than horizontal size.

ESTIMATING EQUIVALENT FEET OF TUBE DUE TO FRICTION

Component Description	Type "L" Copper Tube - O.D. Line Size									
	1/2	5/8	7/8	1 1/8	1 3/8	1 5/8	2 1/8	2 5/8	3 1/8	3 5/8
Long radius "L" or Straight thru "T"	1	2	2	2	3	3	4	5	6	7
90° turn "T"	3	3	4	5	7	8	10	12	15	18
Smooth(1 size)reducer	2	2	3	3	4	5	6	7	8	9
Trap	4	5	6	7	8	10	13	16	19	24
Globe valve(open)	15	17	21	28	38	44	54	68	82	98
Angle valve(open)	6	8	10	13	17	20	25	30	38	45
Ball valve(full flow)	1	1	1	2	2	2	3	3	4	4
Check valve(ball type)	6	8	10	12	14	16	20	25	30	35

RECOMMENDED LINE SIZES R-404A, R-507

SYSTEM	+40°F SUCTION				+30°F SUCTION				+20°F SUCTION				*LIQUID LINE*				SYSTEM
BTUH	30'	60'	100'	150'	30'	60'	100'	150'	30'	60'	100'	150'	30'	60'	100'	150'	BTUH
3,000	3/8	3/8	1/2	1/2	3/8	3/8	1/2	1/2	3/8	1/2	1/2	1/2	1/4	1/4	1/4	1/4	3,000
4,000	3/8	1/2	1/2	1/2	3/8	1/2	1/2	1/2	1/2	1/2	1/2	5/8	1/4	1/4	1/4	1/4	4,000
6,000	1/2	1/2	5/8	5/8	1/2	1/2	5/8	5/8	1/2	5/8	5/8	7/8	1/4	1/4	1/4	3/8	6,000
9,000	1/2	5/8	5/8	7/8	1/2	5/8	7/8	7/8	5/8	7/8	7/8	7/8	1/4	3/8	3/8	3/8	9,000
12,000	1/2	5/8	7/8	7/8	1/2	5/8	7/8	7/8	5/8	7/8	7/8	7/8	3/8	3/8	3/8	3/8	12,000
15,000	5/8	5/8	7/8	7/8	5/8	5/8	7/8	7/8	5/8	7/8	7/8	7/8	3/8	3/8	3/8	1/2	15,000
18,000	5/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	7/8	1 1/8	3/8	3/8	1/2	1/2	18,000
24,000	5/8	7/8	7/8	7/8	5/8	7/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	3/8	1/2	1/2	1/2	24,000
30,000	7/8	7/8	7/8	1 1/8	7/8	7/8	7/8	1 1/8	7/8	1 1/8	1 1/8	1 1/8	1/2	1/2	1/2	5/8	30,000
36,000	7/8	7/8	1 1/8	1 1/8	7/8	7/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 3/8	1/2	1/2	1/2	5/8	36,000
42,000	7/8	1 1/8	1 1/8	1 1/8	7/8	1 1/8	1 1/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1/2	1/2	5/8	5/8	42,000
48,000	7/8	1 1/8	1 1/8	1 3/8	7/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8	1/2	1/2	5/8	5/8	48,000
60,000	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 5/8	1/2	5/8	5/8	5/8	60,000
75,000	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8	1 1/8	1 3/8	1 5/8	1 5/8	5/8	5/8	5/8	7/8	75,000
90,000	1 1/8	1 3/8	1 3/8	1 5/8	1 1/8	1 3/8	1 3/8	1 5/8	1 3/8	1 5/8	1 5/8	1 5/8	5/8	5/8	7/8	7/8	90,000
120,000	1 3/8	1 3/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	5/8	7/8	7/8	7/8	120,000
150,000	1 5/8	1 5/8	1 5/8	2 1/8	1 5/8	1 5/8	1 5/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	7/8	7/8	7/8	7/8	150,000
180,000	1 5/8	1 5/8	2 1/8	2 1/8	1 5/8	1 5/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	7/8	7/8	1 1/8	1 1/8	180,000
210,000	1 5/8	2 1/8	2 1/8	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	7/8	1 1/8	1 1/8	1 1/8	210,000
240,000	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	7/8	1 1/8	1 1/8	1 1/8	240,000
300,000	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 5/8	2 5/8	2 5/8	1 1/8	1 1/8	1 1/8	1 3/8	300,000
360,000	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8	2 5/8	2 5/8	3 1/8	1 1/8	1 1/8	1 1/8	1 3/8	360,000
480,000	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	1 1/8	1 1/8	1 3/8	1 3/8	480,000
600,000	2 5/8	2 5/8	2 5/8	3 1/8	2 5/8	2 5/8	2 5/8	3 1/8	2 5/8	2 5/8	3 1/8	3 1/8	1 1/8	1 3/8	1 3/8	1 5/8	600,000

All line lengths are "equivalent feet" and must include all fittings, valves, and accessories.
Sizes shown are for O.D. type "L" copper tube.
Liquid line is from receiver to expansion valve.
Shaded size indicates MAXIMUM suction line size for risers. Riser size must not be larger than horizontal size.

