REFPLUS®

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

LIGHT-INDUSTRIAL WALK-IN EVAPORATORS

EK-EM-EJ-LM-LJ-DJ SERIES

AWEF REGISTERED

ecoefficient+

cityquiet zeroleak smartpower

R3

REFPLUS

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1. SAFETY CONSIDERATIONS

Installing, starting up, and servicing equipment can be hazardous due to system pressures, electrical components and equipment location (elevated structures, etc.). Only trained and qualified installers as well as service technicians should install, start-up and service this equipment.

When working on the equipment, observe precautions found in the literature, on the tags, stickers, and labels attached to the equipment.

Follow all safety codes. Wear safety glasses and work gloves. Keep quenched cloths and fire extinguisher nearby when brazing. Use care in handling, rigging, and setting bulky equipment. Units are factory pressurized with dry air at approximately 40 psig. Be careful when opening the circuit. If no pressure is present, check for leaks or loose valves. Work in a well-ventilated location when using refrigerant.

WARNING! Before installation, always check to make sure main power to systems is OFF. Electrical shock can cause personal injury or death.

2. INTRODUCTION

These instructions describe installation, start-up and service of refrigeration duty, light-industrial evaporator units.

3. PRODUCT DESCRIPTION

EK, **EM**, **EJ**, **LM**, **LJ** and **DJ** series are ceiling-mounted light-industrial walk-in evaporators. All series except the **LM** series are AWEF registered. Each unit includes a wiring diagram that meets the customer's requirements. The wiring diagram displays all the components with all the necessary protections and controls.

EK, **EM** and **EJ** series are single-coil construction for an air distribution towards the centre of the cooler and freezer. The fans draw air from the evaporator coil and discharge it through the fan guards at the front of the unit.

LM, LJ and **DJ** series are dual-coil construction. On the **LM** and **LJ** series, fans draw air from below the unit and discharge it through the evaporator coils on both sides of the unit. On the **DJ** series, the fans draw air from the evaporator coil and discharge it vertically through the fan guards underneath the unit.

Coils are manufactured with seamless deoxidized heavy wall smooth copper tubes and aluminum plate fins. For a maximum heat transfer, the tubes are mechanically expanded into self-spaced plate fins with full collar for a permanent bond.

Connections and bends are brazed with high-temperature brazing alloy. Coils are factory leak tested at 300 psig and purged with a -40°F dew point dry air. Coils are ready for HFC, HFO and CO_2 refrigerants and are provided with sweat type connections (several coating materials are available).

All units are modular design and use a minimum amount of parts for easy part replacement and availability.

All controls, motors and heaters are factory wired to provide a fully automatic operation of the unit.

Casing for all models is made from heavy-gauge stucco aluminum. All units come with stainless steel or plated hardware for a lightweight and rustproof assembly. Other optional materials are available.

EM and **EJ** series are provided with removable 1 1/4" female pipe thread drain fitting for easy installation and cleaning when installed with a drain union. **EK, LM**, **LJ** and **DJ** series are provided with removable 7/8" female pipe thread drain fittings.

EK, **EM** and **LM** models are equipped with AC standard-efficiency fan motors. **EJ**, **LJ** and **DJ** models are equipped with 500mm (20") high-efficiency cast-aluminum industrial fans. This flexible, economical and environmentally friendly fan system enables high air side pressures, ideal efficiency and quiet operation. Fans are designed with a polymer aerodynamic ventury for maximum air-flow dynamics. Seven sickle-shaped fan blades are made from cast aluminum for good corrosion resistance, low weight, excellent airflow output and sound power reduction.

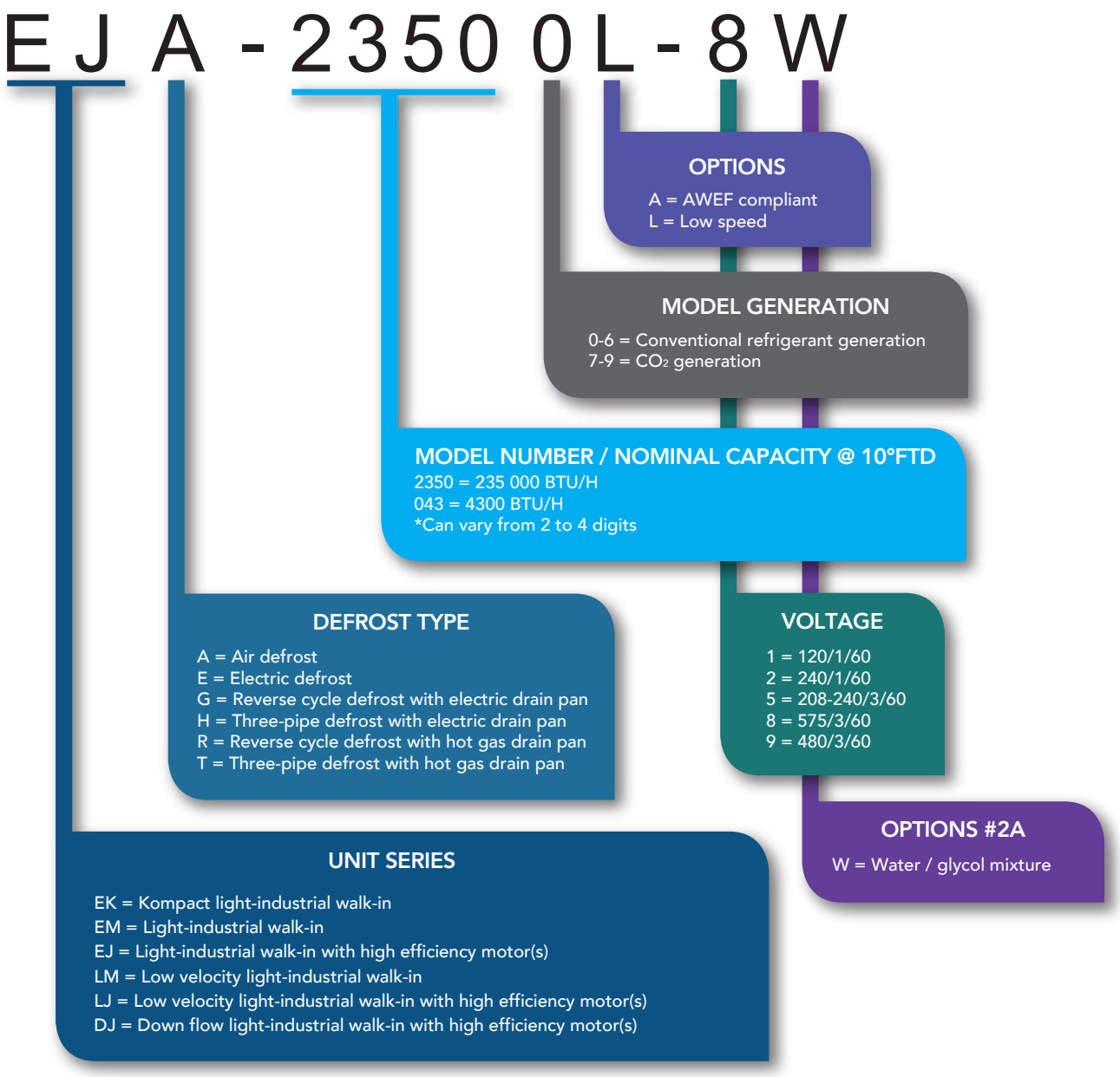
All units are provided with an insulated drain pan and assembled with corrosion-free components.

All standard **EKE**, **EME, EJE, LME, LJE** and **DJE** models are provided with a defrost termination switch, heater safety thermostat and fan delay thermostat. All units feature incoloy low watt density tubular heaters. They are embedded within the coil for positive defrost and high-energy efficiency. This allows heat gain reduction in coolers and freezers. They are available for 208-240/3/60, 480/3/60 and 575/3/60. 240/3/60 and 480/3/60 can be used on 200/3/50 and 380/3/50. All units use proper number of heaters for an even phase loading. Refer to the wiring diagrams (Section 13) for heater arrangement.

EMG, EJG, LMG, LJG, DJG, EMH, EJH, LMH, LJH and **DJH** models are provided with fan motor contactors, heater contactors, drain pan heater safety, fan delay and defrost termination thermostats. These thermostats sense the coil temperature and control the operation of fans and heaters. All units feature incoloy low watt density tubular heaters in the drain pan.

EKT, EMT, EJT, LMT, LJT and **DJT** models are provided with fan delay, defrost termination thermostat and hot gas defrost pan grid.

4. NOMENCLATURE



5. HANDLING AND RIGGING

Good handling and rigging practices must be followed to protect units from damage. Having proper handling equipment at the job site is most important and it should be planned.

In the US, follow OSHA 1926.251 standard for Rigging Equipment and Material Handling.

In Canada, follow your province's requirements for hoisting and rigging.

Improper rigging of a load or a rigging failure can expose riggers and other workers nearby to a variety of potential hazards.

Always lift units secured to the fork lift to prevent it from slipping off.

Your unit is shipped crated on a pallet. This prevents any damage to the drain pan underneath. To fasten the unit to the ceiling, it is recommended to leave it on the pallet in order to securely lift it up with a motorized or hand-operated forklift. **Do not** use a forklift against sheet metal panels or coils. Make sure forks extend the entire length of the unit and against a structural part or frame.

On **EK** models, use the provided support brackets to bolt the unit to the ceiling, as shown. **EM, EJ, LM**, **LJ** and **DJ** models must be mounted with steel rod hangers, as shown in Figure 1. Refer to section 6.3 MOUNTING for more information. **LM**, **LJ** and **DJ** units should be titled so that drain fittings are on the lower side, to allow proper draining.

This procedure is for reference only. Rigging and handling procedures will vary from one machine to another and from one site to another.

Equipment handling and rigging should be carried out by a certified operator.

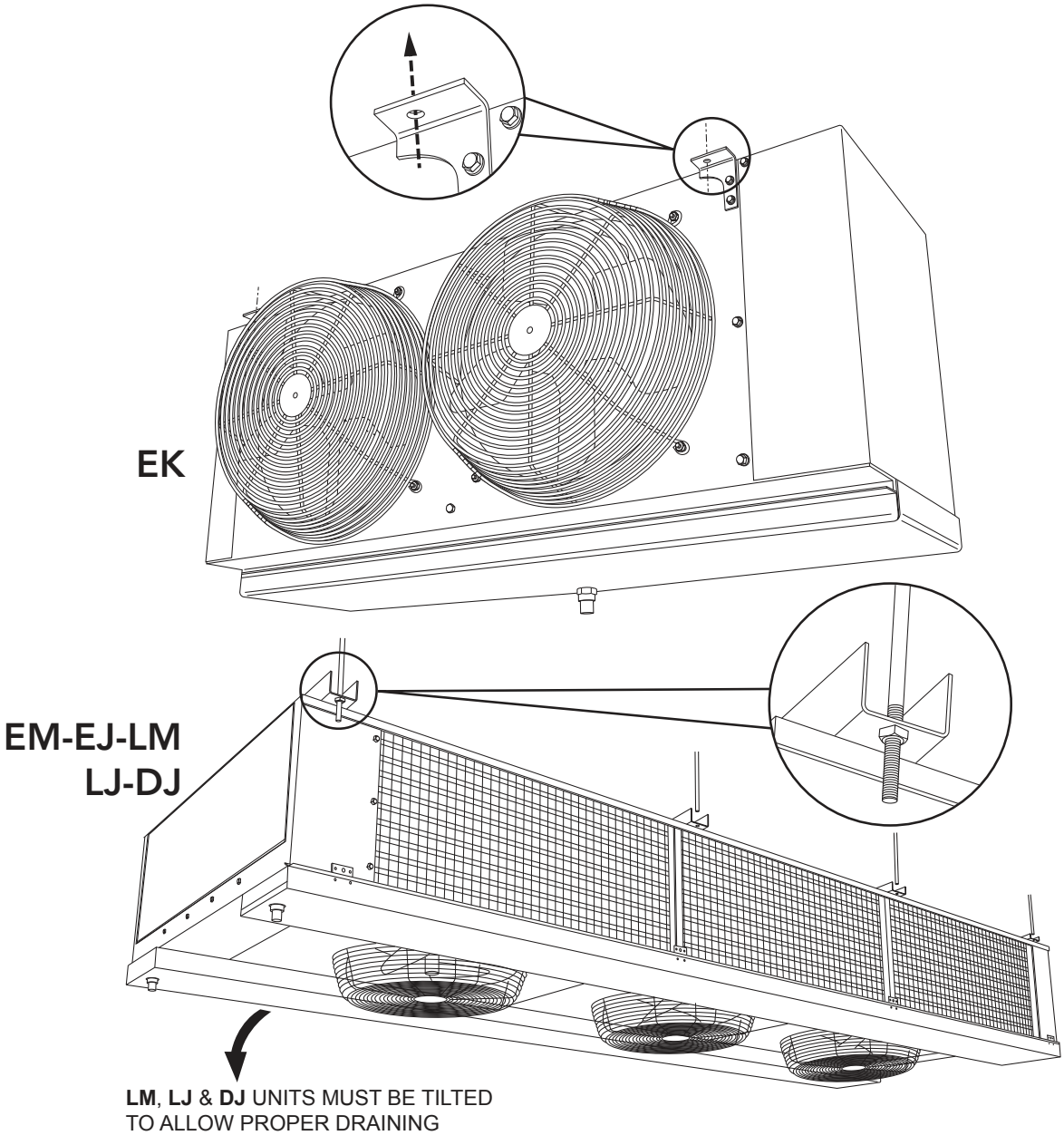


Figure 1 Securing unit to ceiling

5.1 STANDARD UNIT WEIGHTS (LB.)

MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT
EKA-1400	100	EKE-1300	110	EK*-1300	108
EKA-1600	110	EKE-1500	121	EK*-1500	118
EKA-1800	153	EKE-1700	168	EK*-1700	165
EKA-2100	167	EKE-2000	184	EK*-2000	180
EKA-2400	196	EKE-2200	216	EK*-2200	211
EKA-3000	214	EKE-2900	235	EK*-2900	230
EKA-3600	243	EKE-3400	267	EK*-3400	261
EKA-4200	264	EKE-4000	290	EK*-4000	284
EKA-5400	313	EKE-5000	344	EK*-5000	337
EKA-6300	361	EKE-6000	397	EK*-6000	388

* EKR/EKT

MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT
LMA-02200	221	LME-02200	268	LM*-02200	242
LMA-02800	236	LME-02800	279	LM*-02800	279
LMA-03300	257	LME-03300	310	LM*-03300	279
LMA-04400	394	LME-04400	394	LM*-04400	426
LMA-05600	420	LME-05600	504	LM*-05600	452
LMA-06600	462	LME-06600	567	LM*-06600	494
LMA-08400	625	LME-08400	625	LM*-08400	662
LMA-09900	672	LME-09900	811	LM*-09900	714
LMA-11200	824	LME-11200	977	LM*-11200	877
LMA-13200	872	LME-13200	1,038	LM*-13200	945

* LMG/LMH/LMR/LMT

MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT
EMA-02150	210	EME-02000	255	EM*-02000	230
EMA-02550	225	EME-02400	265	EM*-02400	245
EMA-03000	245	EME-02900	295	EM*-02900	265
EMA-04300	375	EME-04000	455	EM*-04000	405
EMA-05100	400	EME-04800	480	EM*-04800	430
EMA-06000	440	EME-05800	540	EM*-05800	470
EMA-07650	595	EME-07200	720	EM*-07200	630
EMA-09000	640	EME-08700	772	EM*-08700	680
EMA-10200	785	EME-09600	930	EM*-09600	835
EMA-12000	830	EME-11600	989	EM*-11600	900

* EMG/EMH/EMR/EMT

MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT
LJA-03300L	381	LJE-03200L	421	LJ*-03300L	381
LJA-03900L	396	LJE-03800L	436	LJ*-03900L	396
LJA-04800L	417	LJE-04700L	624	LJ*-04800L	417
LJA-06600L	584	LJE-06400L	624	LJ*-06600L	584
LJA-07900L	640	LJE-07700L	680	LJ*-07900L	640
LJA-09600L	682	LJE-09300L	762	LJ*-09600L	682
LJA-11800L	845	LJE-11500L	905	LJ*-11800L	845
LJA-14400L	892	LJE-14300L	1,012	LJ*-14400L	892
LJA-15800L	1,044	LJE-15800L	1,124	LJ*-15800L	1,044
LJA-19200L	1,092	LJE-19200L	1,252	LJ*-19200L	1,092
LJA-25400L	1,547	LJE-25000L	1,631	LJ*-25400L	1,644

* LJG/LJH/LJR/LJT

MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT
EJA-02900	370	EJA-02500L	370	EJE-02700	415
EJA-03600	385	EJA-03100L	385	EJE-03500	425
EJA-04500	405	EJA-03700L	405	EJE-04300	455
EJA-05900	595	EJA-05100L	595	EJE-05700	675
EJA-07200	620	EJA-06200L	620	EJE-07100	700
EJA-08900	660	EJA-07400L	660	EJE-08800	760
EJA-10800	875	EJA-09300L	875	EJE-10700	1,000
EJA-13500	920	EJA-11100L	920	EJE-13400	1,052
EJA-14300	1,125	EJA-12300L	1,125	EJE-17600	1,329
EJA-18000	1,170	EJA-14900L	1,170	EJE-22800	1,454
EJA-21800	1,454	EJA-18200L	1,454		
EJA-24800	1,600	EJA-19400L	1,600		

MODEL	SHIPPING WEIGHT
EJG/EJH/EJR/EJT-02900	390
EJG/EJH/EJR/EJT-03600	405
EJG/EJH/EJR/EJT-04500	425
EJG/EJH/EJR/EJT-05900	625
EJG/EJH/EJR/EJT-07200	650
EJG/EJH/EJR/EJT-08900	690
EJG/EJH/EJR/EJT-10800	910
EJG/EJH/EJR/EJT-13500	960
EJG/EJH/EJR/EJT-14300	1,175
EJG/EJH/EJR/EJT-18000	1,240
EJG/EJH/EJR/EJT-21800	1,454
EJG/EJH/EJR/EJT-24800	1,600

MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT	MODEL	SHIPPING WEIGHT
DJA-03300L	381	DJE-03200L	421	DJ*-03300L	381
DJA-03900L	396	DJE-03800L	436	DJ*-03900L	396
DJA-04800L	417	DJE-04700L	624	DJ*-04800L	417
DJA-06600L	584	DJE-06400L	624	DJ*-06600L	584
DJA-07900L	640	DJE-07700L	680	DJ*-07900L	640
DJA-09600L	682	DJE-09300L	762	DJ*-09600L	682
DJA-11800L	845	DJE-11500L	905	DJ*-11800L	845
DJA-14400L	892	DJE-14300L	1,012	DJ*-14400L	892
DJA-15800L	1,044	DJE-15800L	1,124	DJ*-15800L	1,044
DJA-19200L	1,092	DJE-19200L	1,252	DJ*-19200L	1,092
DJA-25400L	1,547	DJE-25000L	1,631	DJ*-25400L	1,631

* DJG/DJH/DJR/DJT

5.2 R-448A OPERATING CHARGES (LB.)

MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE
EKA-1400	3.48	EKE-1300	5.5	EK*-1300	3.48
EKA-1600	5.24	EKE-1500	8.65	EK*-1500	5.24
EKA-1800	4.24	EKE-1700	6.7	EK*-1700	4.24
EKA-2100	6.38	EKE-2000	10.52	EK*-2000	6.38
EKA-2400	6.14	EKE-2200	9.67	EK*-2200	6.14
EKA-3000	9.21	EKE-2900	15.2	EK*-2900	9.21
EKA-3600	8.01	EKE-3400	12.64	EK*-3400	8.01
EKA-4200	12.03	EKE-4000	19.87	EK*-4000	12.03
EKA-5400	14.86	EKE-5000	24.55	EK*-5000	14.86
EKA-6300	17.71	EKE-6000	29.23	EK*-6000	17.71

* EKR/EKT

MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE
EMA-02150	3.97	EME-02000	6.09	EM*-02000	3.97
EMA-02550	5.31	EME-02400	8.5	EM*-02400	5.31
EMA-03000	7.96	EME-02900	12.57	EM*-02900	7.96
EMA-04300	7.53	EME-04000	11.52	EM*-04000	7.53
EMA-05100	10.03	EME-04800	16.05	EM*-04800	10.03
EMA-06000	15.05	EME-05800	23.72	EM*-05800	15.05
EMA-07650	14.76	EME-07200	23.6	EM*-07200	26.57
EMA-09000	22.11	EME-08700	34.88	EM*-08700	39.87
EMA-10200	20.65	EME-09600	32.22	EM*-09600	37.21
EMA-12000	30.98	EME-11600	48.83	EM*-11600	55.82

* EMG/EMH/EMR/EMT

MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE	MODEL	SHIPPING WEIGHT
EJA-02900	6.6	EJA-02500L	6.6	EJE-02700	5.6
EJA-03600	8.79	EJA-03100L	8.79	EJE-03500	7.82
EJA-04500	13.2	EJA-03700L	13.2	EJE-04300	11.54
EJA-05900	12.47	EJA-05100L	12.47	EJE-05700	10.59
EJA-07200	16.63	EJA-06200L	16.63	EJE-07100	14.76
EJA-08900	24.94	EJA-07400L	24.94	EJE-08800	21.82
EJA-10800	24.45	EJA-09300L	24.45	EJE-10700	21.7
EJA-13500	36.68	EJA-11100L	36.68	EJE-13400	32.1
EJA-14300	32.27	EJA-12300L	32.27	EJE-17600	42.35
EJA-18000	48.42	EJA-14900L	48.42	EJE-22800	52.63
EJA-21800	60.16	EJA-18200L	60.16		
EJA-24800	80.2	EJA-19400L	80.2		

MODEL	OPERATING CHARGE
EJG/EJH/EJR/EJT-02900	6.6
EJG/EJH/EJR/EJT-03600	8.79
EJG/EJH/EJR/EJT-04500	13.2
EJG/EJH/EJR/EJT-05900	12.47
EJG/EJH/EJR/EJT-07200	16.63
EJG/EJH/EJR/EJT-08900	24.94
EJG/EJH/EJR/EJT-10800	24.45
EJG/EJH/EJR/EJT-13500	36.68
EJG/EJH/EJR/EJT-14300	32.27
EJG/EJH/EJR/EJT-18000	48.42
EJG/EJH/EJR/EJT-21800	60.16
EJG/EJH/EJR/EJT-24800	80.2

MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE	MODEL	SHIPPING WEIGHT
LMA-02200	3.7	LME-02200	4.77	LM*-02200	3.7
LMA-02800	5.55	LME-02800	8.13	LM*-02800	5.55
LMA-03300	7.45	LME-03300	10.03	LM*-03300	7.45
LMA-04400	7.01	LME-04400	9.06	LM*-04400	7.01
LMA-05600	10.52	LME-05600	15.34	LM*-05600	10.52
LMA-06600	14.03	LME-06600	19	LM*-06600	14.03
LMA-08400	15.49	LME-08400	22.6	LM*-08400	15.49
LMA-09900	20.65	LME-09900	27.91	LM*-09900	20.65
LMA-11200	19.92	LME-11200	26.6	LM*-11200	19.92
LMA-13200	26.55	LME-13200	34.54	LM*-13200	26.55

* LMG/LMH/LMR/LMT

MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE
LJA-03300L	10.57	LJE-03200L	7.94	LJ*-03300L	10.57
LJA-03900L	14.08	LJE-03800L	10.13	LJ*-03900L	14.08
LJA-04800L	21.14	LJE-04700L	15.83	LJ*-04800L	21.14
LJA-06600L	19.97	LJE-06400L	14.95	LJ*-06600L	19.97
LJA-07900L	26.6	LJE-07700L	19.14	LJ*-07900L	26.6
LJA-09600L	39.89	LJE-09300L	29.91	LJ*-09600L	39.89
LJA-11800L	39.11	LJE-11500L	28.11	LJ*-11800L	39.11
LJA-14400L	58.7	LJE-14300L	44.03	LJ*-14400L	58.7
LJA-15800L	51.63	LJE-15800L	37.12	LJ*-15800L	51.63
LJA-19200L	77.45	LJE-19200L	58.11	LJ*-19200L	77.45
LJA-25400L	96.25	LJE-25000L	72.19	LJ*-25400L	96.25

* LJG/LJH/LJR/LJT

MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE	MODEL	OPERATING CHARGE
DJA-03300L	10.57	DJE-03200L	7.94	DJ*-03300L	10.57
DJA-03900L	14.08	DJE-03800L	10.13	DJ*-03900L	14.08
DJA-04800L	21.14	DJE-04700L	15.83	DJ*-04800L	21.14
DJA-06600L	19.97	DJE-06400L	14.95	DJ*-06600L	19.97
DJA-07900L	26.6	DJE-07700L	19.14	DJ*-07900L	26.6
DJA-09600L	39.89	DJE-09300L	29.91	DJ*-09600L	39.89
DJA-11800L	39.11	DJE-11500L	28.11	DJ*-11800L	39.11
DJA-14400L	58.7	DJE-14300L	44.03	DJ*-14400L	58.7
DJA-15800L	51.63	DJE-15800L	37.12	DJ*-15800L	51.63
DJA-19200L	77.45	DJE-19200L	58.11	DJ*-19200L	77.45
DJA-25400L	96.25	DJE-25000L	72.19	DJ*-25400L	96.25

* DJG/DJH/DJR/DJT

6. INSTALLATION

6.1 COMPLETE PRE-INSTALLATION INSPECTION

Check all items against the bill of lading to make sure all crates and boxes have been received. Check unit for possible damage incurred during shipment. Check for concealed damage. If there is any shortage or damage, **file a freight claim immediately with the transport company**. Do not return damaged equipment to the factory without prior approval. A Return Material Authorization (RMA) must be obtained in advance. **Items returned without an RMA label will be refused**. Also verify that the nameplate electrical requirements match the available power supply.

