Carrier

38AXQ*16-25 Gemini™ Heat Pump Condensing Units with Puron Advance™ (R-454B) Refrigerant

Installation, Start-Up and Service Instructions

CONTENTS

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SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloths for brazing operations and have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and appropriate national electrical codes (in U.S.A., ANSI/NFPA70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

It is important to recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ DANGER

ELECTRICAL SHOCK HAZARD

Failure to follow this warning will result in personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lock(s) and lockout tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. Do not check compressor ohms at compressor terminals. Unit may have more than one power switch.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

R-454B is an A2L refrigerant. All service equipment or components must be A2L refrigerant rated. Do not use non-A2L rated equipment or components on R-454B refrigerant equipment.

⚠ WARNING

PERSONAL INJURY AND ENVIRONMENTAL HAZARD

Failure to follow this warning could cause personal injury or death.

Relieve pressure and recover all refrigerant before system repair or final unit disposal.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

⚠ CAUTION

PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing air conditioning equipment.

⚠ WARNING

RISK OF FIRE — FLAMMABLE REFRIGERANT

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing 38AXQ units.

Unit Label Safety Symbols

	WARNING	This symbol shows that the appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an ignition source, there is a risk of fire.
	CAUTION	This symbol shows that the operation manual should be read carefully.
	CAUTION	This symbol shows that the service personnel should be handling the equipment with reference to the installation manual.
	CAUTION	This symbol shows that the information is available such as the operating manual or installation manual.

Detection of Flammable Refrigerants

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector utilizing a naked flame) shall not be used.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks, but in the case of flammable refrigerants the sensitivity may not be adequate, or may need recalibration. Detection equipment shall be calibrated in a refrigerant-free area. Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% max.) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Examples of leak detection fluids:

- Bubble method.
- Fluorescent method agents.

If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to the following section.

Ignition Source Mitigation

No person carrying out work on an appliance containing A2L refrigerants which involves exposing any pipe work shall use any sources of ignition in such a way that can lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, must be kept sufficiently far away from the site of work. This includes, but is not limited to, installation, repair, removal, and disposal of equipment.

Work shall be performed under a controlled procedure so as to minimize the risk of flammable gas or vapors being present while work is performed.

Ventilation Requirements

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree ventilation shall continue during the period that work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it external atmosphere. Should an auxiliary ventilation system be present, check that it is operating correctly and no outlets are obstructed.

INSTALLATION GUIDELINE

INSTALLATION

1. Remove the existing evaporator coil or fan coil and install the replacement coil.
2. Drain oil from low points and traps in suction line tubing if they were not replaced.
3. Remove the existing outdoor unit. Install the new outdoor unit according to these installation instructions.
4. Install the factory-supplied liquid-line filter drier at the indoor coil just upstream of the TXV.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Never install suction-line filter drier in the liquid-line of an R-454B system.

5. If required, install a 100% activated alumina suction line filter drier at the outdoor unit.
6. Evacuate and charge the system according to the instructions in this installation manual.
7. Operate the system for 10 hr. Monitor the pressure drop across the suction line filter drier. If pressure drop exceeds 3 psig (21 kPa), replace suction-line and liquid-line filter driers. Be sure to purge system with dry nitrogen and evacuate when replacing filter driers. Continue to monitor the pressure drop across suction-line filter drier. Repeat filter changes is necessary. Never leave suction-line filter drier in system longer than 72 hours (actual time).

GENERAL

For model and serial number nomenclature, see Fig. 1-2.
See Fig. 3-4 and Table 2 for unit dimensions and corner weights. For physical data, see Tables 3-4.

Rated Indoor Airflow (cfm)

Table 1 below lists the rated indoor airflow used for the AHRI efficiency rating for the units covered in this document.