MINIMUM LIQUID SUBCOOLING °F TO OFFSET PRESSURE LOSS IN RISERS

	Rise in Feet					
Refrigerant	10'	15'	20'	25'	30'	40'
R-22	2°	3°	4°	4°	5°	7°
R-404A, R-507	2°	2°	3°	3°	4°	5°

MAXIMUM DISTANCE BETWEEN COPPER TUBE LINE SUPPORTS

Type "L" Tube O.D.	Maximum Feet
3/8 - 1/2	4
5/8 - 7/8	6
1 1/8 - 2 1/8	8
2 5/8 - 3 5/8	10

ELECTRICAL - FIELD WIRING AIR DEFROST EVAPORATORS

The spec plate on the evaporator is marked with the electrical characteristics and ratings. Make sure the supply voltage and the fan motor requirements are in accord. Use copper conductors of the proper size to handle the connected voltage and amperage load. All wiring must be in compliance with the National Electrical Code and any local codes that apply. Depending on the system design and individual preference, air defrost evaporator fan power may come from the condensing unit, from the control circuit, or from a separate source. An air defrost system is wired so that the evaporator fans run continuously unless manually de-energized. A disconnect switch is required and branch circuit protection may be required.

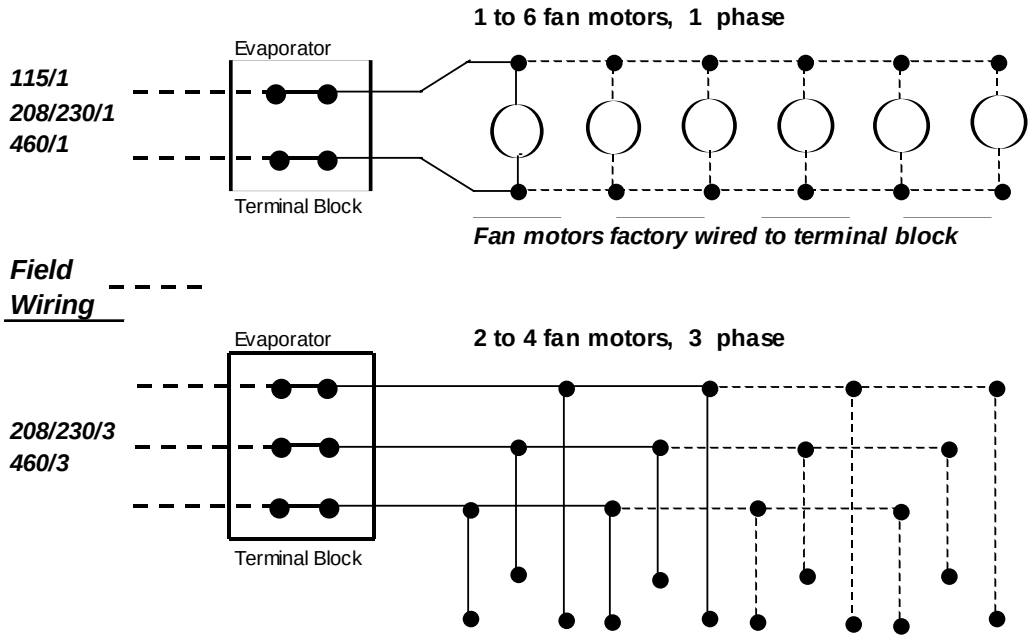
All field wiring should enter through electrical bushings and fittings and the conduit must be internally sealed on both ends to prevent warm, moist, outside air from being drawn through it into the cooler. If conduit is not properly sealed, moisture from the outside can migrate through it and short circuit electrical terminals in the evaporator. Check all wiring connections, including factory connections, to be sure they are tight and did not vibrate loose during shipment. Spin each fan blade to be sure it turns freely and observe the tip clearance.