All RefPlus units are pressurized with dry air. A lack of pressure does not indicate a leak. Check the coil for possible leaks before installing or returning the unit.

The following essential rules should be complied with when installing the unit:

- All circuits, including controls and safety switches, must be correctly connected according to the wiring diagram supplied with the unit and/or found in this manual.
- The factory wiring cannot be modified without RefPlus' written approval.
- All units and equipment must be installed with the specified clearances.
- System piping must be in accordance with proper refrigeration practices.
- Inert gas must be charged into the system piping during brazing.

6.2 INSTALLATION LOCATION

All units should be installed flush against the ceiling. The unit must be level in all directions to ensure proper drainage of condensate. Refer to Figure 2 and Figure 3 for unit clearance information.

When deciding on the location of the unit, consider the following:

- Location of aisle racks
- Location relative to compressor for minimum pipe runs
- Location of condensate drains for minimum run
- The air pattern must cover the entire room
- Never locate units over doors or door openings
- Allow sufficient space between rear of unit and wall to permit free return of air

IMPORTANT: Avoid placement of the unit directly above doors and door openings where low temperature is being maintained. Position the unit so the discharge air blows above the doors. Install a baffle if door extends above the blower level. Leave space equal to unit height between bottom of unit and product. **Do not stack product in front of fans**.
EK, EM and EJ units should be located in a position where the air discharge is towards the door.

The coil face on units should be away from the wall by:

- EK, EM & EK models: 1/2 coil unit height minimum - unit height recommended
- LM models: 6 ft minimum - 40 ft maximum
- LJ models: 10 ft minimum - 40 ft maximum
- DJ models: unit height recommended

NOTE: Units with electric defrost require a minimum clearance equal to the width (W) of the unit at the left end when facing the fans to allow removal of defrost heaters, as shown in Figure 2 and Figure 3.

6.3 MOUNTING

Most units can be mounted with either bolts or steel rod hangers. When mounting unit to ceiling, use Table 1 below to determine proper rod or bolt size. Use steel rods with a minimum 9 Kpsi. This information should be used as reference only.

STEEL ROD OR BOLT SIZE	MAXIMUM WEIGHT PER ANCHOR POINT
5/16"	200 lbs
3/8"	300 lbs
1/2"	550 lbs

Table 1 Bolt and rod size chart

The evaporator must be mounted level for proper condensate draining. Adequate support must be provided to hold the weight of the unit.

NOTE: The area above the unit must be sealed or accessible to facilitate hand cleaning without the use of tools in order to comply with National Sanitation Foundation (NSF) Standard 7.

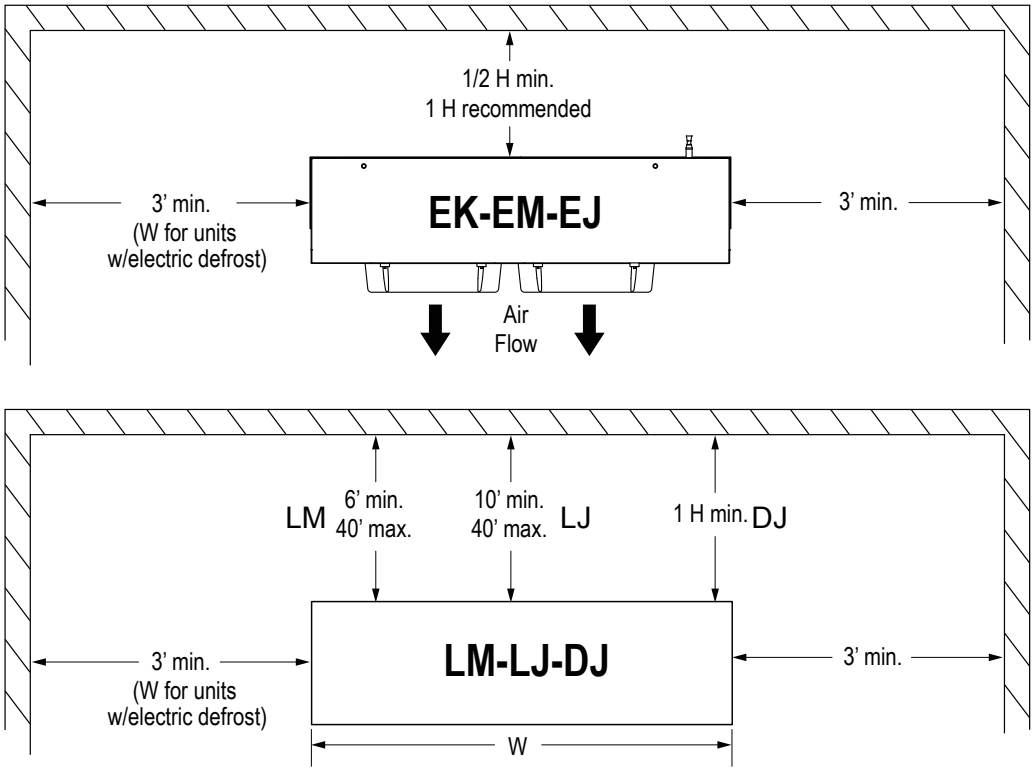


Figure 2 Single-evaporator clearance (H=Height of unit - W=Width of unit)

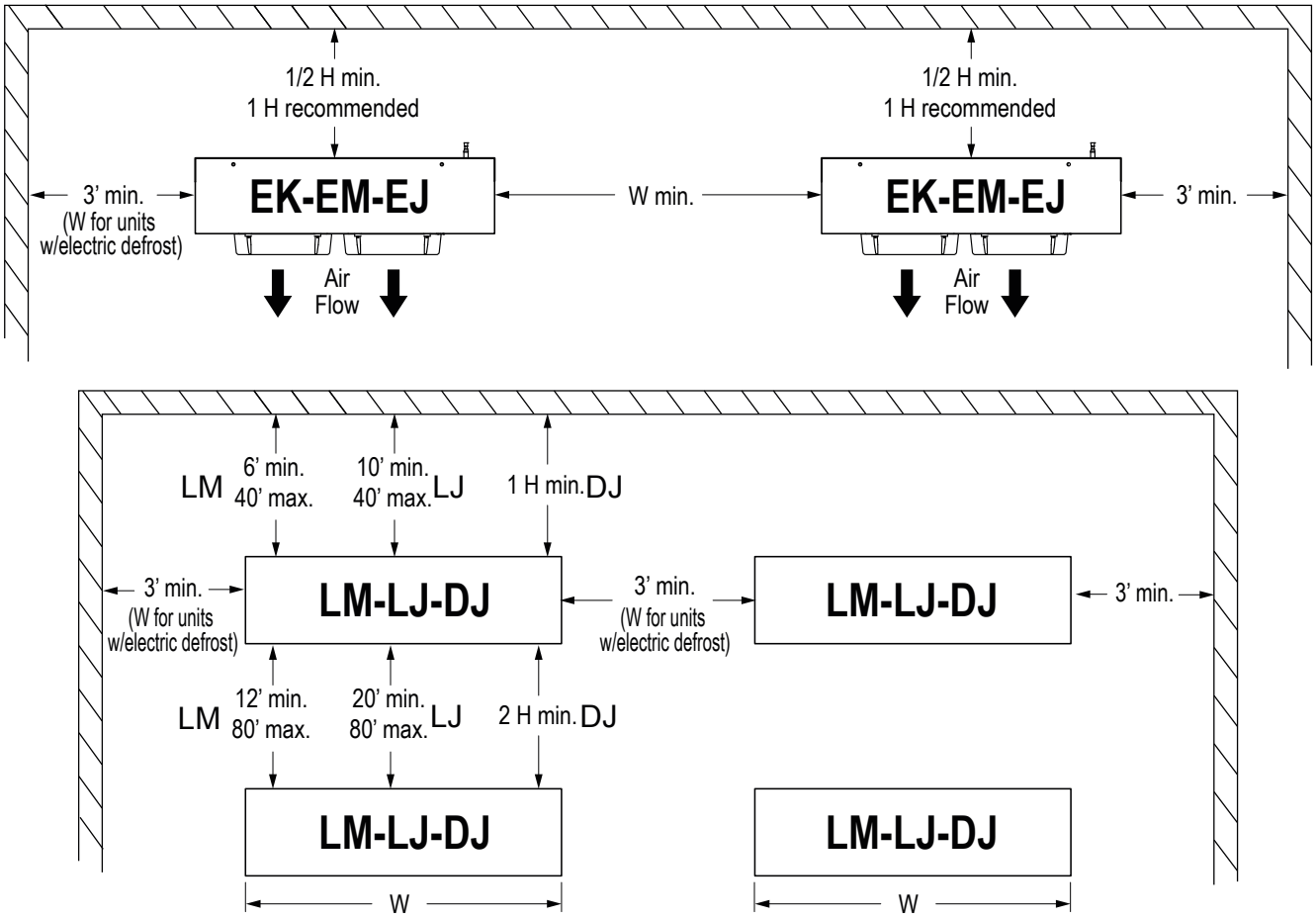


Figure 3 Multiple-evaporator clearance (H=Height of unit - W=Width of unit)

6.4 CONNECTING DRAIN LINE

For all evaporators, a drain line union is recommended for ease of installation and future servicing and should be located in close proximity to the drain pan.

EK, LM, LJ & DJ: A 7/8" ID removable drain coupling is supplied with each unit.

EM & EJ are supplied with 1 1/4" FPT connections.

FOR ALL MODELS, connect the drain line as follows:

1. Replace the rubber gasket to prevent condensate leakage.
2. Locate the union as close to the drain pan as possible.
3. Hand tighten the coupling as shown in Figure 4. **DO NOT** use wrench to tighten coupling in place as this could damage the gasket and cause leaks. Once the coupling is in place, connect the drain pipe and tighten pipe using two wrenches as shown. The use of two wrenches will prevent the coupling from twisting and damaging the unit.

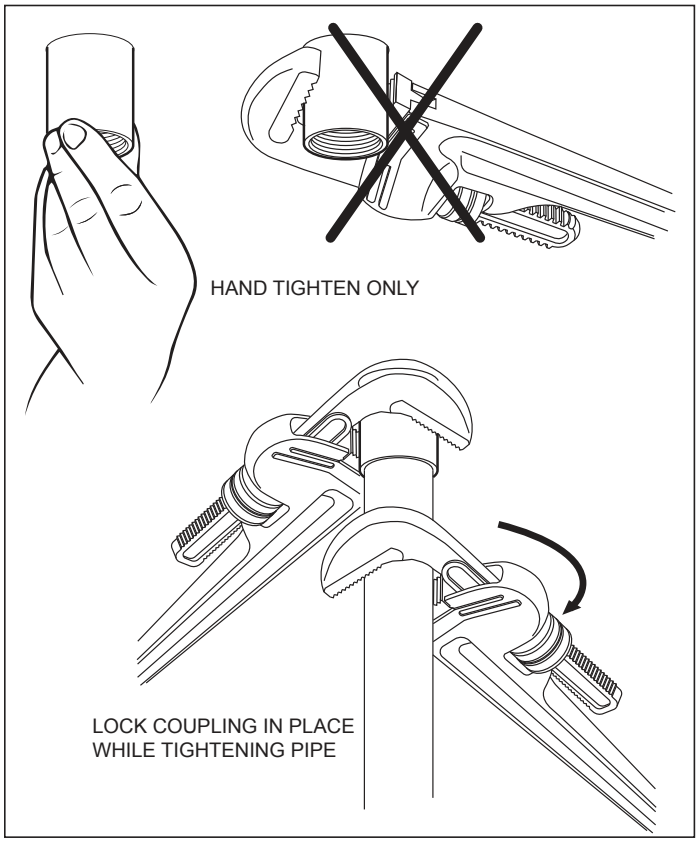


Figure 4 Drain pan coupling

4. Sharply pitch the drain line and exit it through the cooler with a short run.
5. Insulate and seal the drain line where it passes through the wall.
6. Locate the drain traps in warm ambient air temperature to prevent freeze-up.

Drain traps on low temperature units must be outside of refrigerated enclosures. Properly protected from freezing, copper or steel pipes should be used. Food approved plastic can also be used for medium temperature coolers above 35°F (2°C). The drain line must have a minimum of 1/4'' per foot pitch for proper drainage. The unit must be perfectly level in two directions. The drain line should be at least as large as the evaporator drain connection. All plumbing connections should be made in accordance with local plumbing codes. All condensate drain lines must be trapped and run to an open drain. They must never be connected directly to the sewer system. Traps in the drain lines must be in a warm ambiance.

We recommend a trap on each evaporator. Traps located outside the building must be insulated and wrapped with a drain line heater. When installing the heater, be sure to avoid overlapping. The heater must be permanently energized. A heat input of at least 20 W per linear foot of drain line for a 0°F (-18°C) room and 30 W per linear foot of drain line for a -20°F (-29°C) room should be satisfactory. **Always trap drain lines individually to prevent vapour migration.**

6.5 CONNECTING REFRIGERANT LINES

All refrigerant system components must be installed in accordance with applicable local and national codes using proper engineering practices. Refer to the piping diagrams on page 36.

Use top quality refrigeration tubing that is internally free of dirt, humidity or other contaminants. Unsealed tubing should not be used. Long radius elbows are recommended.

Dry nitrogen must be swept through the lines while joints are brazed to avoid oxidation and carbon deposits.

IMPORTANT: A calibrated pressure gauge and regulator must always be used with nitrogen gas cylinders.
All external piping must be well supported. The unit will not support external piping or valves.

If the condition arises where the suction line must be raised to a point higher than the suction connection on the unit, a suction line trap must be installed on the unit.

Horizontal suction lines should slope away from the evaporator toward the compressor. Leak check and evacuate the system using a two-stage deep vacuum pump. Pull and hold for 24 hours a 500 micron vacuum.

6.6 CONNECTING THE EXPANSION VALVE

All units are supplied with a sweat expansion valve connection. Expansion valves are field supplied or may have been installed at the factory (optional).

All units require the use of an externally equalized expansion valve and are provided with a 1/4" OD equalizer line.

Check the operation of the expansion valve after the system has reached the desired cooler temperature. If the coil is not receiving enough refrigerant, reduce the superheat setting on the expansion valve.

To ensure unit performance, the expansion valve must be set at the proper superheat and at the lowest temperature in which the system is expected to operate.

6.7 BULB LOCATION AND INSTALLATION

The location and installation of the bulb is extremely important to the proper system performance and care should be taken with its final location. Accepted principles of good suction line piping should be followed to provide a bulb location that will give the best possible valve control.

The bulb should be securely fastened to a clean straight and horizontal section of the suction line at the evaporator outlet. This will ensure good thermal contact between the bulb and the suction line for satisfactory expansion valve control. If the bulb cannot be located in that manner, it may be located on a descending vertical line only. The bulb should never be located in a trap or downstream of a trap in the suction line. Liquid refrigerant or mixture of liquid refrigerant and oil boiling out of the trap will falsely influence the temperature of the bulb and result in poor valve control.

On suction lines 7/8” OD and larger, the surface temperature may vary slightly around the circumference of the line. On these lines, it is generally recommended that the bulb be installed at 4 or 8 o’clock on the side of the horizontal line, and parallel with respect to the direction of flow. On smaller lines the bulb may be mounted at any point around the circumference, however locating the bulb on the bottom of the line is not recommended as an oil-refrigerant mixture is generally present at that point. Figure 5 shows both installation configuration. Certain conditions, specific to a particular system, may require a different bulb location than normally recommended. In these cases, the proper bulb location may be determined by trial.

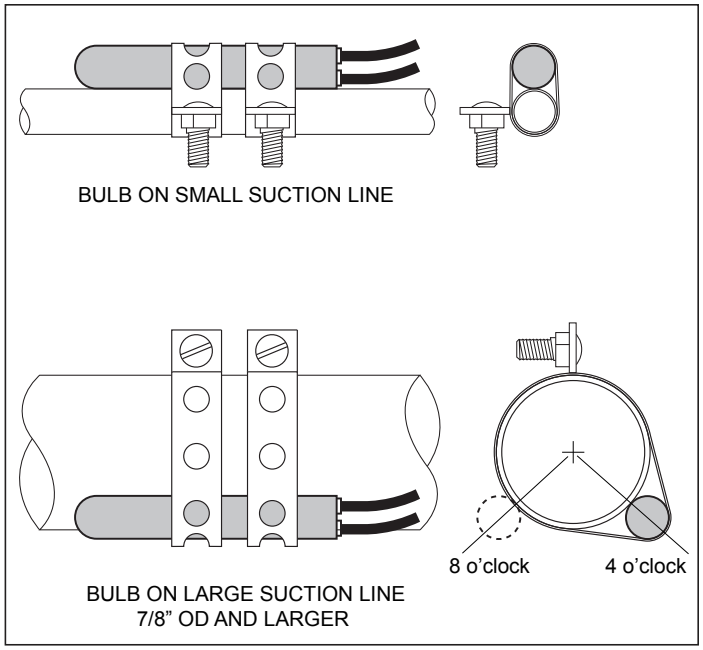


Figure 5 Bulb installation

On multiple evaporator installations, the piping should be arranged so that the flow from any valve cannot affect the bulb of another, as shown in Figure 6. Approved piping practices including the proper use of traps ensures individual control for each valve without the influence of refrigerant and oil flow from other evaporators.

The vertical riser extending to the height of the evaporator prevents refrigerant from draining by gravity into the compressor during the off-cycle.

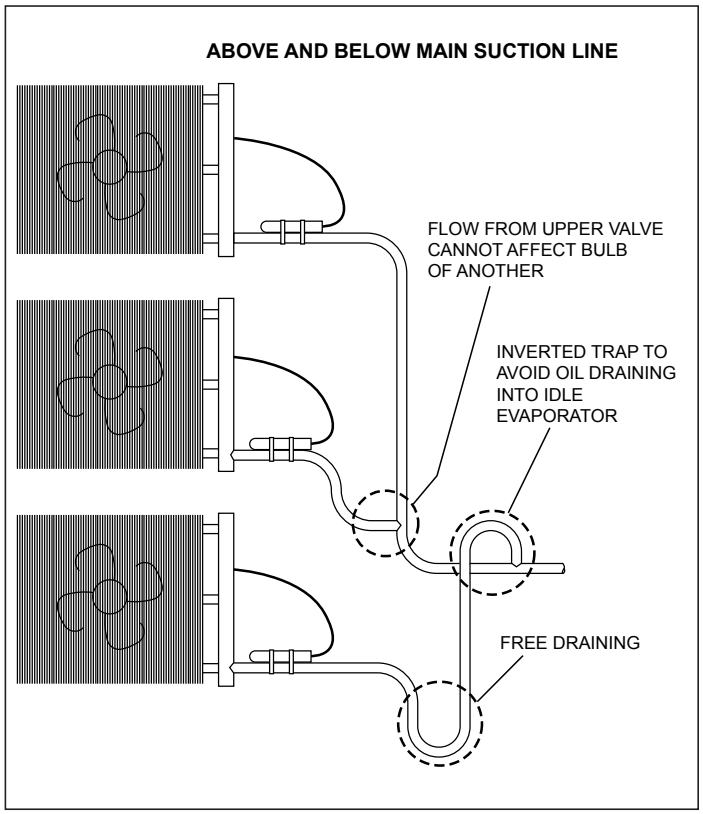


Figure 6 Bulb installation on multiple evaporator configuration

6.8 SUCTION LINE CONSTRUCTION

RECOMMENDED VELOCITY FOR GOOD OIL RETURN OF POE WITH HFC - FPM (M/S)

FPM	Minimum Horizontal	Minimum Vertical	Design	Maximum
Condensate	NA	NA	≤ 100 (0.5)	150 (0.8)
Liquid	NA	NA	≤ 300 (1.5)	300 (1.5)
Suction	500 (2.5)	900 (4.6)	1000 (5.1) - 3000 (15.2)	4000 (20.3)
Discharge	500 (2.5)	900 (4.6)	2000 (10.2) - 3000 (15.2)	3500 (17.8)
HG Defrost	500 (2.5)	900 (4.6)	1000 (5.1) - 2000 (10.2)	3000 (15.2)

Table 2 Recommended velocity for good oil return of POE with HFC - FPM (m/s)

IMPORTANT: A calibrated pressure gauge and regulator must always be used with nitrogen cylinders.