Table 1 — 38AXQ with 40RLQ

MODEL NUMBERS	FULL LOAD AIRFLOW (cfm)
38AXQ16 — 40RLA16	5625
38AXQ25 — 40RLA25	7500

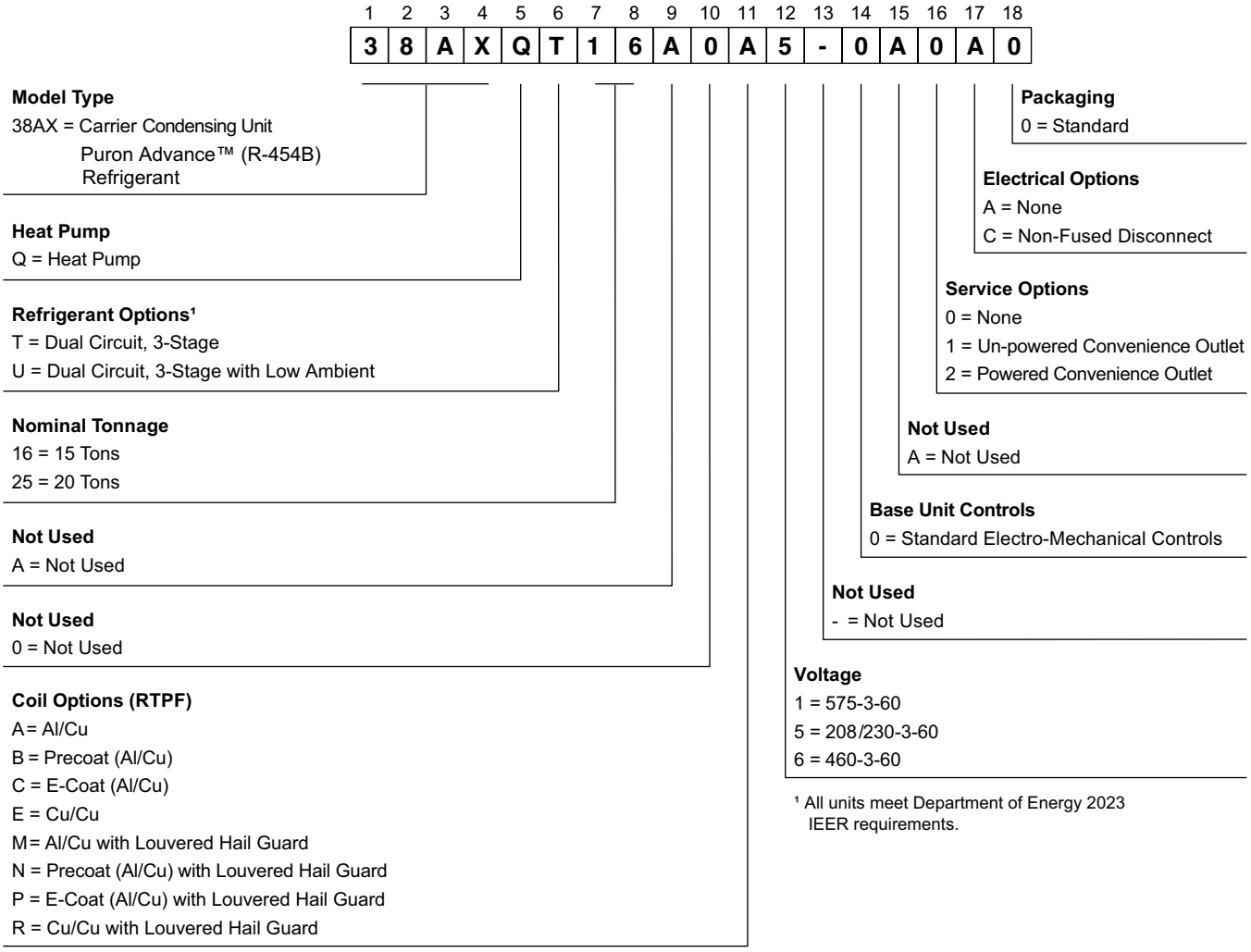


Fig. 1 — Model Number Nomenclature

POSITION NUMBER	1	2	3	4	5	6	7	8	9	10
TYPICAL	0	5	2	5	9	1	2	3	4	5

POSITION	DESIGNATES
1−2	Week of manufacture (fiscal calendar)
3−4	Year of manufacture (“25” = 2025)
5	Manufacturing location
6−10	Sequence number

Fig. 2 — Serial Number Nomenclature

UNIT	ELECTRICAL CHARACTERISTICS	STD. UNIT WT.		CORNER A		CORNER B		CORNER C		CORNER D		CENTER OF GRAVITY			UNIT HEIGHT
		LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z	H
38AXZ16 (RTPF)	208/230-3-60,460-3-60,575-3-60	731	332	237	107	172	78	135	61	186	84	38 [965.2]	19 [482.6]	17 [431.8]	50-3/8 [1279.2]
38AXD16 (RTPF)	208/230-3-60,460-3-60,575-3-60	731	332	237	107	172	78	135	61	186	84	38 [965.2]	19 [482.6]	17 [431.8]	50-3/8 [1279.2]
38AXQ16 (RTPF)	208/230-3-60,460-3-60,575-3-60	768	348	236	107	183	83	153	69	196	89	39 [990.6]	20 [508]	23 [584.2]	50-3/8 [1279.2]