The most positive and dependable method of keeping liquid refrigerant out of the compressor crankcase is to use a pump down cycle. The room thermostat and liquid line solenoid are wired in series so that when the thermostat temperature setting is satisfied, the thermostat will open, the solenoid will close, and the compressor will pump down to the low pressure control setting, and then shut off. The evaporator fans continue to run circulating room air and the off cycle defrost occurs. The pump down cycle is mandatory to maintain compressor warranty on most refrigeration systems.

It is essential that any frost completely melts and drains each time the compressor cycles off. If it does not, a partial defrost results and the residual water and slush re-freeze into ice during the next run cycle. A manual defrost is usually required and complete removal of all ice is necessary. Do not let ice continue to build in the coil. A normal defrost will remove frost, but not ice. Continued ice build up can result in total coil failure.

Adequate off cycle (air defrost) time is a function of system capacity. If the system is too small for the application, ice build up will usually result. Use of an air defrost timer is sometimes successful in avoiding coil icing on undersize systems. A temporary loss of room temperature will occur during defrost. Optional timers are available to assist in air defrost applications.

TYPICAL AIR DEFROST EVAPORATOR WIRING



START-UP and PULL DOWN

A thorough leak test and evacuation must precede charging and start-up. Refer to the condensing unit or system installation instructions. Check the compressor oil level before and during start-up. Check fan blades for correct rotation. The control circuit should be energized at least 12 hours and preferably 24 hours before charging and start-up to open the liquid line solenoid and turn on the crankcase heater. This will assist with a good, deep evacuation and provide added compressor protection during charging and start-up.

Do not leave equipment unattended during start-up. High moisture levels in new rooms can cause rapid frost build up on the evaporator coil. It may be necessary to manually control an off cycle to defrost the coil before the room pulls down to design temperature. Do not allow the coil to become completely blocked with frost. Check the compressor oil level frequently during pull down. Do not overfill with oil.

EXPANSION VALVE ADJUSTMENT - EVAPORATOR SUPERHEAT

Expansion valves will usually need adjustment. Evaporator superheat should be approximately 6° to 12°F. Air defrost evaporators will operate efficiently with 8° to 10° superheat at design room temperature. Obtain evaporator superheat by accurately measuring the suction line temperature at the expansion valve bulb. Obtain pressure at the Schrader fitting on the suction connection. Convert the pressure to temperature using a pressure-temperature chart. Subtract the converted temperature from the measured temperature to obtain superheat. For close coupled systems with short line runs it may be necessary to increase superheat at the evaporator to insure the minimum acceptable superheat at the compressor.

The access panels on the evaporator must always be in place when the evaporator is operating. Do not leave the access panels off after valve adjustment or service.

AIR DEFROST SYSTEMS

Air defrost systems are designed to operate at room temperatures of 35°F and higher. Defrosting of the evaporator occurs during the off cycle (when the compressor is off). For 35 to 41°F rooms the system is normally designed for 16 hours compressor run time and 8 hours off time per day. During the off cycle the room air continues to circulate and melts any frost accumulation on the coil. In unexpected situations the off cycle may not be sufficient for the coil to defrost completely and a defrost timer may correct the problem, however, a rise in room temperature may be expected during the timed off cycle.

Systems with 42°F or higher room temperature and suction temperature above 32°F may operate with 18 to 20 hours run time because the coil will not collect frost at those conditions. Systems with a suction temperature below 32°F may collect frost on the coil and should be selected for 16 hours compressor run time maximum.

EVAPORATOR MAINTENANCE

Disconnect electrical power to the evaporator when inspecting or cleaning. Evaporators should be checked occasionally and cleaned of all dirt or grease accumulation. Fan blades and guards may require more frequent cleaning. DO NOT use ammonia or other cleaning chemicals that are corrosive to copper or aluminum. The drain pan should be lowered and thoroughly cleaned to prevent any drain restriction. The drain connection must be open and clean. Coils must be power washed if they become dirty. We recommend using the Air Defrost System Check List on page 12. Using often can give indication of a problem before it becomes a major issue. The Check List can also assure the owners that their equipment is in good condition and is being maintained properly. The Check List should be retained as a permanent service record document for each system.

REPLACEMENT PARTS

To order replacement parts always include the evaporator model number, serial number, and a complete description of the part. Provide component model numbers, markings, size, function, and state the quantity you are ordering. Providing complete information will insure prompt handling of your order. Record the evaporator model number and serial number near the bottom of page 11. A replacement parts list for all air defrost evaporators is included on page 10.