The suction line must be sized to maintain proper line velocities with a practical line pressure drop. It is usually equal to 2°F (1.1°C). To ensure proper oil return, all horizontal lines must be sloped down toward the compressor with a minimum pitch of 1/4" (6.4 mm) per 10 ft (3 m).

An access fitting must be installed (when not part of the evaporator) on the evaporator suction line to read an accurate suction pressure for superheat adjustment.

In situations where it is necessary for the suction line to rise, an oil trap must be installed at the bottom of the riser as shown in Figure 7, page 13. To ensure oil return through a riser in the suction line, a velocity of no less than 1000 FPM (5.1 m/s) is required. When a system has capacity variation or unloaders, a double riser when at less than 50% capacity may be necessary to keep the velocity at a minimum of 900 FPM (4.6 m/s). You can drop one size for suction riser to lift the oil. A trap should be provided for each additional 20 ft (6 m) of riser. See Figure 8.

Avoid oil and refrigerant migration between active and inactive evaporators in a common suction system. When multiple evaporators are connected to a common suction line, it must enter from the top. The first evaporator suction connection should have an inverted trap as shown in Figure 9.

Suction lines should not be exposed to heat or the sun. The line must be properly insulated if it is necessary to run suction line outside of the building or through heated areas. The suction line must be insulated in any situation where the pipe may sweat or freeze.

If isolation valves are installed on the suction lines, full port ball valves should be used.

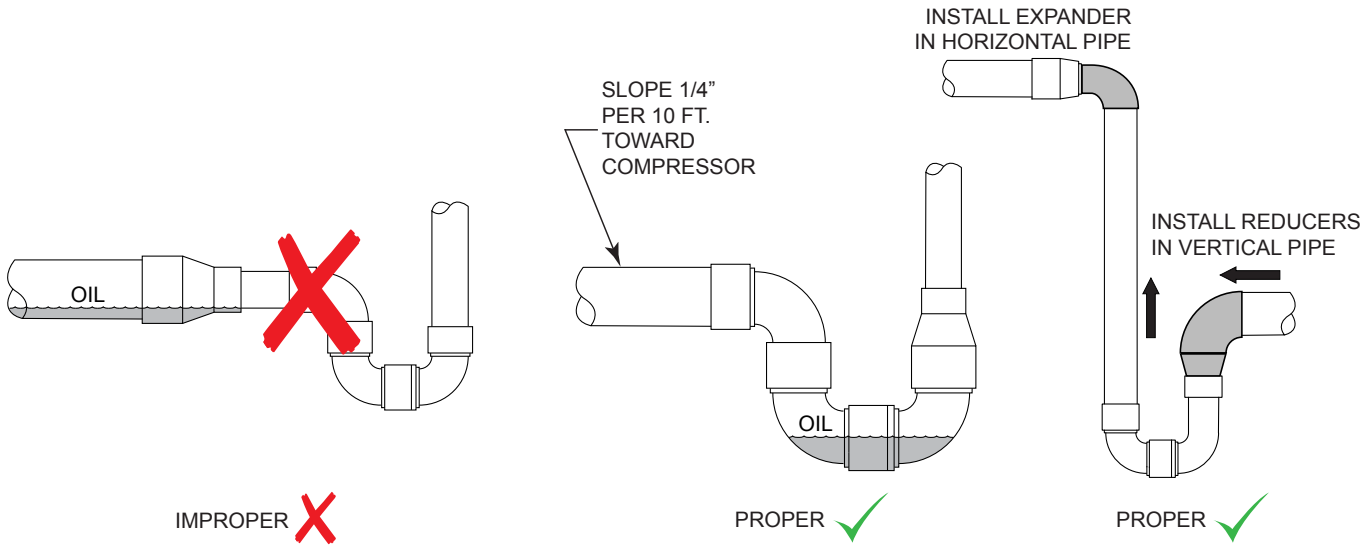


Figure 7 Suction oil trap construction

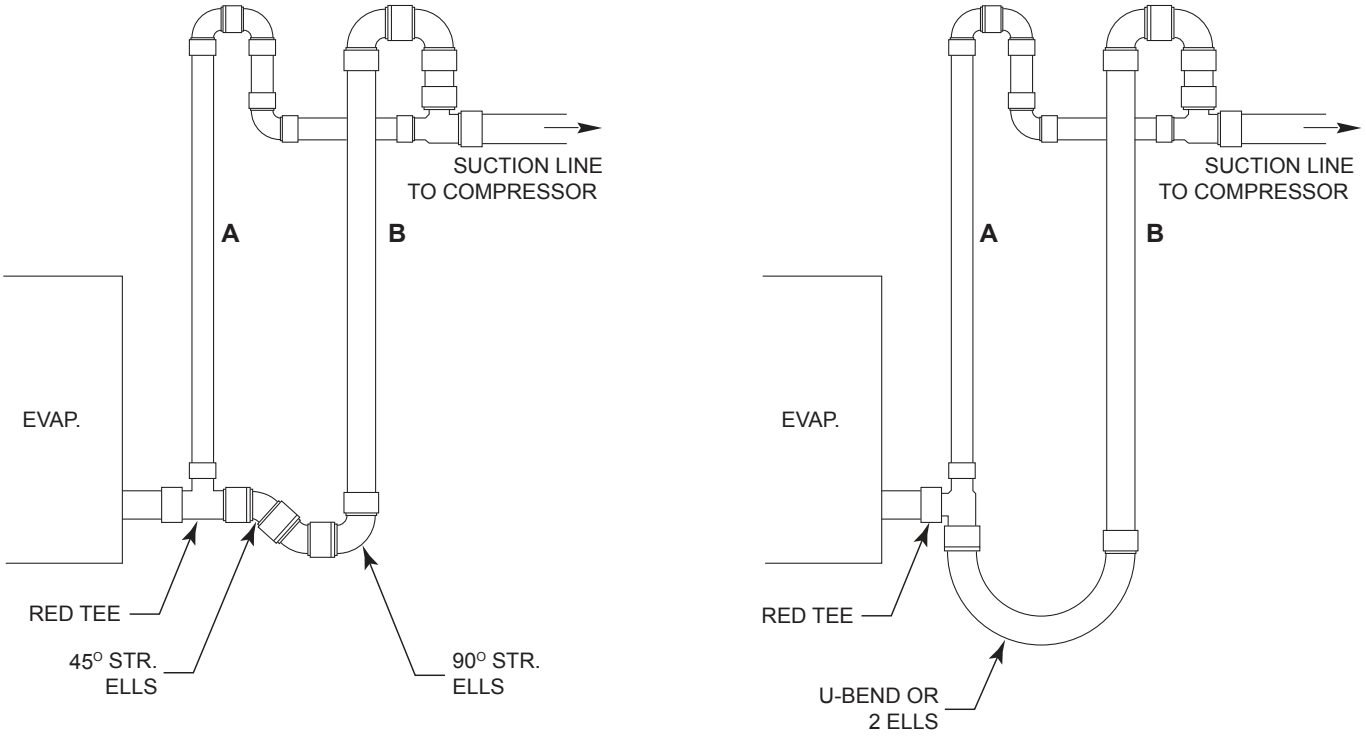


Figure 8 Double suction riser

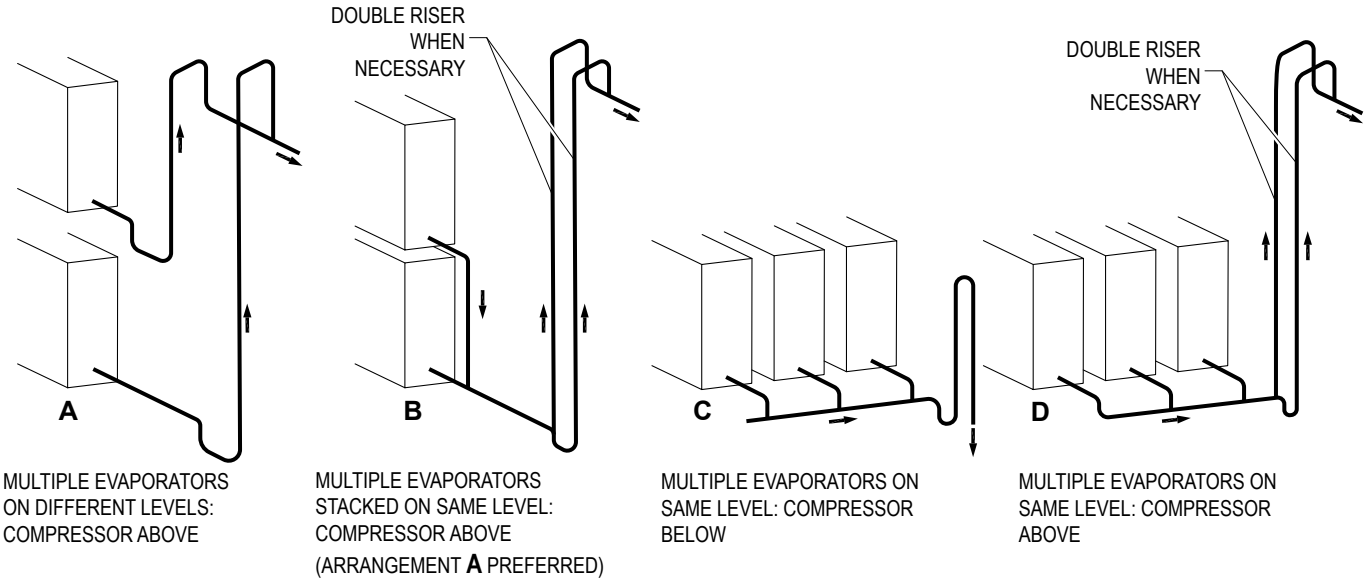


Figure 9 Multiple evaporator suction line construction

6.9 EXTERNAL EQUALIZER LOCATION

The purpose of the external equalizer is to sense the pressure in the suction line at the bulb location and transmit it to the TEV diaphragm. This usually means installing the external equalizer immediately downstream from the bulb. This ensures the correct pressure is signalled to the TEV.

In some situations this “ideal” location may not be possible. In these cases, an alternate location, such as at B or C (see Figure 10), could be used. However, the pressure at these locations must be nearly identical to the pressure in the line where the bulb is located.

In other words, locations B and C are acceptable as long as these pressures are essentially the same as A when the system is operating at full load. In the past, there has been concern about installing the external equalizer “up-stream” from the bulb. This was due to the possibility of refrigerant leaking past the TEV push rods, passing through the equalizer line and into the suction line, thus falsely influencing the TEV bulb temperature.

6.10 FIELD WIRING

WARNING: All system wiring must be done in accordance with applicable codes and local ordinances.

All internal wiring of fan motors, tubular heaters and combination defrost termination fan delay control have been factory connected. Before operating the unit, always double-check all wiring connections, including the factory wired terminals. Factory connections may vibrate loose during transport.

Wiring diagrams are shown at the end of this manual for reference only. **Always** refer to the wiring diagram supplied with your specific unit.

When field wiring the unit, consider the following:

- All wiring connections terminate on terminal block(s) in the wiring compartment and are clearly labeled.
- The serial tag on the unit is identified with the electrical characteristics for wiring the unit.
- Consult the wiring diagram in the unit for proper connections.
- Wires should be copper conductor only and of the proper size in order to handle the connected electrical load.
- The unit must be grounded.
- For systems with multiple evaporator, the defrost termination controls should be wired in series. Follow the wiring diagrams for multiple evaporators carefully.
- Multiple evaporator systems should operate off of one thermostat.
- If a remote defrost timer is used, the timer should be located outside the refrigerated space.

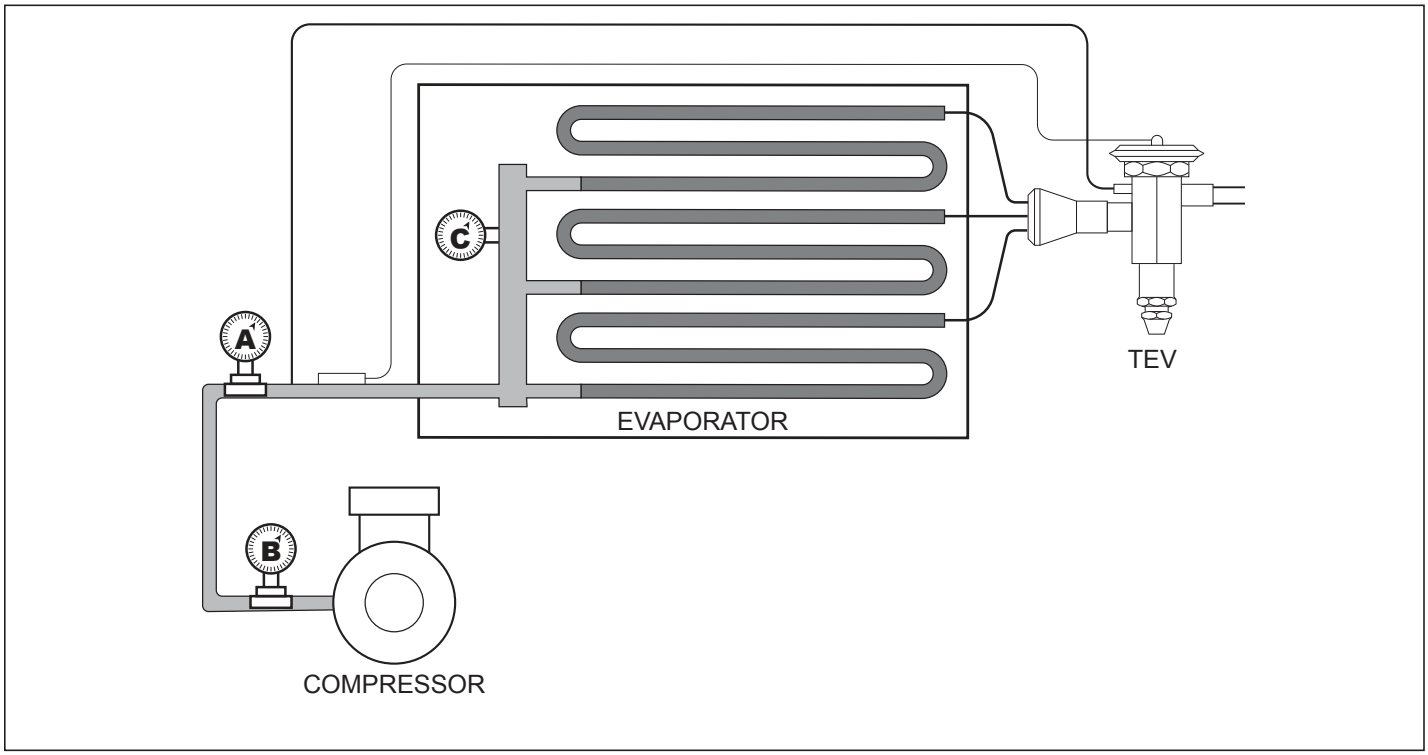


Figure 10 Location of TEV external equalizer

7. START-UP

CAUTION: Before starting unit, be sure wire fan guards are secured in place over each fan.

7.1 LEAK TESTING AND EVACUATION

Leak testing and evacuation must be done in accordance with local and national codes.

Once all refrigerant connections are made, leak test all joints before charging the system with refrigerant. After leak testing, all moisture and non-condensable gas must be evacuated from the system. Attach high vacuum line pump and gauge on both high and low pressure sides of the system. A minimum vacuum level of 500 micron is required to effectively remove moisture.

Be sure all valves such as compressor, hot gas, receiver, and liquid solenoid valves are open. Break the vacuum in the system with the refrigerant to be used. Always charge the refrigerant into the system through a new 16 cu. in drier (field supplied) in the charging manifold line.

7.2 FAN MOTORS

Fan motors may cycle off on automatic thermal protection if the coils are frozen or blocked. Check the supply voltage at the motor leads if motor is inoperable. Also check direction of rotation of the motors.

AWEF registered EJ, LJ & DJ models are limited to -30ºF room temperature and -40ºF suction. Minimum fan speed is set to 60% of its maximum. For air defrost units, minimum fan speed is 50%.

IMPORTANT! For units equipped with variable-speed ECM Blue motors, current provided to fan motors must be applied at all times, specially during winter operation. Refer to wiring diagram 13.14 on page 35 for more details.

7.3 FAN DELAY / DEFROST TERMINATION CONTROL

This control is located on the coil plate and senses the coil temperature. To provide fan delay, the defrost thermostat must be turned off.

To set the defrost termination / fan delay thermostat:

1. Set the cut-in temperature to approximately 50-60ºF. This will be your high event or the limit defrost temperature.
2. Set the differential temperature to approximately 20-30ºF. This will be your low event or fan cut-in temperature. The idea is to have your evaporator coil temperature below 32ºF in order to avoid water carry over.

Example:
Cut-in defrost temperature=**55ºF** (End defrost)
Cut-in fan temperature=**30ºF** (Start fans)
Differential= **25ºF** (55-30=25)

7.4 FAN DELAY DRAIN PAN CONTROL

The fan delay drain pan control senses the general coil temperature.

- With temperature rise, the fan delay thermostat de-energizes the fan and energizes the electric pan heaters.
- After defrost cycle, the coil temperature drops below the freezing point and the fan delay thermostat energizes the fan motor and de-energizes the heaters.
- Defrost timer must be set long enough to completely melt the ice in the unit. Set the thermostat at 20 to 25ºF and the differential at minimum.

IMPORTANT: After correcting a faulty defrost cycle, it is essential that the coil, drain pan and unit be free and clear of ice before placing the unit back on automatic operation.

7.5 ADJUSTING EVAPORATOR PRESSURE AND SUPERHEAT

What is Glide:

Understanding Glide is the key to maintaining the desired temperature and protecting the compressor.

To reach EPA and Environment Canada's mandated lower global warming potential (GWP) levels, the commercial refrigeration industry has increasingly turned to refrigerant blends. These blends are non-toxic, non-flammable and operate within the typical commercial refrigeration operating pressures.

Many technicians are accustomed to using refrigerants that act as a single component with a boiling temperature that doesn't change within the evaporator. But with zeotropic refrigerant blends, the temperature in the evaporator will be colder at the start of the coil than at the end. Simply put, the differences in these temperatures is the **Glide**.

Refrigerant Blends and Glide:

Refrigerant blends such as R-404A, R-407A, R-407C, R-407F, R-448A and R-449A are a mixture of components that retain their individual evaporating and condensing points.

With R-404A, the refrigerant glide is approximately 1ºF and can generally be ignored.

With R-407A, R-407C, R-407F, R-448A and R-449A, refrigerant glide is much higher (6-10˚F) and yields higher dew point condensing temperatures in comparison to R-404A for equivalent performance

Why Glide Matters:

Because different components in a blend boil at different temperatures, the temperature in the coil will vary as the mixture boils. If the expansion valve adjustment isn't made using the **Dew Point**, two things can happen. FIRST, the liquid may not vapourize before reaching the compressor, which can cause inefficiency and lead to compressor damage. SECOND, the blend may completely boil part way through the evaporator, leading to a loss of efficiency and required fixture temperature.

Setting Evaporator Pressure:

As an example, let say we want to achieve an average coil temperature of 20°F (4 in Table 3). Using a temperature-pressure chart as reference such as the example in Table 3, now that we can begin by setting the Pressure to 51 psig (item 1).

Setting Evaporator Superheat:

In order to set the superheat, find the **Dew Point** temperature corresponding to the coil pressure. The evaporator coil pressure and dew temperature are shown by 1 and 2 in the chart below. To get superheat, compare the dew temperature from the chart to the actual temperature of the evaporator outlet piping. The difference in these two temperatures is the **superheat**. In this example, when the pressure is 51 psig and the pipe temperature is 30 degrees, the superheat will be 30 minus 25, or 5 degrees. As you continue to take temperature readings, you can adjust the superheat and pressure as needed until you've achieved the desired coil temperature.

Note: In the absence of specific manufacturer recommendations, a 4 to 6° F superheat for low temperature and 6 to 8° F for medium temperature is recommended.

Note: When setting superheat in a system using a refrigerant with glide, remember that pressure is constant throughout the evaporator while the temperature will change during boiling in the evaporator.

Adjusting for Glide:

When adjusting pressure and superheat, your goals are to achieve the desired temperature, maximize coil efficiency, and protect the compressor for long service life. It all starts by looking at the Pressure-Temperature (PT) chart included with your refrigerant or any up-to-date refrigerants PT Chart.

PRESSURE	TEMPERATURE		
	AVERAGE	BUBBLE	DEW
(PSIG)	°F		
45	15	10	20
46	16	11	21
47	17	12	22
48	18	12	23
49	18	13	24
50	19	14	24
1 51	**4 20**	**3 15**	**2 25**
52	21	16	26
53	22	16	27
54	22	17	28
55	23	18	28

Table 3 Example of pressure-temperature chart

8. DEFROST SYSTEM

IMPORTANT: For all EJ series models, at medium temperature, fans must run at **low speed** when there is no cooling demand or when defrost is on. This will prevent any water blow over.

8.1 AIR DEFROST UNITS

Fan motors run continuously and a defrost time clock, or low-pressure setting, stops the compressor when defrost is required.

NOTE: The unit must not be in operation more than 16 hours per day.

8.2 ELECTRIC DEFROST UNITS

A time clock starts the defrost process by stopping the fan and energizing the heaters. When the defrost thermostat resets the time clock, it de-energizes the heaters and re-starts the fan motors.

8.3 REVERSE-CYCLE HOT-GAS DEFROST UNITS

Reverse-cycle defrost systems introduce compressor discharge gas through the suction line during defrost. The amount of gas introduced is controlled by a solenoid bypass valve and a gas defrost time clock.