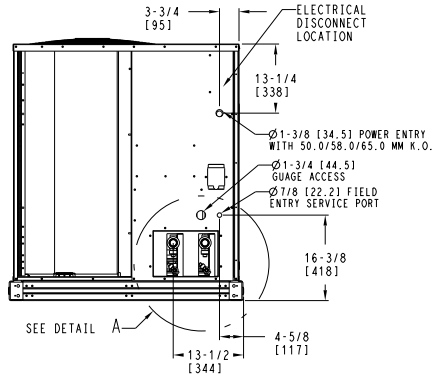
NOTES:
1. MINIMUM CLEARANCE (LOCAL CODES OR JURISDICTION MAY PREVAIL):
   A. BOTTOM TO COMBUSTIBLE SURFACES: 0 INCHES.
   B. OUTDOOR COIL, FOR PROPER AIR FLOW: 36 INCHES ONE SIDE, 12 INCHES THE OTHER. THE SIDE GETTING THE GREATER CLEARANCE IS OPTIONAL.
   C. OVERHEAD: 60 INCHES, TO ASSURE PROPER OUTDOOR FAN OPERATION.
   D. BETWEEN UNITS: CONTROL BOX SIDE, 42 INCHES PER NEC.
   E. BETWEEN UNIT AND UNGROUNDED SURFACES: CONTROL BOX SIDE, 36 INCHES PER NEC.
   F. BETWEEN UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES: CONTROL BOX SIDE, 42 INCHES PER NEC.
2. WITH EXCEPTION OF THE CLEARANCE FOR THE OUTDOOR COIL AS STATED IN NOTE 1B, A REMOVABLE FENCE OR BARRICADE REQUIRES NO CLEARANCE.
3. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM WOOD OR CLASS A, B OR C ROOF COVERING MATERIAL.

SERVICE VALVE CONNECTIONS			QTY
UNIT	SUCTION	LIQUID	
38AXZ16	1-3/8 [34.9]	5/8 [15.9]	1 EA
38AXD16	1-3/8 [34.9]	1/2 [12.7]	2 EA
38AXQ16	1-3/8 [34.9]	1/2 [12.7]	2 EA

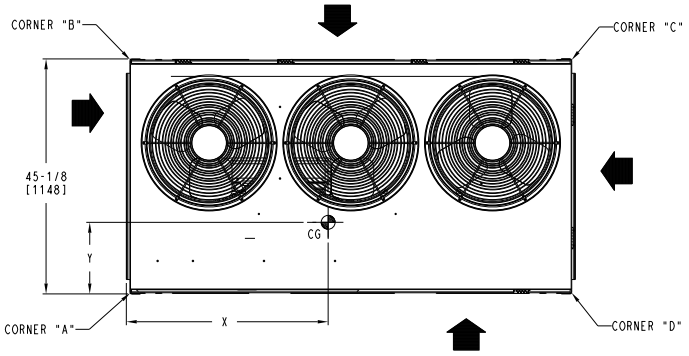
CG CENTER OF GRAVITY

DIRECTION OF AIR FLOW

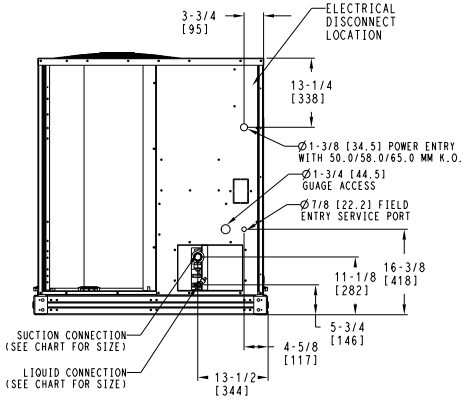
DIMENSIONS IN [ ] ARE IN MM



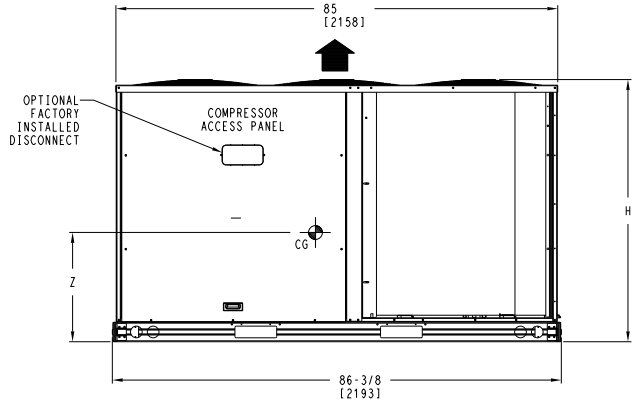
LEFT SIDE VIEW
(FOR 38AXD/38AXQ SYSTEMS)