AIR DEFROST EVAPORATOR PARTS LIST

GENERAL DESCRIPTION of PART	COMPONENT PART NUMBER FOR AIR DEFROST MODEL					
	LP Low Profile	LV Low Velocity	MSA CSA DSA	CM CCM DCM	HSA Height Saver	C Large Curvette
115/1 SP Motor, 1/20 hp	102540003					049-119
115/1 SP Motor, 9 watt		103104004				
115/1 SP Motor, 16 watt		103104007			103104007	
115/1 SP Motor, 1/8 hp						049-156A
115/1 PSC Motor, 1/20 hp	108178001					
115/1 PSC Motor, 16 watt		107933001			107933001	
115/1 PSC Motor, 1/8 hp			115248001			049-044
115/230/1 Motor, 1/8 hp						049-050
115/230/1 Motor, 1/4 hp						049-173
115/1 PSC Motor, 1/3 hp			205051005			
230/1 SP Motor, 1/20 hp	102540004					049-123
230/1 SP Motor, 9 watt		103104005				
230/1 SP Motor, 16 watt		103104008			103104008	
230/1 PSC Motor, 1/20 hp	108178002					
230/1 PSC Motor, 16 watt		107933002			107933002	
230/1 PSC Motor, 1/8 hp			115248002			
230/1 PSC Motor, 1/3 hp			205051004			
230/1 PSC Motor, 1/2 hp				049-158		
230/1 PSC Motor, 3/4 hp				113139000		
460/1 SP Motor, 1/20 hp	102540005					
460/1 PSC Motor, 1/8 hp			115248003			
460/1 PSC Motor, 1/3 hp			205051006			
460/1 PSC Motor, 1/2 hp				049-159		
230/460/3 Motor, 1/2 hp				049-171		
230/460/3 Motor, 3/4 hp				114639000		
Fan Blade	107943000	1020CCW	214100000	213142000	204395017	12" 039-188
Fan Blade		↳ (20° pitch)	↳ (14" dia.)	↳ (24" dia.)	↳ (1031CCW)	14" 039-160
Fan Blade		204395017	213456000	213143000		16" 039-143
Fan Blade		↳ (1031CCW)	↳ (20" dia.)	↳ (30" dia.)		20" 039-184
Fan Guard	205925002	205925002	213626001	213144000	205925002	12" 073-099
Fan Guard	↳ (wire)	↳ (wire)	↳ (14" dia.)	↳ (24" dia.)	↳ (wire)	14" 073-091
Fan Guard	205925001		201006009	202136007		16" 073-100
Fan Guard	↳ (plastic)		↳ (20" dia.)	↳ (30" dia.)		20" 073-053
Motor Mount	210620000	103096003	214837000	Base type	10243000	
Motor Mount			↳ (14" dia.)	Motor is		
Motor Mount			210225000	rail mounted		
			↳ (20" dia.)			

AIR DEFROST SYSTEM CHECK LIST

ROOM NAME_____ ROOM TEMPERATURE_____°F

Condensing Unit Model No._____ Serial No._____

Evaporator Model No._____ Serial No._____

Date Installed_____ Date Today_____ Ambient Temp._____°F

Evaporator Suction Temp._____°F

Evaporator Suction Pressure_____PSI --- Convert to _____°F

Evaporator Superheat_____° Liquid Temp. entering X-valve _____ °F

Compressor Suction Temp._____°F

Compressor Suction Pressure_____PSI --- Convert to _____°F

Compressor Superheat_____° Condenser Coil Clean _____

Compressor Discharge Pressure_____PSI Sight Glass Clear and Dry_____

Compressor Discharge Line Temp._____°F Liquid Temp. leaving C/U_____°F

Compressor Oil Level_____Glass Receiver Pressure_____PSI

Evaporator Frost Load – Light ☐ Medium ☐ Heavy ☐ Dry ☐ Wet ☐

Does Coil Clear of Frost during off cycle _____ Is Air Defrost Timer used _____

Air Defrost Timer (if used) set for _____ defrost per day, with _____ minutes off time

Compressor oil level during off cycle _____ glass.

Floodback observation _____

Evaporator Notes _____

_____

SYSTEM ELECTRICAL

Design Voltage_____ Test Voltage (1-2)_____ (1-3)_____ (2-3)_____

Component Amps:	Specplate Amps	(L1)	Test Amps	(L3)
Compressor –	_____	_____	_____	_____
Condenser –	_____	_____	_____	_____
Evaporator –	_____	_____	_____	_____

SERVICE NOTES - _____

_____

_____ By_____

KRAMER

AIR DEFROST EVAPORATORS

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