Condensed refrigerant is relieved through a check valve. The check valve bypasses the expansion valve leading to the liquid line which has reduced pressure. The drain pan is warmed by the entering hot gas to avoid freezing. Defrost is initiated and terminated by the time clock.

NOTE: A minimum of 4 evaporators is required for an efficient operation.

NOTE: The use of a suction to liquid heat exchanger is recommended.

8.4 THREE-PIPE HOT-GAS DEFROST UNITS

During defrost, compressor discharge gas is introduced in a separate hot gas line. The amount of gas introduced is controlled by a solenoid bypass valve and a gas defrost time clock.

To avoid excessive accumulation of liquid in the suction accumulator, a heat exchanger is recommended. The drain pan is warmed by the entering hot gas to avoid freezing. The time clock cycles fan motors, liquid and hot gas solenoids.

NOTE: A minimum of 3 evaporators is required for an efficient operation. Special engineering is required for a 1 or 2 evaporator configuration. Please contact RefPlus' Sales-Engineering department for proper selection.

NOTE: A field-installed pressure regulating valve may be required on low temperature systems to control compressor crankcase pressure.

9. SERVICE

9.1 INITIAL INSPECTION

After the system has been charged and has operated for at least two hours at normal operating conditions without any indication of malfunction, it should be allowed to operate overnight on automatic controls. Then a thorough inspection of the unit operation should be made as follows:

1. Check for any vibration in the unit.
2. Check liquid line sight glass and proper operation of expansion valve. If additional refrigerant seems to be required, leak test all connections. Repair any leaks before adding refrigerant.
3. Thermostatic expansion valves must be checked for proper superheat settings. Sensing bulbs must be in positive contact with the suction line and should be insulated. Valves set at high superheat will lower refrigeration capacity. Low superheat may cause liquid slugging and compressor bearing washout.
4. Check defrost controls for initiation and termination settings and length of defrost period. Set fail safe at length of defrost + 25%. Example: 20 minute defrost + 5 minutes = 25 minute fail safe
5. Check drain pan for proper drainage.

9.2 PERIODIC INSPECTIONS

All units should be checked at least once a month for proper defrosting. It may be necessary to periodically change the number of defrost cycles or adjust the duration of defrost.

Under normal usage conditions, proper unit maintenance should be done every six months to include the following:

1. Check all wiring and insulators.
2. Check and tighten all electrical connections.
3. Inspect contactors for proper operation and for worn contact points.
4. Check all fan motors. Tighten motor mount bolts/nuts and tighten fan set screws.
5. Clean condenser coil surface.
6. Check refrigerant and oil level in the system.
7. Check operation of the control system ensuring all safety controls are operating properly.
8. Check all defrost controls are functioning properly.
9. Clean the unit coil surface.
10. Clean the drain pan and check the drain pan drain line for proper drainage.
11. Check drain line heater for proper operation, cuts and abrasions.
12. Check and tighten all flare connections.

See troubleshooting chart for troubleshooting information.

CAUTION: Before starting unit, be sure wire fan guards are securely fastened over each fan.

9.3 CLEANING

WARNING! Before carrying out any cleaning or maintenance of the unit, always check to make sure main power to systems is OFF. Electrical shock can cause personal injury or death.

The unit should be checked periodically for dirt accumulation. Grease and dust should be removed from the fan, fan guards, and drain pan.

Occasional cleaning of finned surfaces can be done by dusting the fins and then cleaning with a mild detergent and warm water spray.

Always pressure clean in reverse of the air flow.

IMPORTANT: Do not use alkaline or acidic solutions; they will damage the coils. Remove the fan guards to clean the inner face of the coil.

10. TROUBLESHOOTING CHART

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE STEPS
Fan(s) will not operate	1. Main switch open. 2. Blown fuses. 3. Defective motor. 4. Defective timer or defrost thermostat. 5. Unit in defrost cycle. 6. Coil does not get cold enough to reset thermostat.	1. Close switch. 2. Replace fuses. Check for short circuits or overload conditions. 3. Replace motor. 4. Replace defective component. 5. Wait for completion of cycle. 6. Adjust fan delay setting of thermostat.
Room temperature too high	1. Room thermostat set too high. 2. Superheat too high. 3. System low on refrigerant. 4. Coil iced-up.	1. Adjust thermostat. 2. Adjust thermal expansion valve. 3. Add refrigerant. 4. Manually defrost coil and check defrost controls for malfunctions.
Ice accumulating on ceiling around evaporator and/or on fan guards, venturi, or blades	1. Defrost duration is too long. 2. Fan delay not delaying fans after defrost period. 3. Defective defrost thermostat or timer. 4. Too many defrosts.	1. Adjust defrost termination thermostat. 2. Defective defrost thermostat or not adjusted properly. 3. Replace defective component(s). 4. Reduce number of defrost.
Coil not clearing of frost during defrost cycle	1. Coil temperature not getting above freezing point during defrost. 2. Not enough defrost cycles per day. 3. Defrost cycle too short. 4. Defective timer or defrost thermostat.	1. Check heater operation. 2. Adjust timer for more defrost cycles. 3. Adjust defrost thermostat or timer for longer cycle. 4. Replace defective component.
Ice accumulating in drain pan	1. Defective heater. 2. Unit not pitched properly. 3. Drain line plugged. 4. Defective drain line heater. 5. Defective timer or thermostat.	1. Replace heater. 2. Check pitch and adjust, if necessary. 3. Clean drain line. 4. Replace heater. 5. Replace defective component.
Uneven coil frosting	1. Defective heater. 2. Unit located too close to door or opening. 3. Defrost termination set too low. 4. Incorrect or missing distributor nozzle.	1. Replace heater. 2. Relocate unit. 3. Adjust defrost termination setting higher. 4. Add or replace nozzle with appropriate sized orifice for conditions.

11. REPLACEMENT PARTS

Download the parts manual at refplus.com

12. EVAPORATOR START-UP REPORT FORM

IMPORTANT: This startup report form must be filled out, signed and sent to RefPlus for the warranty to be honoured.

1. GENERAL INFORMATION

JOB LOCATION: _____

REFPLUS RJ No: _____ CONTRACTOR NAME: _____

UNIT COOLER MODEL No.: _____ SERIAL No.: _____

2. PRE-START-UP (Check each item when completed)

☐ CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS ☐ CHECK ALL FAN MOTORS AND MOTOR MOUNTS FOR TIGHTNESS

☐ CHECK DRAIN LINES AND DRAIN PAN FOR PROPER DRAINAGE ☐ CHECK DRAIN LINE HEATER FOR PROPER OPERATION

☐ VERIFY THAT ALL DEFROST CONTROLS ARE FUNCTIONING PROPERLY ☐ CHECK ALL FLARE CONNECTIONS FOR TIGHTNESS

☐ CHECK ALL MECHANICAL SEALS AND REFRIGERANT PIPING CONNECTIONS FOR TIGHTNESS

☐ CARRY OUT PRESSURE TEST (PRESSURE/DURATION) PRESSURE : _____PSI DURATION: _____

EVACUATION (DURATION): _____ FINAL MICRON: _____

UNIT COOLER DRAIN LINE TRAPPED OUTSIDE OF BOX: ☐YES ☐NO

3. START-UP

REFRIGERANT

REFRIGERANT TYPE _____ (I.E. R448A)

ELECTRICAL

☐ CHECK FAN MOTORS FOR PROPER ROTATION

MAIN POWER (DESIGN): _____V / _____ PH / _____Hz

MAIN POWER (MEASURED): L1-L2 _____V L1-L3 _____V L2-L3 _____V

CONTROL VOLTAGE (MEASURED): _____V

TOTAL UNIT AMPERAGE (MEASURED) _____ AMPS

FAN 1	_____ AMPS (L1)	_____ AMPS (L2)	_____ AMPS (L3)	_____ AMPS (RATED)
FAN 2	_____ AMPS (L1)	_____ AMPS (L2)	_____ AMPS (L3)	_____ AMPS (RATED)
FAN 3	_____ AMPS (L1)	_____ AMPS (L2)	_____ AMPS (L3)	_____ AMPS (RATED)
FAN 4	_____ AMPS (L1)	_____ AMPS (L2)	_____ AMPS (L3)	_____ AMPS (RATED)
FAN 5	_____ AMPS (L1)	_____ AMPS (L2)	_____ AMPS (L3)	_____ AMPS (RATED)

TEMPERATURE	START-UP	AFTER 24 HOURS OF OPERATION
AMBIENT TEMPERATURE	_____ºF	_____ºF
DESIGN BOX TEMPERATURE	_____ºF	_____ºF
OPERATING BOX TEMPERATURE	_____ºF	_____ºF
SUPERHEAT AT COMPRESSOR	_____ºF	_____ºF
SUCTION LINE TEMP. AT EVAPORATOR	_____ºF	_____ºF
SUPERHEAT AT EVAPORATOR	_____ºF	_____ºF
SUB-COOLING	_____ºF	_____ºF
LIQUID TEMPERATURE	_____ºF	_____ºF

PRESSURES (in cooling mode)

REFRIGERANT SUCTION _____ PSIG TEMP AT COMPRESSOR _____ºF

REFRIGERANT DISCHARGE _____ PSIG TEMP AT COMPRESSOR _____ºF

4. CONTROLS

THERMOSTAT SETTING_____ ºF

DEFROST SETTING _____ /DAY _____ MINUTES FAIL-SAFE

ADJUSTABLE LIMIT DEFROST SETTING _____ ºF

ADJUSTABLE FAN DELAY SETTING _____ ºF

5. FIELD INSTALLED EXPANSION VALVE

MANUFACTURER _____

MODEL _____

DATE: _____(YY/MM/DD)

TECHNICIAN: _____

SIGNATURE: _____

FILL OUT FORM MANUALLY, TAKE A PHOTO AND SEND TO:
service@refplus.com

OR

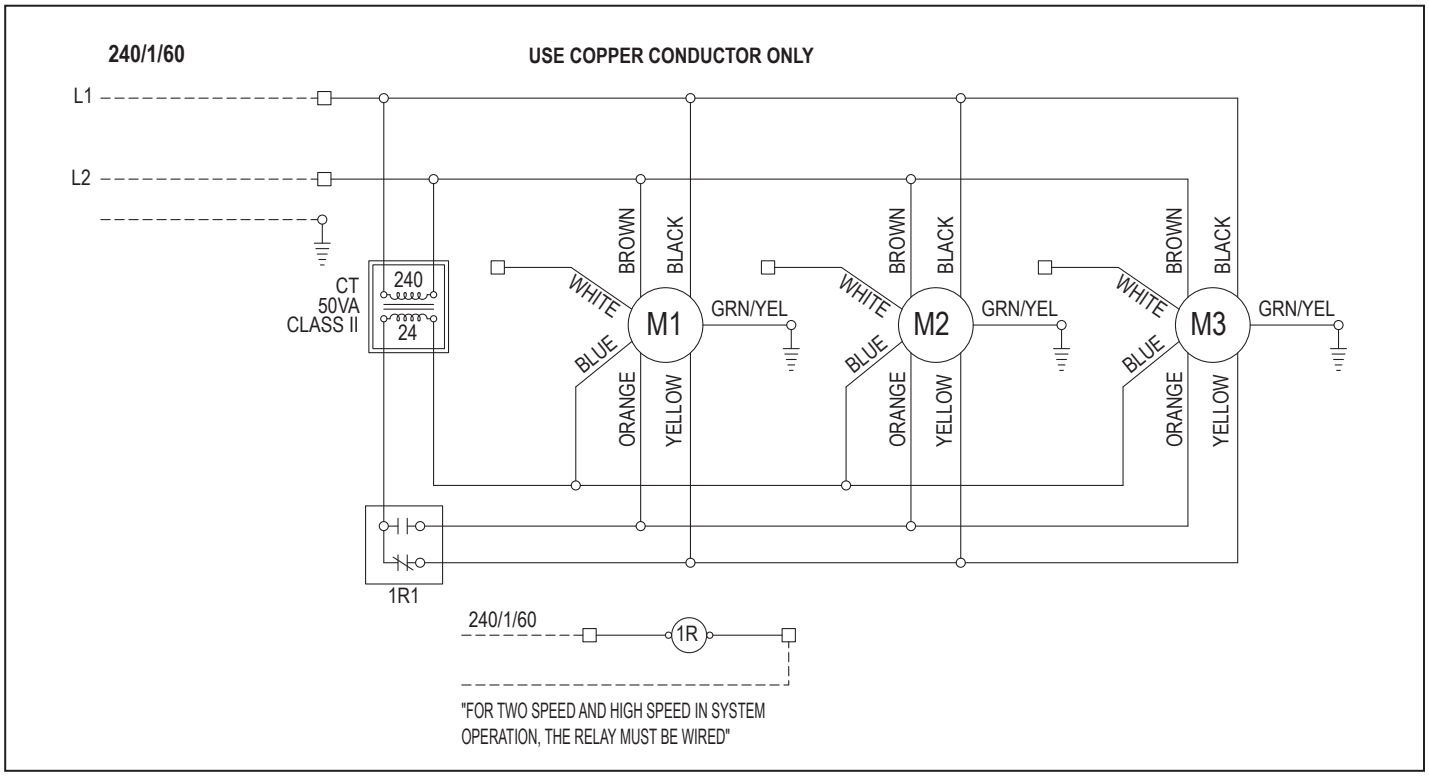
SCAN THE QR CODE LOCATED IN THE CONTROL PANEL OF YOUR UNIT TO ACCESS THE ONLINE FORM

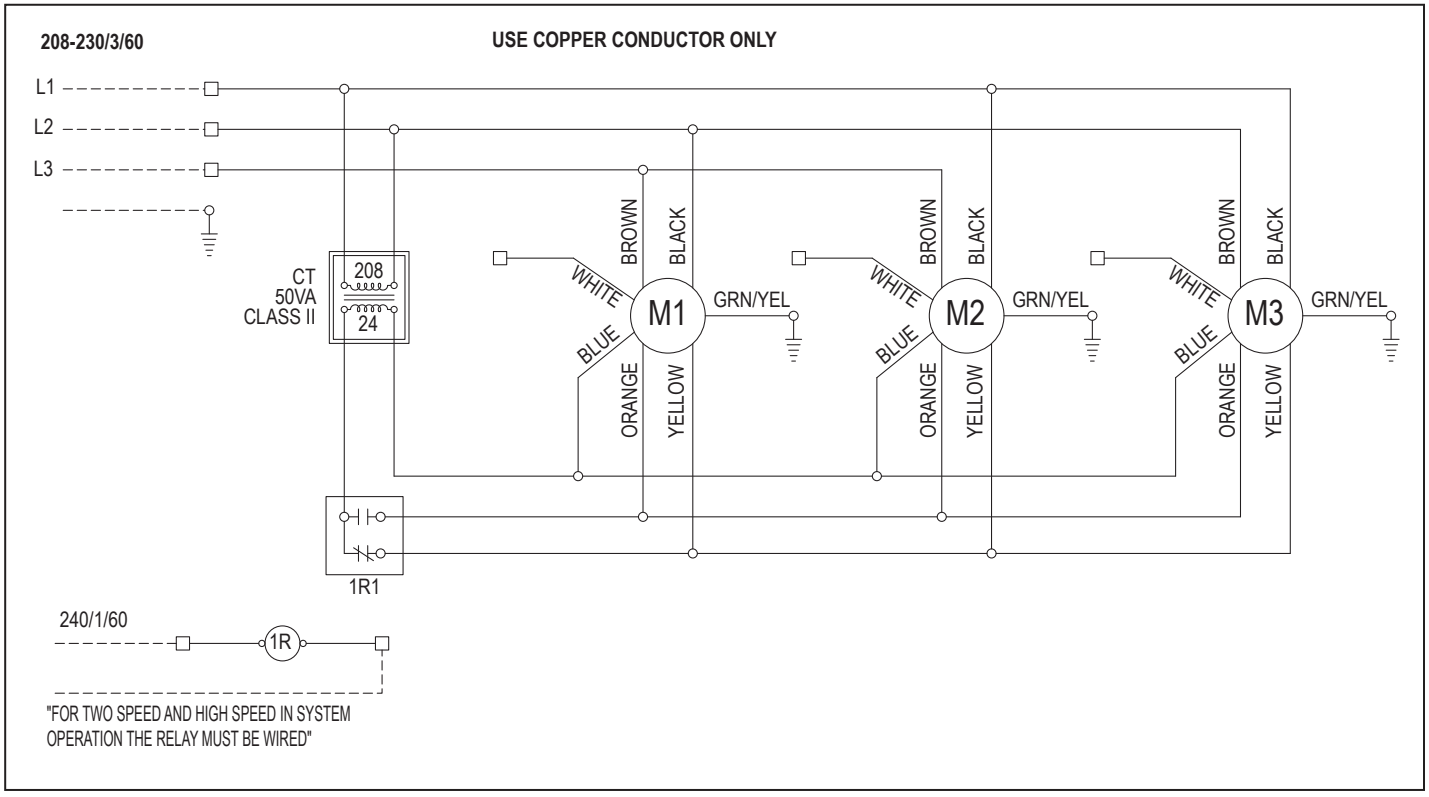
13. WIRING DIAGRAMS

13.1 TYPICAL WIRING DIAGRAMS FOR EKA-EMA MODELS - AIR DEFROST

ECM TWIN-SPEED FAN MOTORS - 240/1/60 & 208-230/3/60

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.

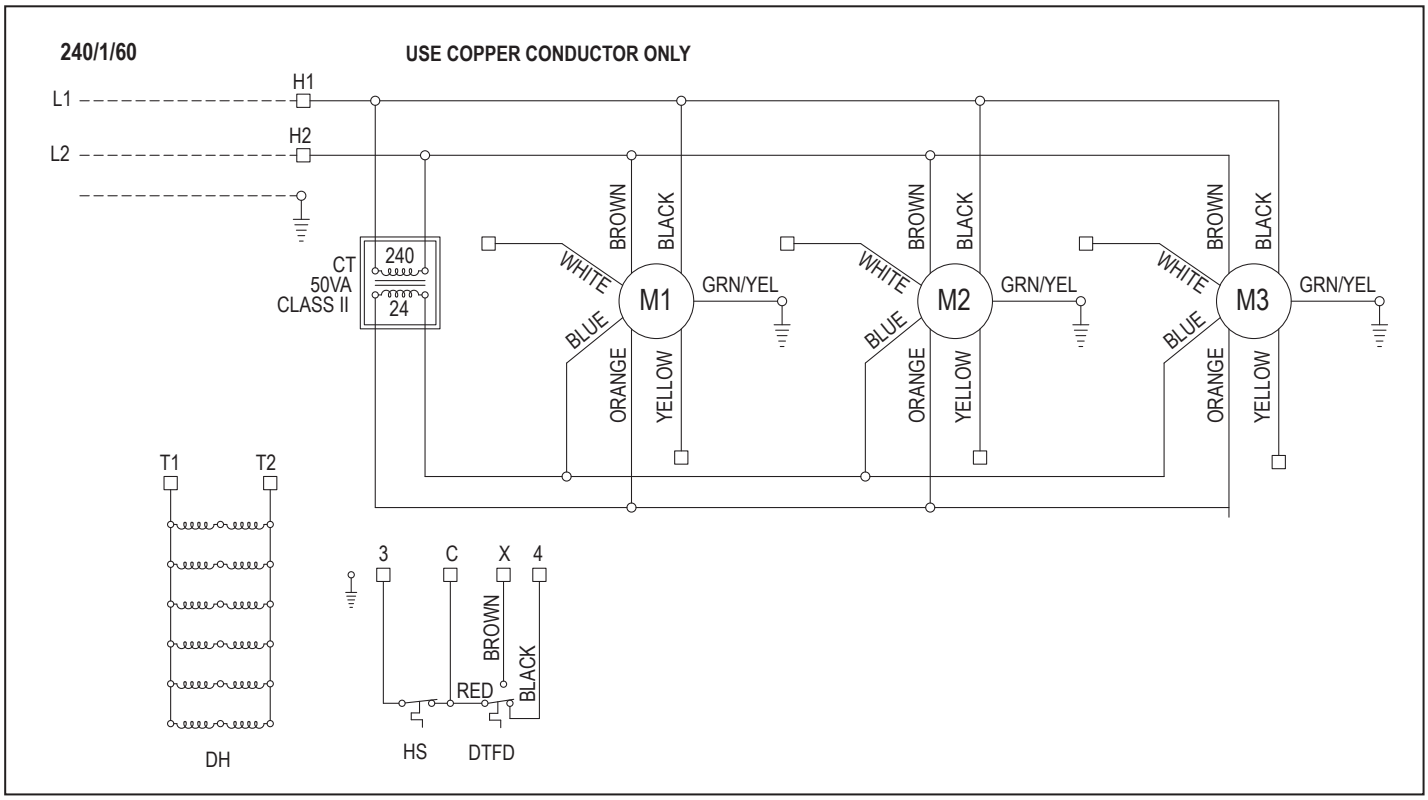


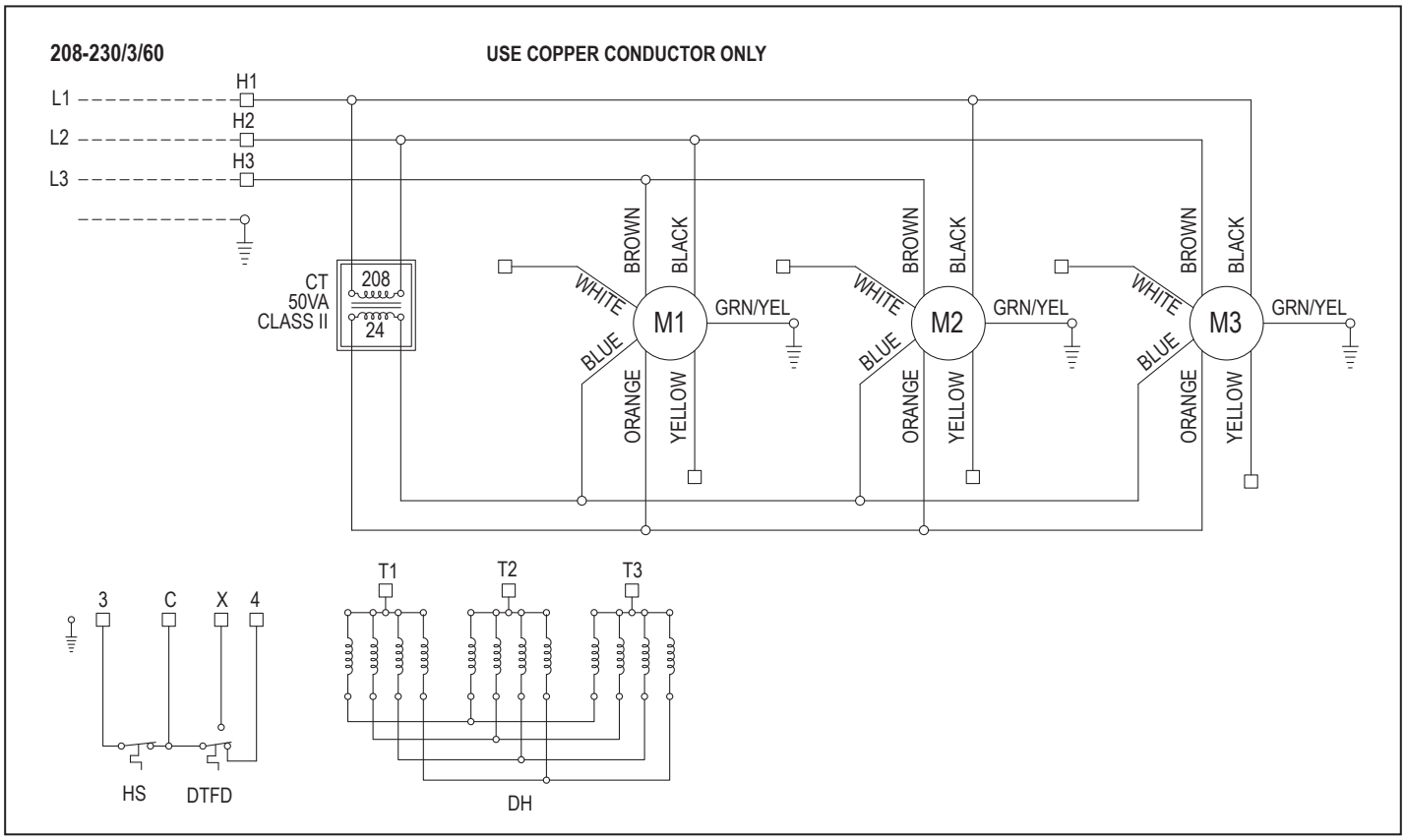


13.2 TYPICAL WIRING DIAGRAMS FOR EKE-EME MODELS - ELECTRIC DEFROST

ECM HIGH-SPEED FAN MOTORS - 240/1/60 & 208-230/3/60

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.