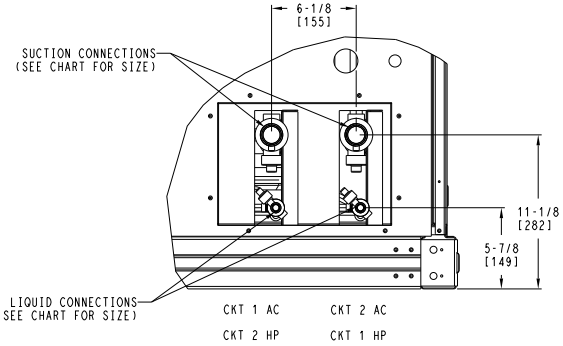
TOP VIEW



LEFT SIDE VIEW
(FOR 38AXZ SYSTEMS)



FRONT VIEW



DETAIL A
(NOTE POSITION OF CKT 1)

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES		REV
U.S. ECCN:NSR	1 OF 1	7/15/24	-	38AXZ,38AXD,38AXQ 16 CONDENSING UNIT	38AU002467	-

Fig. 3 — 38AXQ*16 Unit Dimensions

UNIT	ELECTRICAL CHARACTERISTICS	STD. UNIT WT.		CORNER A		CORNER B		CORNER C		CORNER D		CENTER OF GRAVITY			UNIT HEIGHT
		LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z	H
38AXZ25 (RTPF)	208/230-3-60,460-3-60,575-3-60	978	444	360	163	188	85	147	67	283	128	38 [965.2]	23 [584.2]	17 [431.8]	50-3/8 [1279.2]
38AXD25 (RTPF)	208/230-3-60,460-3-60,575-3-60	978	444	360	163	188	85	147	67	283	128	38 [965.2]	23 [584.2]	17 [431.8]	50-3/8 [1279.2]
38AXD28 (RTPF)	208/230-3-60,460-3-60,575-3-60	1174	533	377	171	267	121	220	100	310	141	41 [1041.4]	28 [711.2]	17 [431.8]	50-3/8 [1279.2]
38AXQ25 (RTPF)	208/230-3-60,460-3-60,575-3-60	1015	460	354	161	224	102	170	77	268	122	37 [939.8]	26 [660.4]	23 [584.2]	50-3/8 [1279.2]

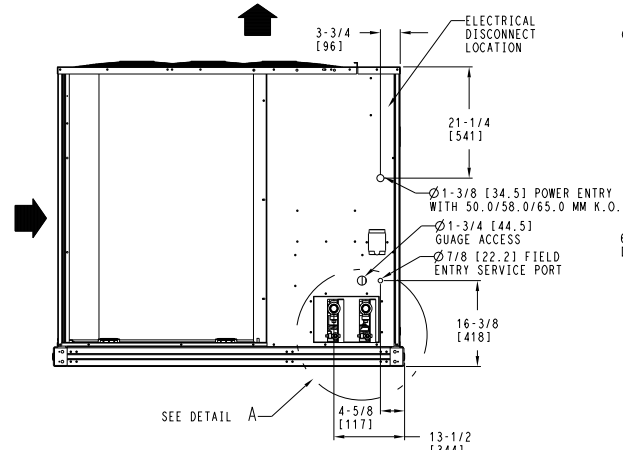
NOTES:
1. MINIMUM CLEARANCE (LOCAL CODES OR JURISDICTION MAY PREVAIL):
   A. BOTTOM TO COMBUSTIBLE SURFACES: 0 INCHES.
   B. OUTDOOR COIL, FOR PROPER AIR FLOW: 36 INCHES ONE SIDE, 12 INCHES THE OTHER. THE SIDE GETTING THE GREATER CLEARANCE IS OPTIONAL.
   C. OVERHEAD: 60 INCHES, TO ASSURE PROPER OUTDOOR FAN OPERATION.
   D. BETWEEN UNITS: CONTROL BOX SIDE, 42 INCHES PER NEC.
   E. BETWEEN UNIT AND UNGROUNDED SURFACES: CONTROL BOX SIDE, 36 INCHES PER NEC.
   F. BETWEEN UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES: CONTROL BOX SIDE, 42 INCHES PER NEC.
2. WITH EXCEPTION OF THE CLEARANCE FOR THE OUTDOOR COIL AS STATED IN NOTE 1B, A REMOVABLE FENCE OR BARRICADE REQUIRES NO CLEARANCE.
3. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM WOOD OR CLASS A, B OR C ROOF COVERING MATERIAL.