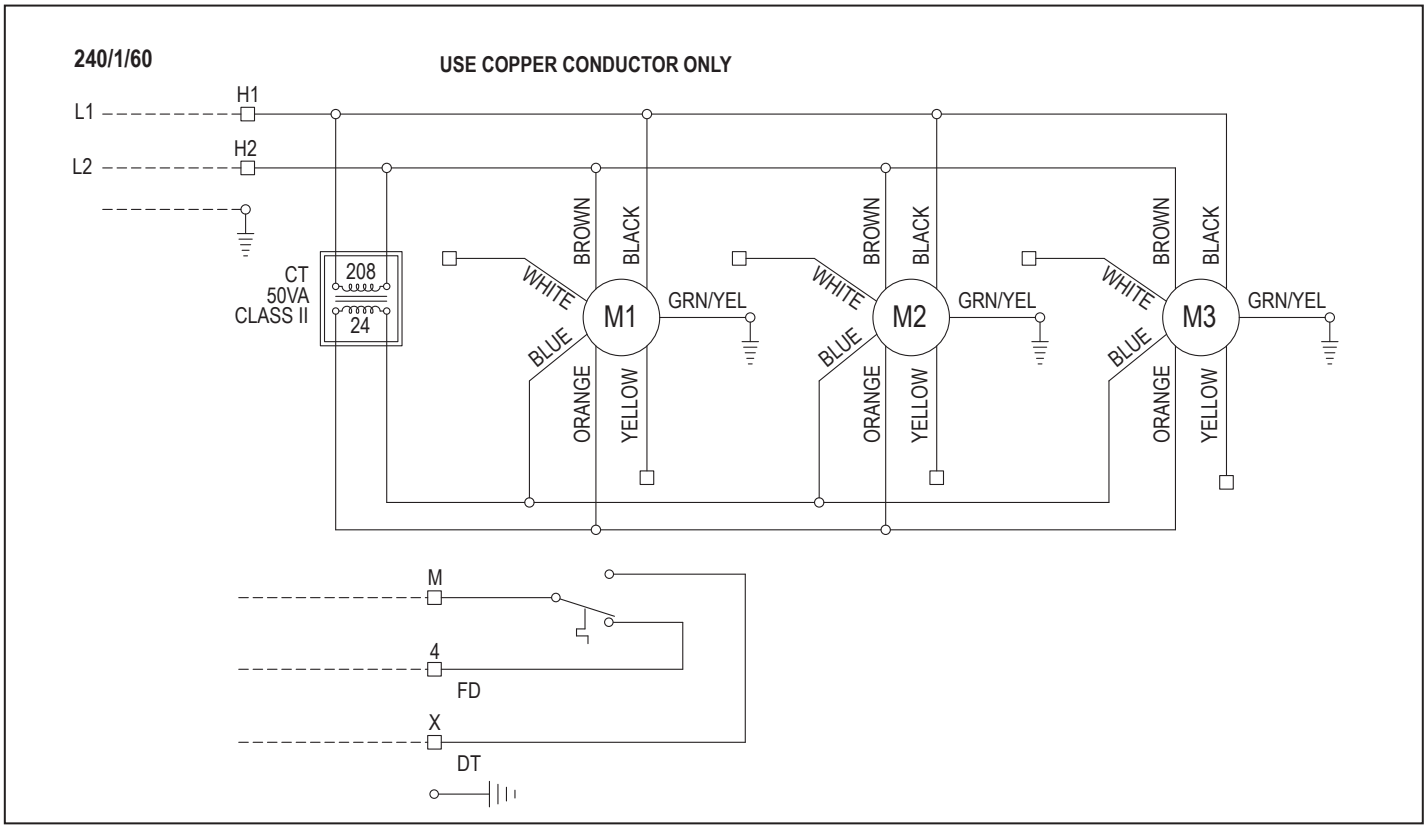


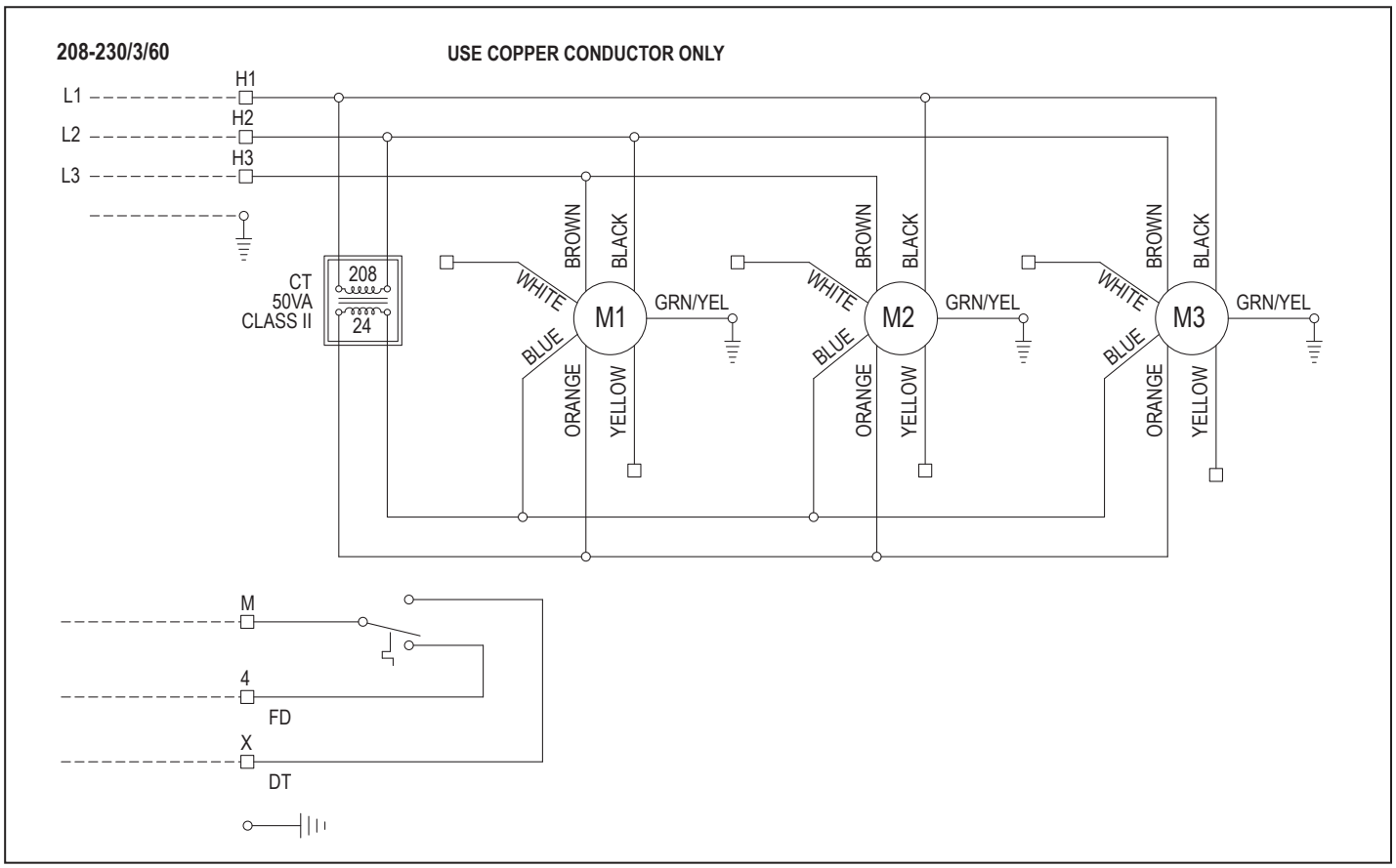


13.3 TYPICAL WIRING DIAGRAMS FOR EKR-EKT-EMR-EMT MODELS - HOT-GAS DEFROST

ECM HIGH-SPEED FAN MOTORS - 240/1/60 & 208-230/3/60

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.



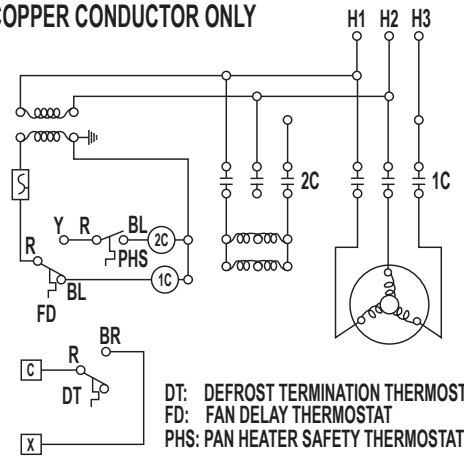


13.4 TYPICAL WIRING DIAGRAMS FOR ALL LM MODELS - AIR, ELECTRIC & HOT GAS DEFROST

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.

LMG & LMH

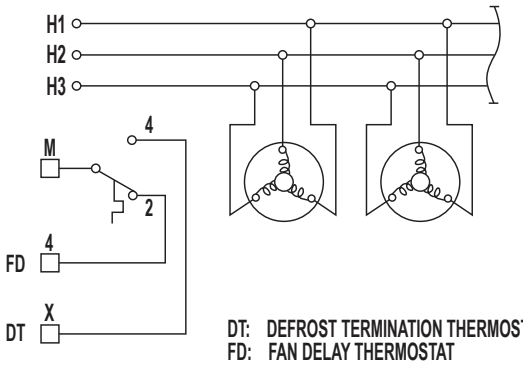
USE COPPER CONDUCTOR ONLY



DT: DEFROST TERMINATION THERMOSTAT
FD: FAN DELAY THERMOSTAT
PHS: PAN HEATER SAFETY THERMOSTAT

LMR & LMT

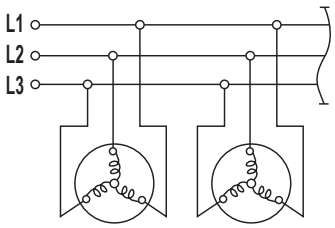
USE COPPER CONDUCTOR ONLY



DT: DEFROST TERMINATION THERMOSTAT
FD: FAN DELAY THERMOSTAT
NOTE: FAN MUST BE STOPPED BY THE DEFROST TIMER

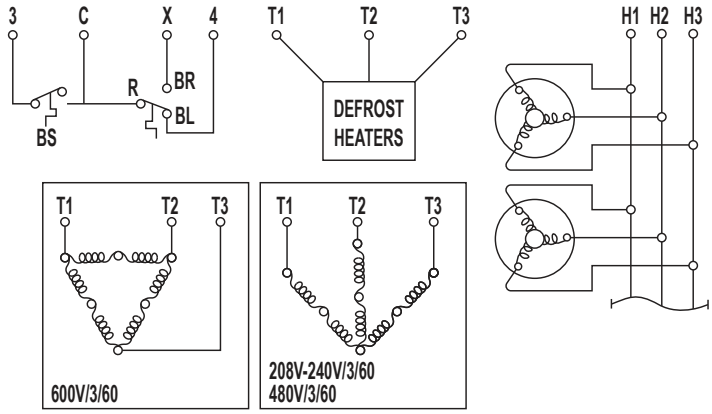
LMA

USE COPPER CONDUCTOR ONLY

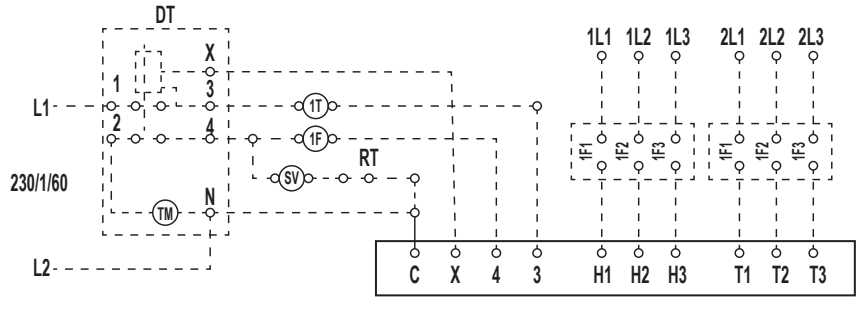


LME

UNIT WIRING



PILOT DUTY



SV: SOLENOID VALVE
RT: ROOM THERMOSTAT
DT: DEFROST TIMER

UNIT TERMINAL BLOCK

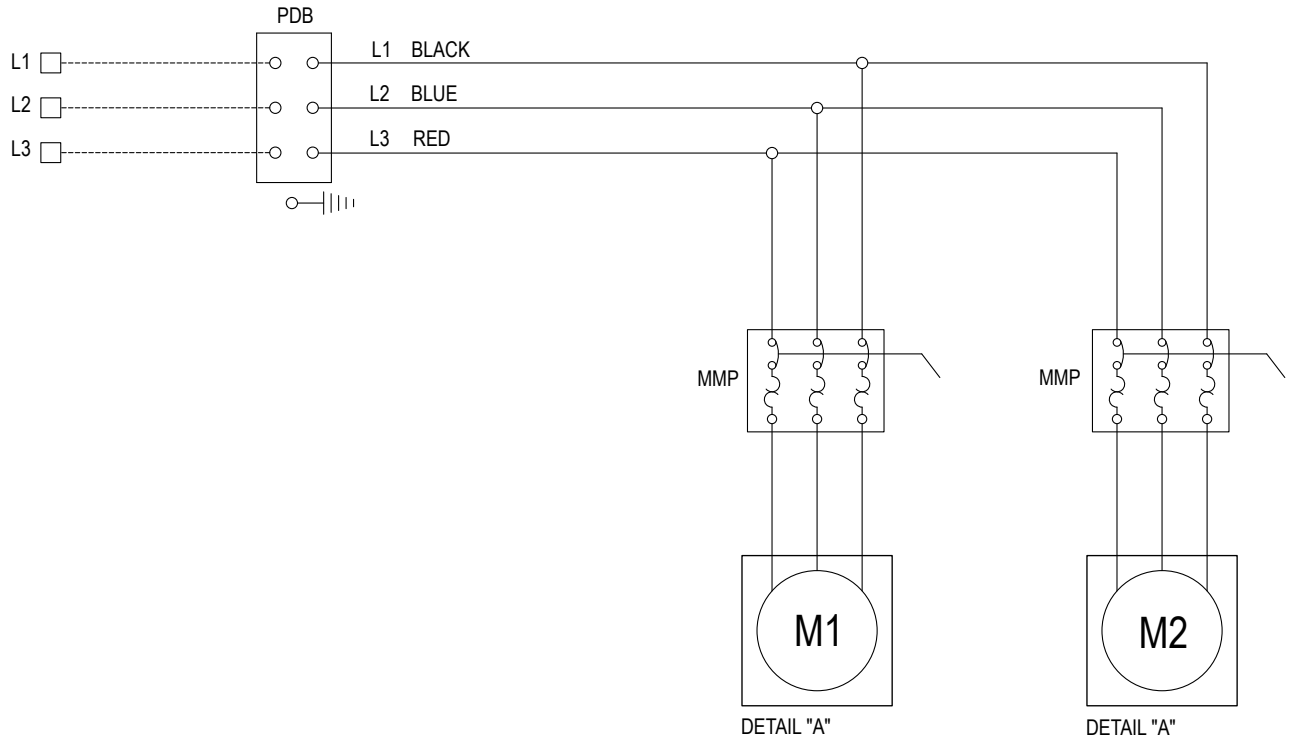
13.5 TYPICAL WIRING DIAGRAMS FOR EJA-LJA MODELS - AIR DEFROST

HIGH-SPEED FAN MOTORS - 208-230/3/60 (OPTIONAL)

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.

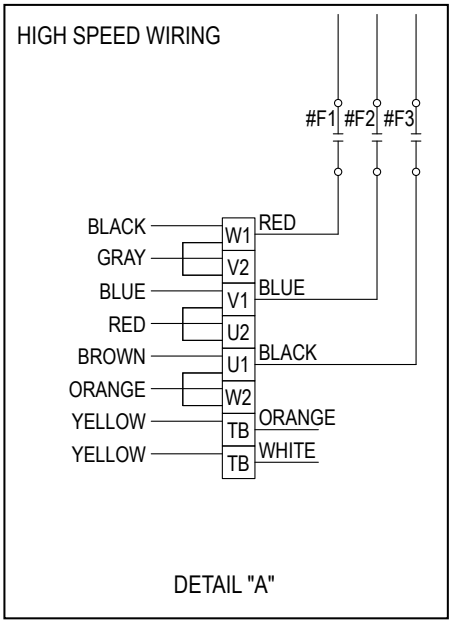
208-230/3/60

USE COPPER SUPPLY WIRES



BY OTHERS -----

M#: FAN MOTOR
MMP: MANUAL MOTOR PROTECTERS
□ : TERMINAL BLOCK
: OVERLOAD



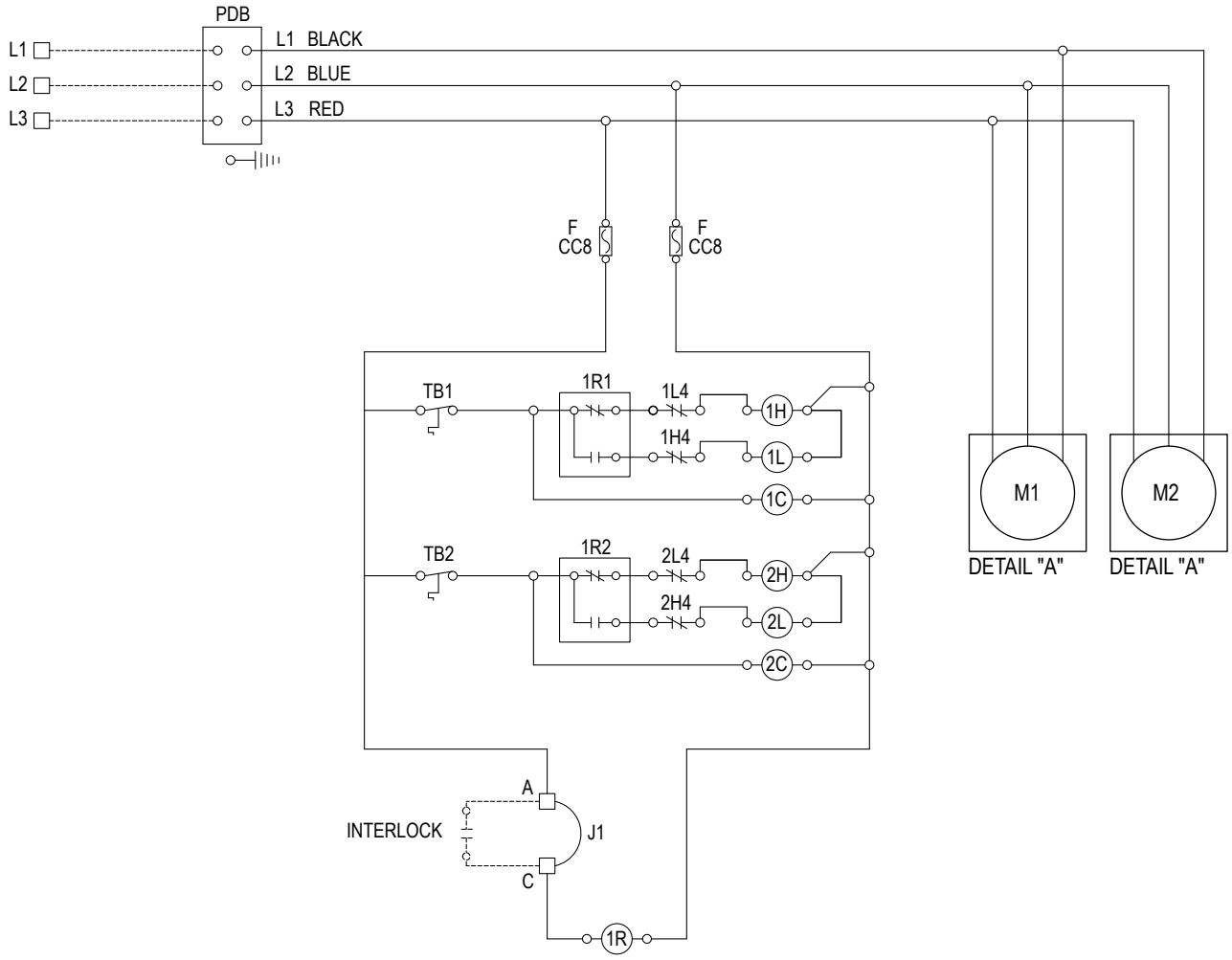
13.6 TYPICAL WIRING DIAGRAMS FOR ALL EJA-LJA-DJA MODELS - AIR DEFROST

TWIN-SPEED FAN MOTORS - 208-230/3/60 (OPTIONAL)

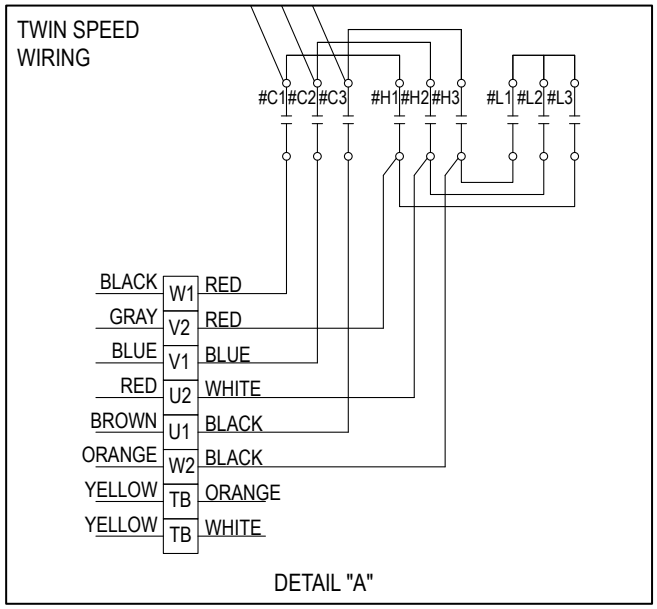
WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.

208-230/3/60

USE COPPER SUPPLY WIRES



NOTE : RELAY LINE USED FOR THE HIGH/LOW FUNCTIONS
OF THE MOTORS. CONTROL REQUIRED



NOTE
A : WITH JUMPER J1 HIGH SPEED CONTACT
B : REMOVE JUMPER J1 FOR EXTERNAL INTERLOCK FOR TWO SPEED OPERATION

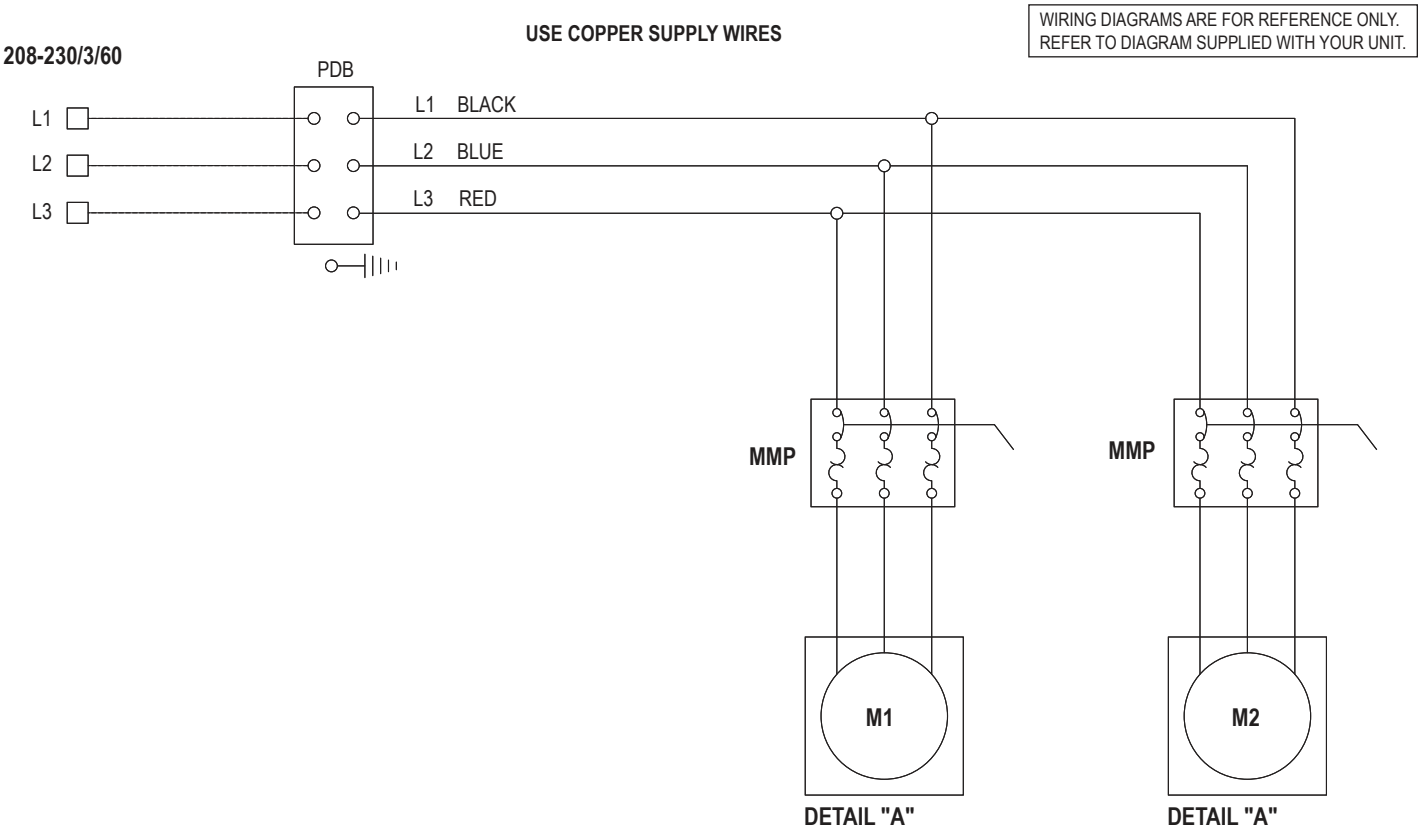
USE COPPER SUPPLY WIRES

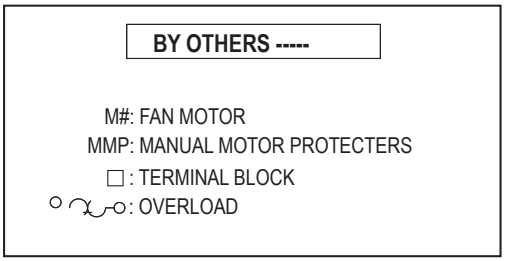
BY OTHERS -----

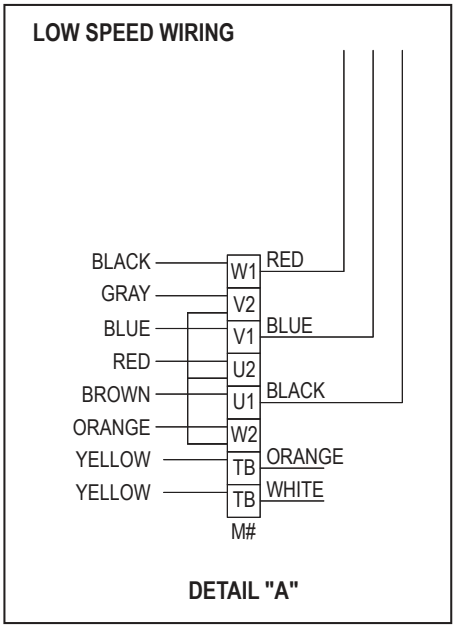
#R: RELAY
M#: FAN MOTOR INTERNALLY PROTECTED
PDB: POWER DISTRIBUTION BLOCK
TB#: MOTOR THERMAL PROTECTION
□ : TERMINAL BLOCK

13.7 TYPICAL WIRING DIAGRAM FOR ALL EJA-LJA-DJA MODELS - AIR DEFROST

LOW-SPEED FAN MOTORS - 208-230/3/60

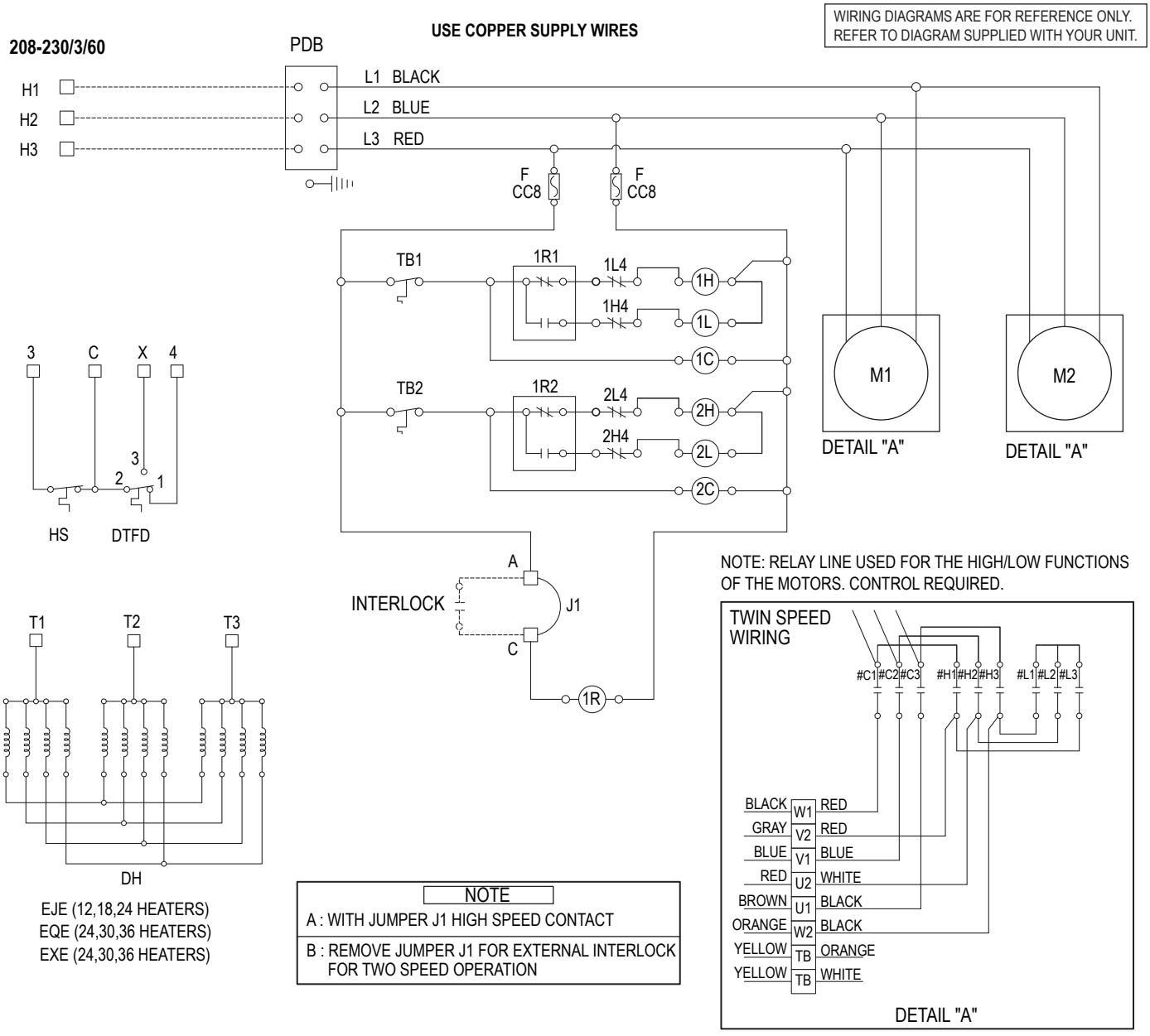


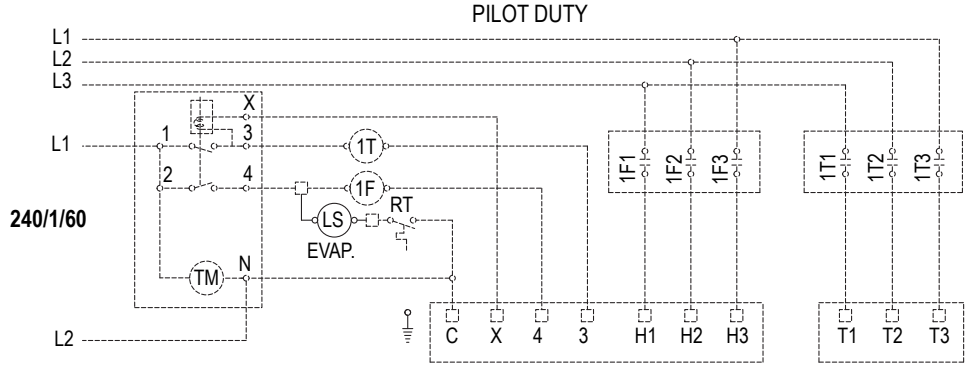




13.8 TYPICAL WIRING DIAGRAM FOR ALL EJE-LJE-DJE MODELS - ELECTRIC DEFROST

TWIN-SPEED FAN MOTORS - 208-230/3/60 (OPTIONAL)

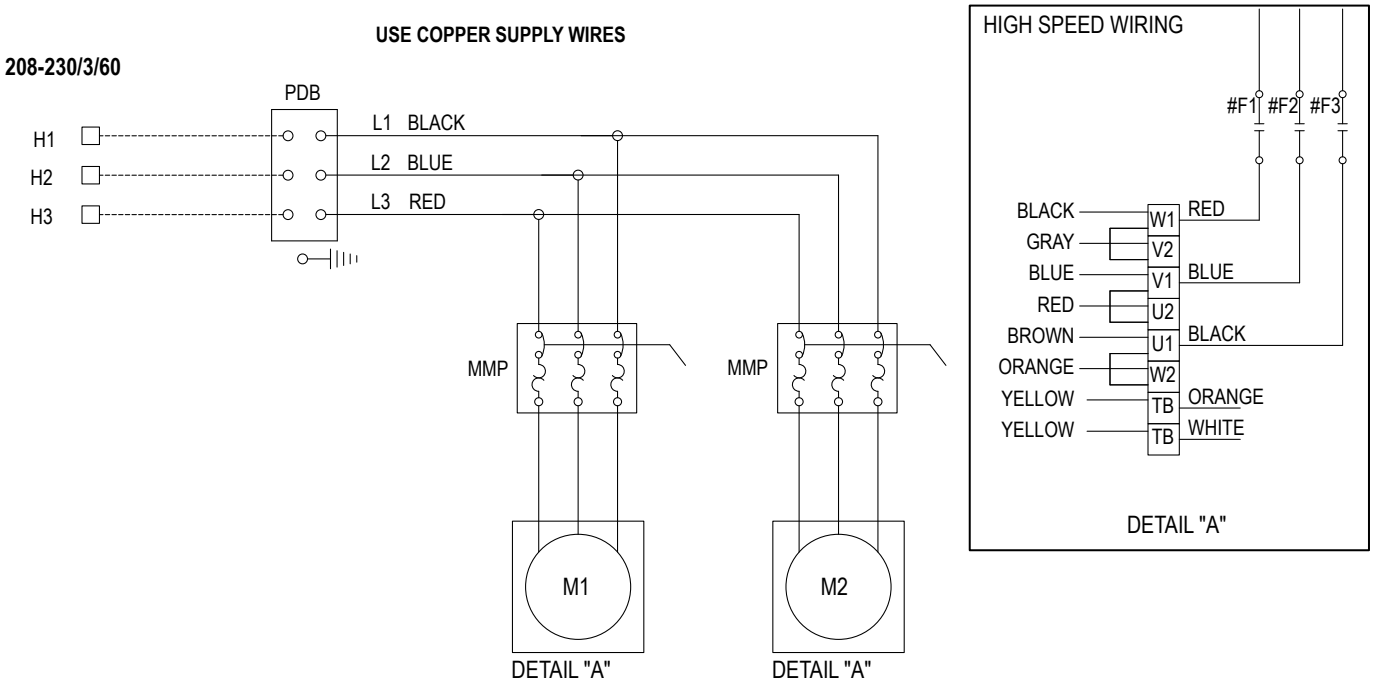


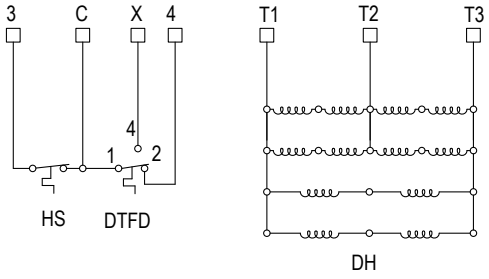


13.9 TYPICAL WIRING DIAGRAM FOR ALL EJE-LJE-DJE MODELS - ELECTRIC DEFROST

HIGH-SPEED FAN MOTORS FOR ROOMS OF LESS THAN 32°F (0°C) - 208-230/3/60 & 240/1/60 (PILOT DUTY)

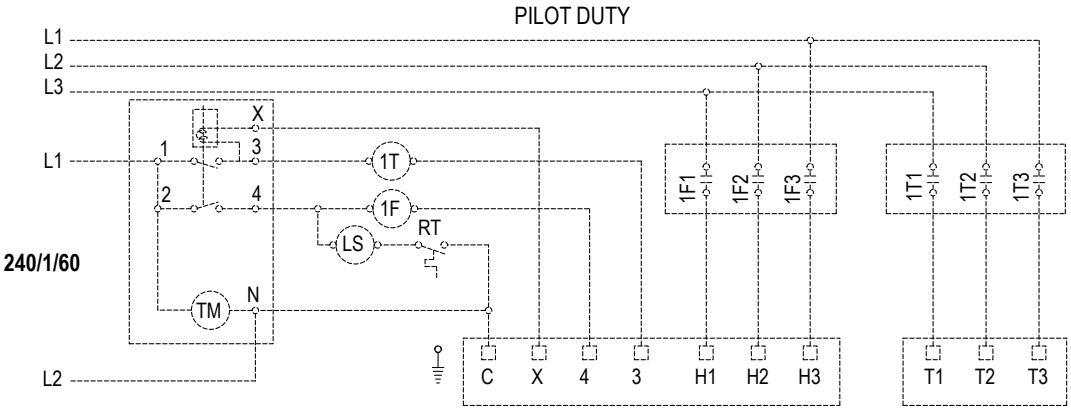
WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.





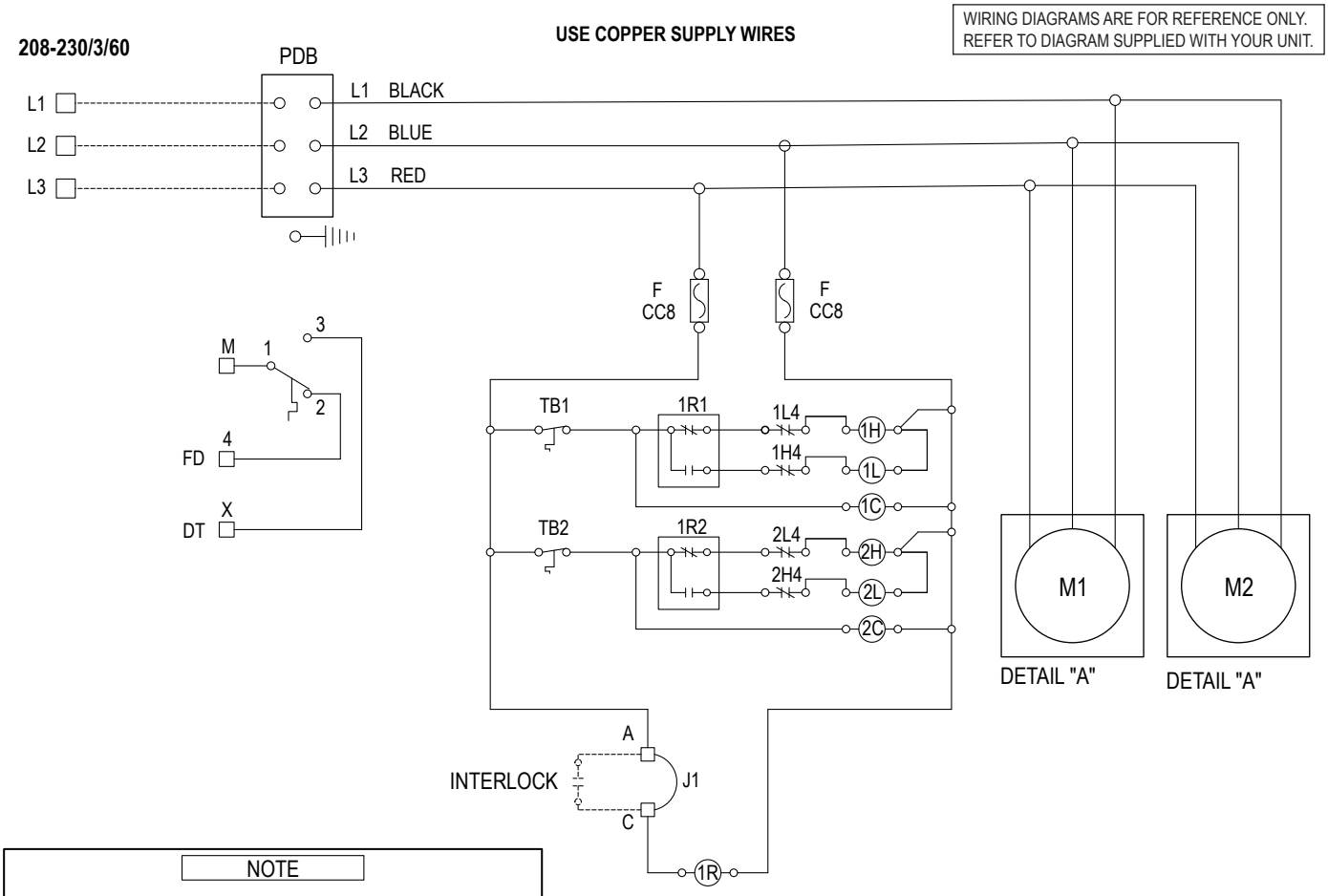
BY OTHERS -----

1F : EVAPORATOR FAN CONTACTOR
1T : EVAPORATOR FAN HEATER
DH : DEFROST HEATER
DT : DEFROST TERMINATION
FD : FAN DELAY
HS : HEATER SAFETY
M# : FAN MOTOR
MMP: MANUAL MOTOR PROTECTERS
□ : TERMINAL BLOCK
: OVERLOAD



13.10 TYPICAL WIRING DIAGRAM FOR FOR ALL EJ-LJ-DJ MODELS - HOT-GAS DEFROST

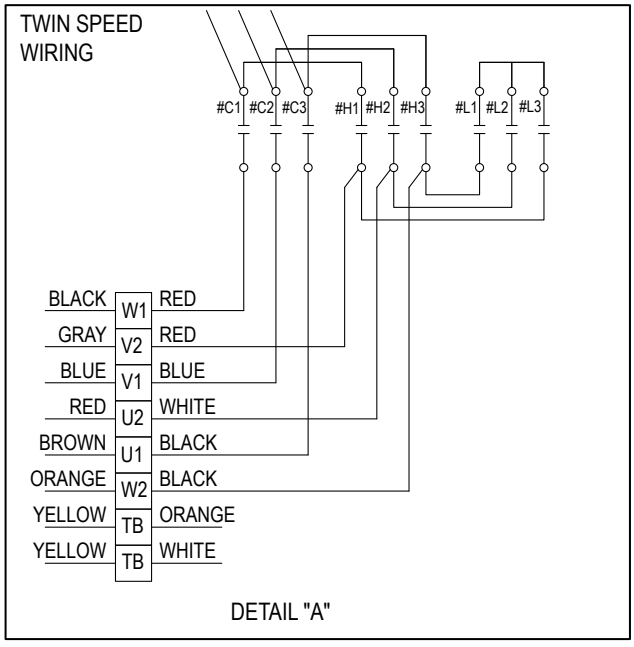
TWIN-SPEED FAN MOTORS - 208/230/3/60



NOTE
A : WITH JUMPER J1 HIGH SPEED CONTACT
B : REMOVE JUMPER J1 FOR EXTERNAL INTERLOCK FOR TWO SPEED OPERATION

NOTE: FAN MUST BE STOPPED BY THE DEFROST TIMER.

NOTE : RELAY LINE USED FOR THE HIGH/LOW FUNCTIONS OF THE MOTORS. CONTROL REQUIRED.



USE COPPER SUPPLY WIRES

BY OTHERS -----

DT: DEFROST TERMINATION
F: FUSE
FD: FAN DELAY
#R: RELAY
LSV: LIQUID SOLENOID VALVE
M#: FAN MOTOR INTERNALLY PROTECTED
PDB: POWER DISTRIBUTION BLOCK
TB#: MOTOR THERMAL PROTECTION
□ : TERMINAL BLOCK

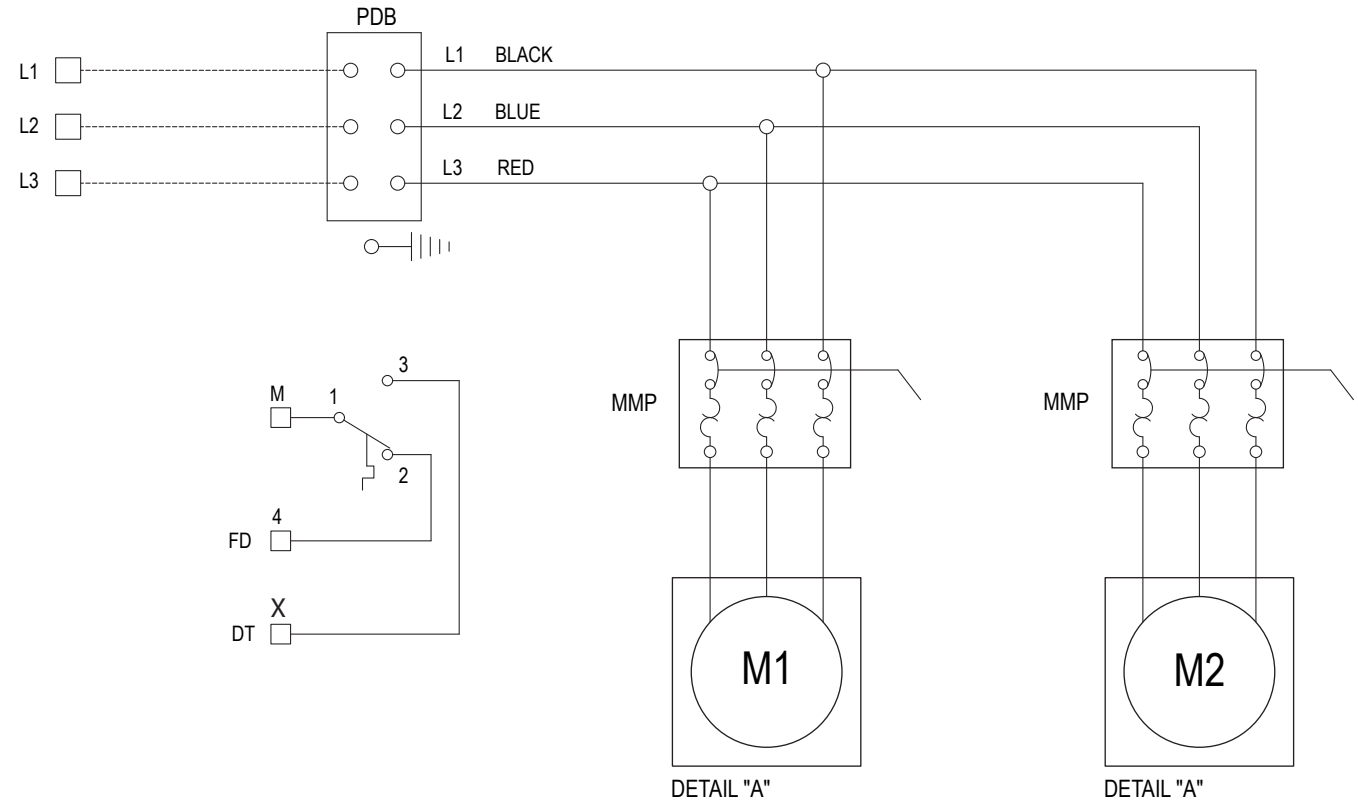
13.11 TYPICAL WIRING DIAGRAM FOR ALL EJ-LJ-DJ MODELS - HOT-GAS DEFROST

HIGH-SPEED FAN MOTORS FOR ROOMS OF LESS THAN 32°F (0°C) - 208-230/3/60

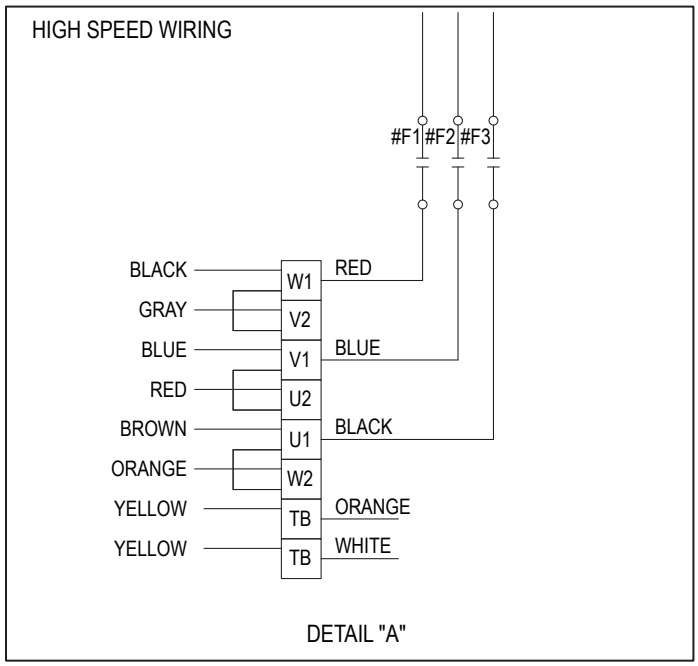
WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.

208-230/3/60

USE COPPER SUPPLY WIRES



NOTE: FAN MUST BE STOPPED BY THE DEFROST TIMER.



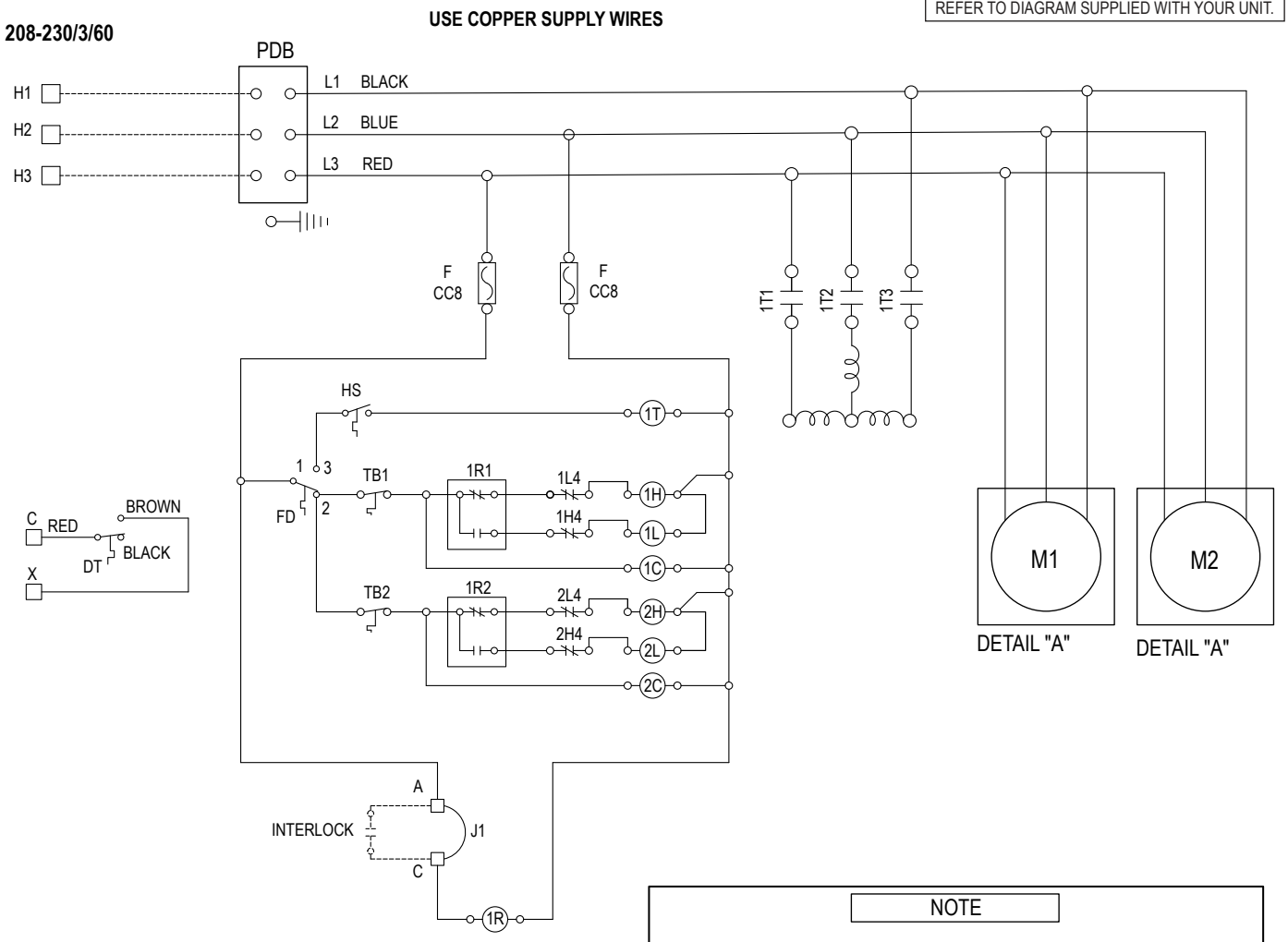
BY OTHERS -----

DT : DEFROST TERMINATION
FD : FAN DELAY
M# : FAN MOTOR
MMP: MANUAL MOTOR PROTECTERS
□ : TERMINAL BLOCK
: OVERLOAD

13.12 TYPICAL WIRING DIAGRAM FOR ALL EJ-LJ-DJ MODELS - HOT GAS DEFROST WITH ELECTRIC DRAIN PAN

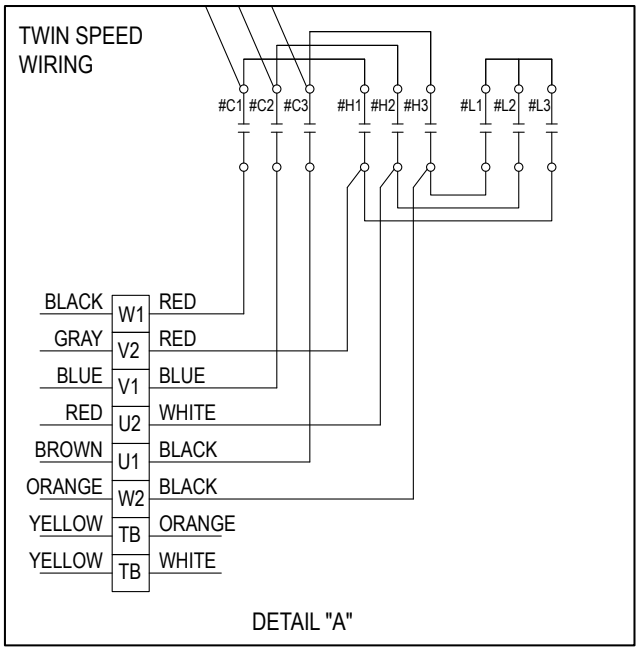
TWIN-SPEED FAN MOTORS - 208-230/3/60

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.



NOTE
A: WITH JUMPER J1 HIGH SPEED CONTACT
B: REMOVE JUMPER J1 FOR EXTERNAL INTERLOCK FOR TWO SPEED OPERATION

NOTE: RELAY LINE USED FOR THE HIGH/LOW FUNCTIONS OF THE MOTORS. CONTROL REQUIRED.



USE COPPER SUPPLY WIRES

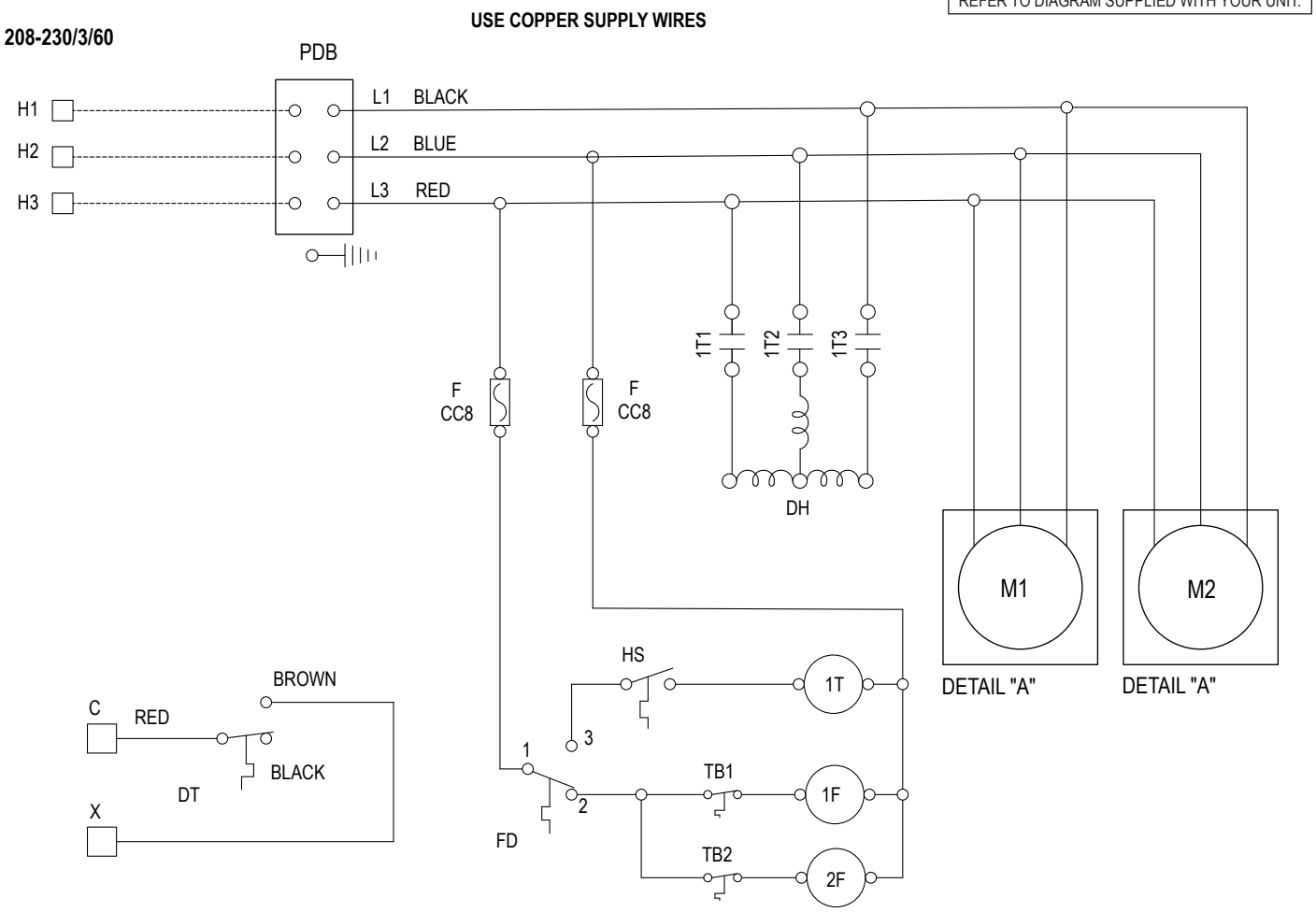
BY OTHERS -----

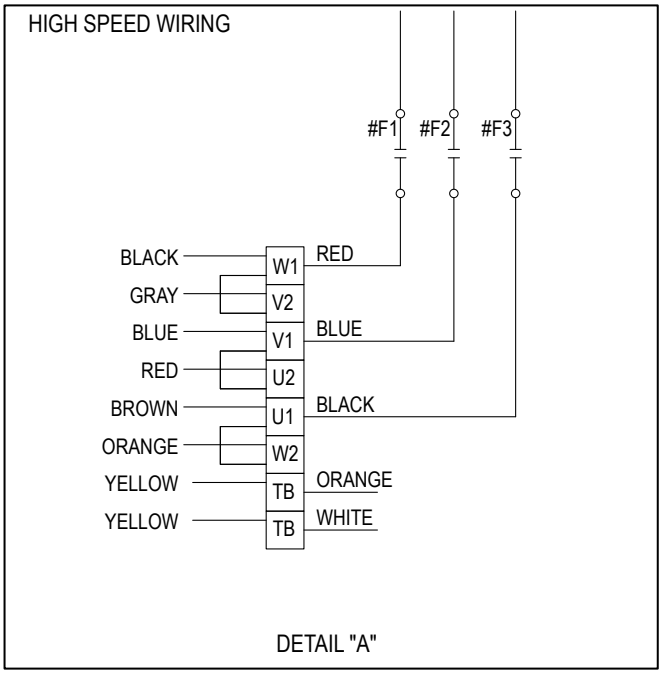
DT: DEFROST TERMINATION
F: FUSE
FD: FAN DELAY
HS: HEATER SAFETY
#R: RELAY
LSV: LIQUID SOLENOID VALVE
M#: FAN MOTOR INTERNALLY PROTECTED
PDB: POWER DISTRIBUTION BLOCK
TB#: MOTOR THERMAL PROTECTION
☐ : TERMINAL BLOCK

13.13 TYPICAL WIRING DIAGRAM FOR ALL EJ-LJ-DJ MODELS - HOT-GAS DEFROST WITH ELECTRIC DRAIN PAN

HIGH-SPEED FAN MOTORS FOR ROOMS OF LESS THAN 32°F (0°C)

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.





BY OTHERS -----

1F : EVAPORATOR FAN CONTACTOR
1T : EVAPORATOR FAN HEATER
DH : DEFROST HEATER
DT : DEFROST TERMINATION
FD : FAN DELAY
HS : HEATER SAFETY
M# : FAN MOTOR
TB#: MOTOR THERMAL PROTECTION
☐ : TERMINAL BLOCK

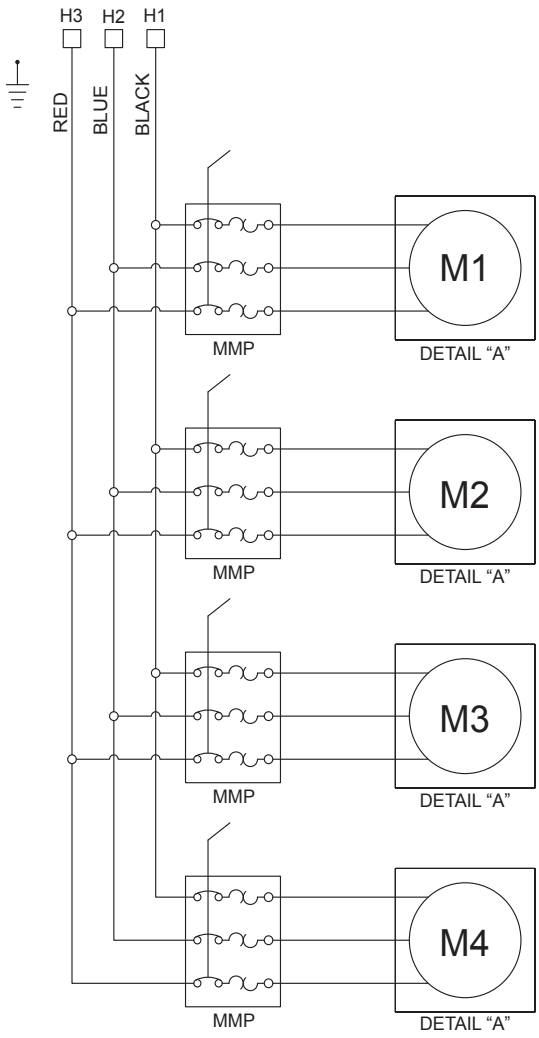
13.14 TYPICAL WIRING DIAGRAM FOR ALL EJ-LJ-DJ MODELS (AWEF)

ECM BLUE FAN MOTORS - 480/3/60

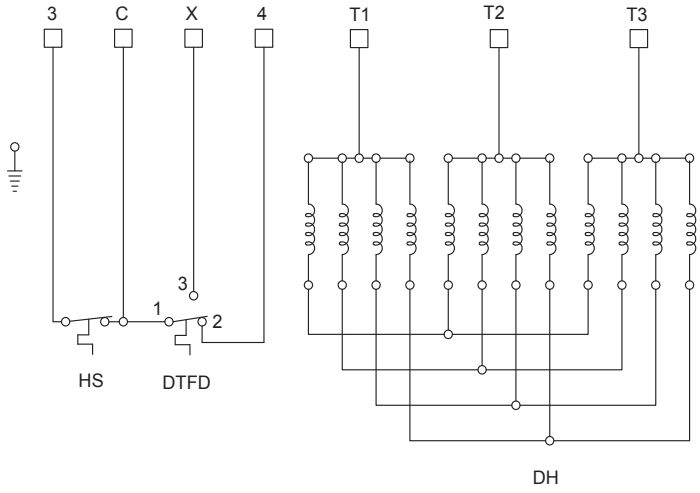
IMPORTANT! CURRENT PROVIDED TO THE MOTORS MUST BE APPLIED AT ALL TIMES

WIRING DIAGRAMS ARE FOR REFERENCE ONLY.
REFER TO DIAGRAM SUPPLIED WITH YOUR UNIT.

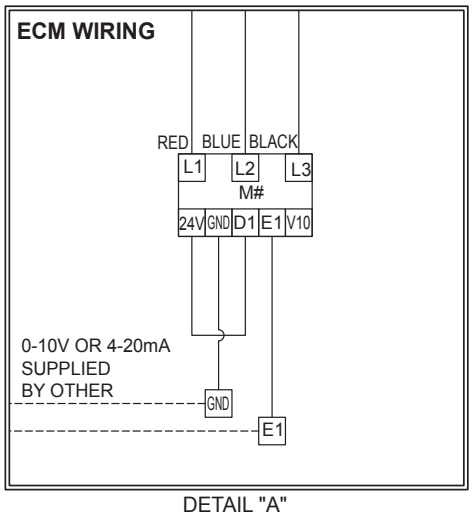
480/3/60



USE COPPER SUPPLY WIRES



EJE (12,18,24 HEATERS)
EQE (24,30 HEATERS)
EXE (24,36,48 HEATERS)



DETAIL "A"

USE COPPER SUPPLY WIRES

BY OTHERS -----

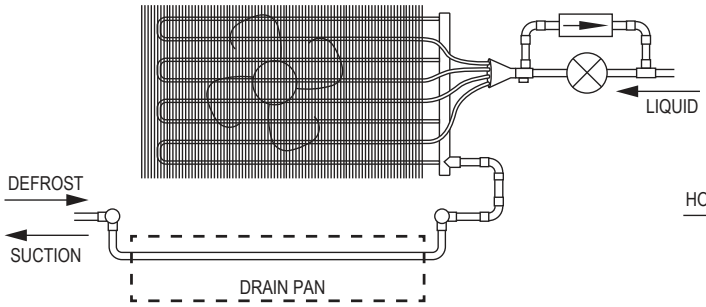
DH: DEFROST HEATER
DTFD: DEFROST TERMINATION FAN DELAY
HS: HEATER SAFETY
M: FAN MOTOR INTERNALLY PROTECTED
MMP: MANUAL MOTOR PROTECTERS
□: TERMINAL BLOCK
: OVERLOAD

14. PIPING DIAGRAMS

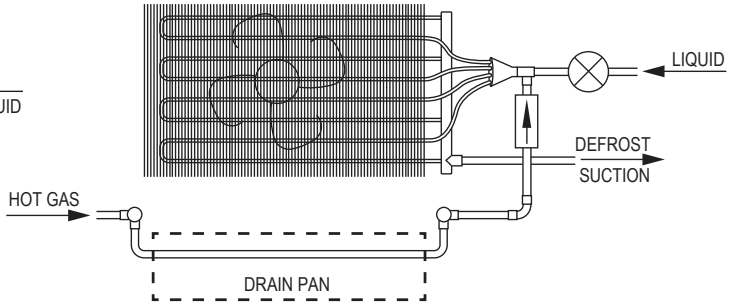
14.1 TYPICAL PIPING DIAGRAMS FOR ALL EK-EM-EJ MODELS - HOT-GAS DEFROST

PIPING DIAGRAMS ARE FOR REFERENCE ONLY.
MAY VARY ON ACTUAL UNIT.

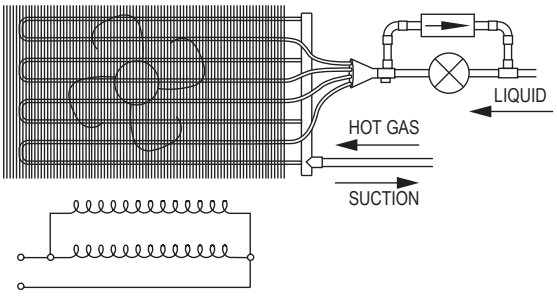
Reverse-cycle defrost with hot-gas drain pan



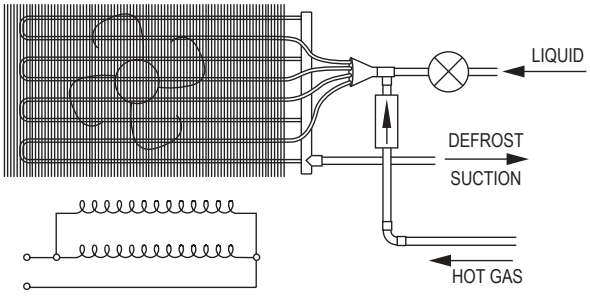
Three-pipe defrost with hot-gas drain pan



Reverse-cycle defrost with electric drain pan

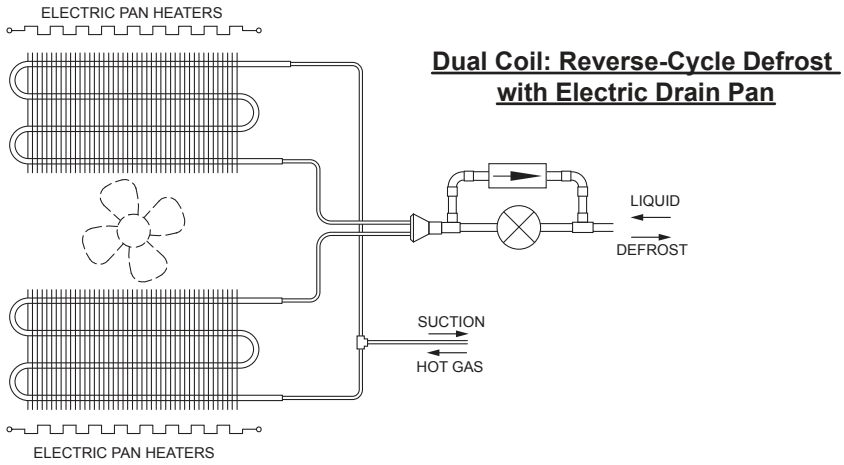


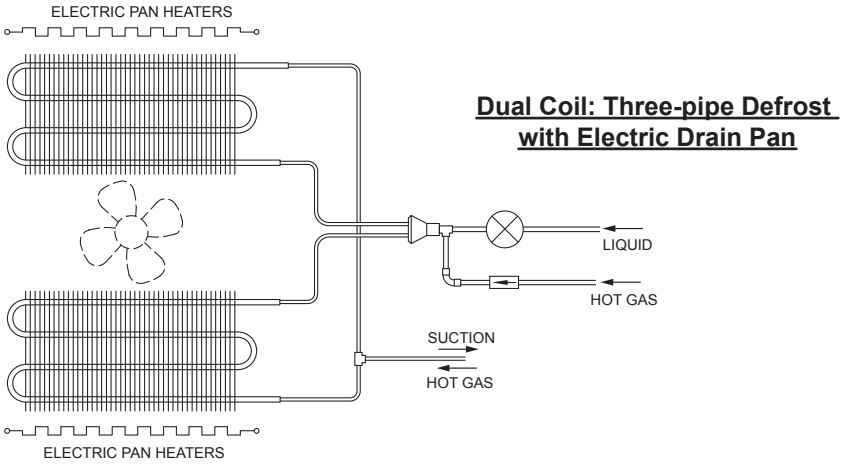
Three-pipe defrost with electric drain pan



14.2 TYPICAL PIPING DIAGRAMS FOR ALL LM-LJ-DJ MODELS - HOT-GAS DEFROST WITH ELECTRIC DRAIN PAN

PIPING DIAGRAMS ARE FOR REFERENCE ONLY.
MAY VARY ON ACTUAL UNIT.

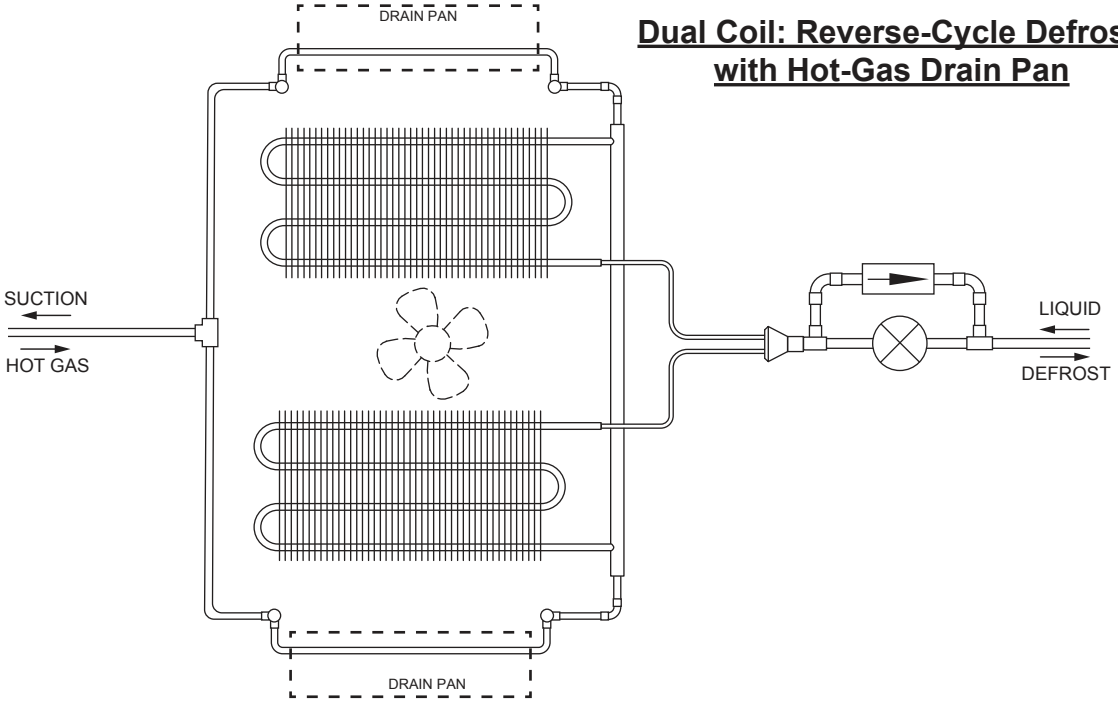




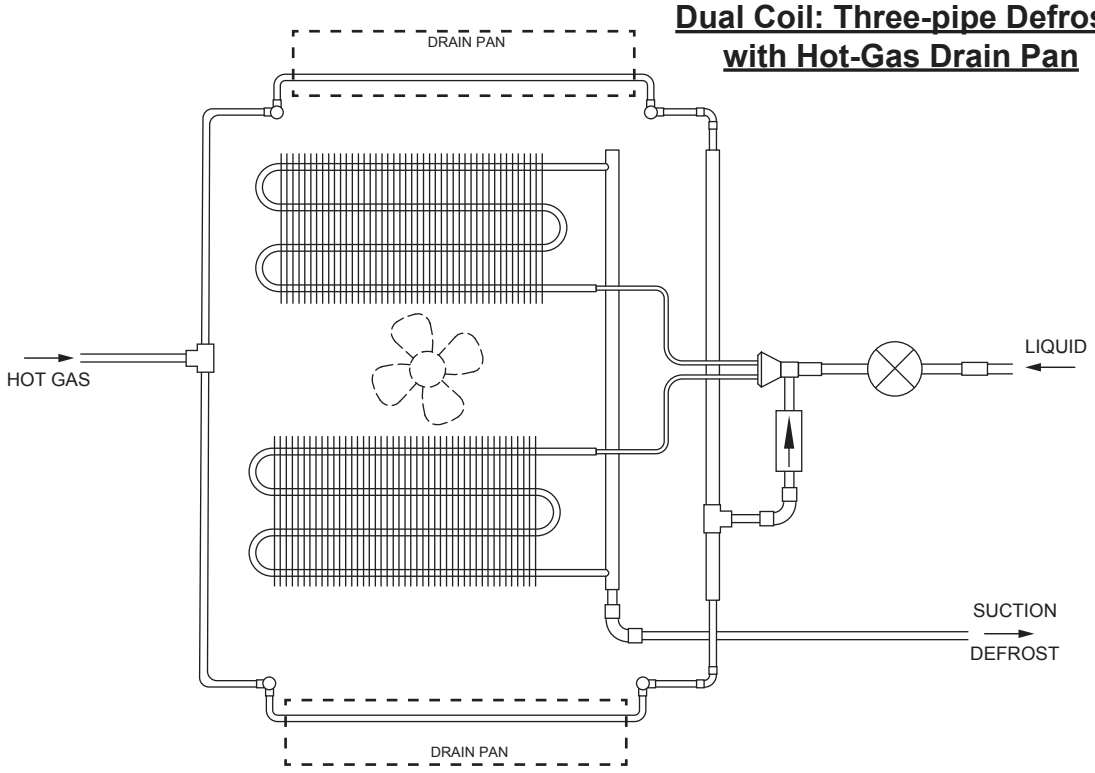
14.3 TYPICAL PIPING DIAGRAMS FOR ALL LM-LJ-DJ MODELS - HOT-GAS DEFROST WITH HOT-GAS DRAIN PAN

PIPING DIAGRAMS ARE FOR REFERENCE ONLY.
MAY VARY ON ACTUAL UNIT.

Dual Coil: Reverse-Cycle Defrost with Hot-Gas Drain Pan



Dual Coil: Three-pipe Defrost with Hot-Gas Drain Pan



GENERAL WARRANTY

REFPLUS (SELLER) WARRANTS THAT THE EQUIPMENT MANUFACTURED BY THE SELLER, INCLUDING SERVICE PARTS, AND SOLD UNDER THIS CONTRACT SHALL BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF TWELVE (12) MONTHS FROM THE DATE OF EQUIPMENT START-UP OR EIGHTEEN (18) MONTHS FROM THE DATE OF SHIPMENT, WHICHEVER OCCURS FIRST. ZIEHL-ABEGG FAN ASSEMBLIES ARE WARRANTED AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF TWENTY-FOUR (24) MONTHS FROM THE DATE OF EQUIPMENT START-UP OR THIRTY (30) MONTHS FROM THE DATE OF SHIPMENT, WHICHEVER OCCURS FIRST.

WRITTEN NOTICE OF A DEFECT IN MATERIAL AND WORKMANSHIP SHALL BE SENT TO SELLER IMMEDIATELY UPON DISCOVERY BY BUYER. DEFECTIVE PARTS SHALL BE REPAIRED OR REPLACED PROVIDED THAT INSPECTION BY SELLER VERIFIES THE CLAIMED DEFECT(S). THE SELLER'S OBLIGATION UNDER THIS WARRANTY IS LIMITED SOLELY TO THE REPAIR OR REPLACEMENT, AT SELLER'S OPTIONS, OF ANY PART OR PARTS THEREOF WHICH SHALL DISCLOSE TO THE SELLER'S SATISFACTION TO HAVE BEEN DEFECTIVE UNDER NORMAL USE AND SERVICE. THIS SHALL BE THE BUYER'S EXCLUSIVE REMEDY. ALL OTHER WARRANTIES, WHETHER VERBAL OR WRITTEN, AND ALL WARRANTIES IMPLIED BY LAW, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXCLUDED. NO REPRESENTATIVE OR AGENT OF SELLER IS AUTHORIZED TO MODIFY OR EXPAND THE EXPRESS WARRANTIES OF SELLER. REPAIRS MADE WITHOUT THE PRIOR WRITTEN APPROVAL OF SELLER SHALL VOID ALL WARRANTIES COVERING MATERIAL AND WORKMANSHIP. SELLER SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT INCIDENTAL, CONSEQUENTIAL, OR OTHER FORM OF LOSS, INJURY, DAMAGE, COST, OR EXPENSE, WHETHER CAUSED BY DELAY, FAILURE, OR PERFORMANCE, BREACH OF WARRANTY, OR BY ANY CAUSE WHATSOEVER. FAILURE ON THE PART OF BUYER OR OF OTHER PARTIES TO PROPERLY MAINTAIN THE PRODUCT(S) SOLD UNDER THIS CONTRACT, OR THE OPERATION OF SUCH PRODUCT(S), BY BUYER AND/OR OTHER PARTIES UNDER CONDITIONS MORE SEVERE THAN THOSE FOR WHICH SUCH PRODUCT(S) WERE DESIGNED SHALL VOID ALL WARRANTIES COVERING MATERIALS AND WORKMANSHIP. WARRANTY IS VOID IF PRODUCT IS USED OR OPERATED ON LOW OR IMPROPER VOLTAGES OR IN A MANNER CONTRARY TO THE INSTRUCTIONS COVERING THE INSTALLATION, USE AND MAINTENANCE WHICH ACCOMPANIES SUCH PRODUCT. SELLER'S OBLIGATION UNDER THIS WARRANTY SHALL BE VOID IF BUYER FAILS WITHOUT LEGAL JUSTIFICATION TO PAY SELLER, WHEN DUE, THE FULL PURCHASE PRICE FOR THE EQUIPMENT SOLD HEREUNDER. BUYER ASSUMES LIABILITY FOR AND SHALL BEAR THE COSTS OF COMPLIANCE WITH ALL LAWS, REGULATIONS, CODES STANDARDS OR ORDINANCES APPLICABLE TO THE LOCATION, OPERATION AND MAINTENANCE OF THE PRODUCT(S) SOLD UNDER THIS CONTRACT. THIS WARRANTY APPLIES ONLY TO THE ORIGINAL PURCHASER OF THE EQUIPMENT AND DOES NOT EXTEND, EXPRESSLY OR BY IMPLICATION, TO THE THIRD PARTIES OR OTHERS WITHOUT THE SPECIFIC WRITTEN APPROVAL AND ACKNOWLEDGMENT OF SELLER.

PROOF OF START-UP:
START-UP REPORT FORM SHALL BE FILLED, SIGNED BY BUYER, AND RECEIVED BY SELLER AT THE TIME OF INSTALLATION OF A COMPLETE UNIT IN ORDER TO ESTABLISH THE EFFECTIVE DATE OF THE WARRANTY AND PROVE INDUSTRY BEST PRACTICES WERE COMPLIED WITH FLAWLESSLY FOR THE INSTALLATION OF THE EQUIPMENT. THIS WILL ALSO DEMONSTRATE THAT PROPER START-UP PROCEDURES FOUND IN THE INSTALLATION, OPERATING AND MAINTENANCE MANUAL (IOM) SUPPLIED WITH THE EQUIPMENT WERE FOLLOWED, FAILING WHICH, THE PRESENT WARRANTY SHALL BE NULL AND VOID.

COMPRESSOR WARRANTY:
A COMPRESSOR DETERMINED BY SELLER TO HAVE BEEN DEFECTIVE WITHIN THE WARRANTY PERIOD SHALL BE RETURNED TO THE NEAREST AUTHORIZED DEALER OF THE COMPRESSOR, WITHOUT ANY ADDITIONAL IMPLICATION FROM THE SELLER. COMPRESSOR MANUFACTURER/DISTRIBUTOR SHALL HONOR THE COMPRESSOR LIMITED WARRANTY. NO FREIGHT SHALL BE ALLOWED FOR TRANSPORTATION OF THE COMPRESSOR TO AND FROM THE COMPRESSOR DEALER. THE REPLACEMENT COMPRESSOR SHALL BE IDENTICAL TO THE MODEL BEING REPLACED. ADDITIONAL CHARGES, WHICH MAY RESULT FROM THE REPLACEMENT OF ANOTHER THAN IDENTICAL COMPRESSOR, ARE NOT COVERED BY THIS WARRANTY.

OPTIONAL EXTENDED WARRANTY ON COMPRESSORS:
THE SELLER OFFERS AN OPTIONAL 4-YEAR EXTENDED WARRANTY ON ALL ITS COMPRESSORS. THIS WARRANTY IS SUBJECT TO THE ABOVE-STATED WARRANTY, IS NON-TRANSFERABLE AND IS ONLY VALID IN CANADA AND THE USA. A DEFECTIVE COMPRESSOR SHALL REMAIN IN THE POSSESSION OF THE BUYER AND SHALL ONLY BE RETURNED ONCE AUTHORIZED BY SELLER. THE SELLER RESERVES THE RIGHT TO REQUEST A FAILED COMPRESSOR TO BE SUBJECT TO A TEAR DOWN ANALYSIS IN ORDER TO IDENTIFY THE CAUSE OF THE FAILURE.

EXCLUSIONS:

- THIS WARRANTY DOES NOT COVER THE COSTS OF REMOVING, SHIPPING, OR REINSTALLING THE EQUIPMENT.
- THIS WARRANTY DOES NOT COVER ANY LEAK THAT OCCURS AT A THREADED, MECHANICAL JOINT (DEFINED AS FLARE JOINTS, PIPE THREAD JOINTS OR ROTOLOCK JOINTS). BECAUSE THESE JOINTS CAN LOOSEN DURING TRANSPORT, IT IS THE RESPONSIBILITY OF THE BUYER TO CHECK AND RE-TIGHTEN THEM UPON ARRIVAL OF THE EQUIPMENT OR PRIOR TO CHARGING THE SYSTEM.
- THIS WARRANTY DOES NOT COVER NORMAL WEAR AND TEAR OR THE EROSION, CORROSION AND/OR DETERIORATION OF THE PRODUCT(S) FROM UNUSUAL CAUSES.
- THIS WARRANTY DOES NOT COVER THE REPAIR OR REPLACEMENT OF ANY EQUIPMENT WHICH HAS BEEN REPAIRED OR ALTERED OUTSIDE OF THE FACTORY IN ANY WAY.
- THIS WARRANTY DOES NOT COVER EQUIPMENT AND PARTS WHICH HAVE BEEN SUBJECT TO NEGLIGENCE, MISUSE, OR ABUSE, OR TO PRESSURES IN EXCESS OF STATED LIMITS.
- THIS WARRANTY DOES NOT APPLY TO DEFECTS IN PRODUCT(S) FOR WHICH PAYMENT IN FULL HAS NOT BEEN RECEIVED BY SELLER.
- NO WARRANTIES BY SELLER SHALL APPLY TO ACCESSORIES SUPPLIED BY OTHERS.
- THIS WARRANTY DOES NOT APPLY TO THE LOSS OF FOOD OR ANY PRODUCTS OR REFRIGERANT DUE TO AN EQUIPMENT FAILURE OR FOR ANY OTHER REASON.
- THIS WARRANTY DOES NOT APPLY IF THE START-UP REPORT FORM WAS NOT FILLED, SIGNED, AND PRESENTED AND RECEIVED BY SELLER BY THE BUYER AT THE TIME OF INSTALLATION.

The RefPlus EcoEfficient+ program aims to improve your environmental footprint by reducing refrigerant leakage, noise and power consumption with uncompromising performance.

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05/24