SERVICE VALVE CONNECTIONS			QTY
UNIT	SUCTION	LIQUID	
38AXZ25	1-5/8 [41.3]	5/8 [15.9]	1 EA
38AXD25	1-3/8 [34.9]	1/2 [12.7]	2 EA
38AXD28	1-3/8 [34.9]	1/2 [12.7]	2 EA
38AXQ25	1-3/8 [34.9]	1/2 [12.7]	2 EA

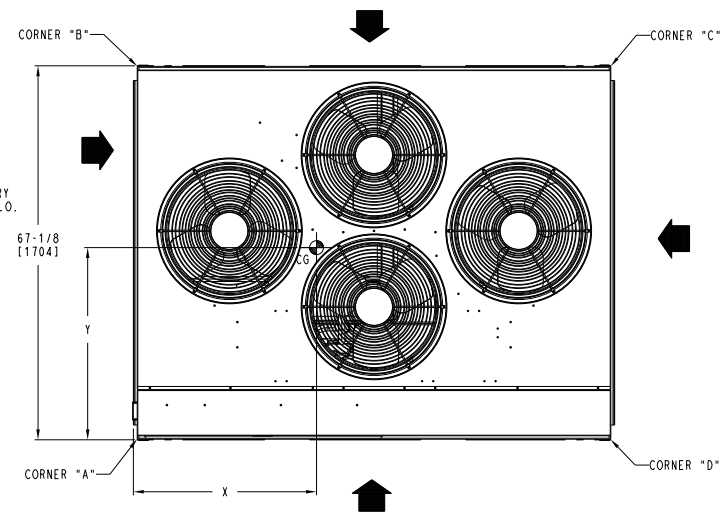
CG — CENTER OF GRAVITY

DIRECTION OF AIR FLOW

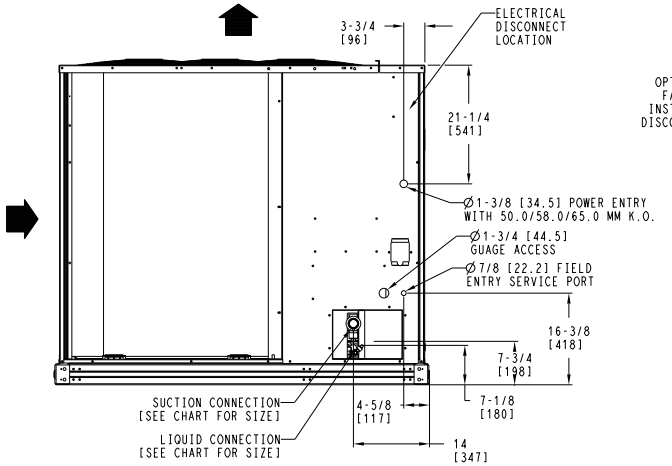
DIMENSIONS IN [ ] ARE IN MM



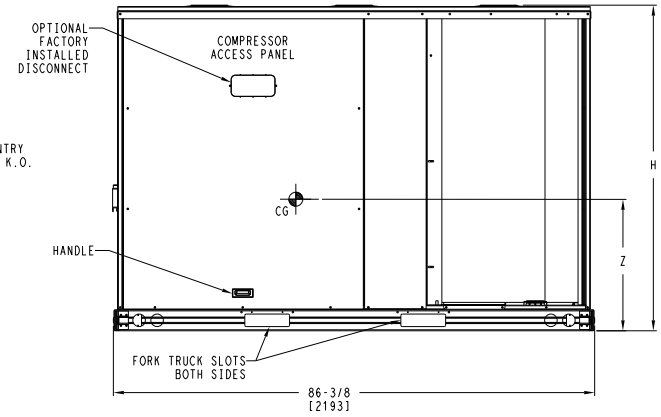
LEFT SIDE VIEW
(FOR 38AXD/38AXQ SYSTEMS)



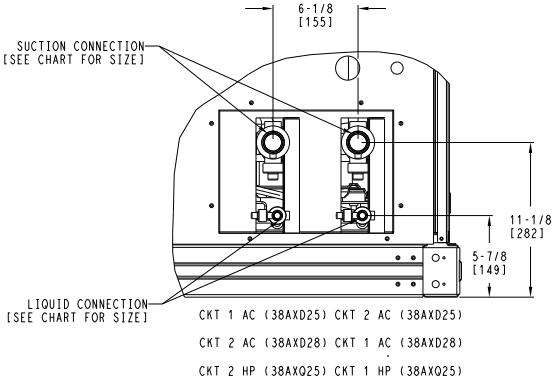
TOP VIEW



LEFT SIDE VIEW
(FOR 38AXZ SYSTEMS)



FRONT VIEW



DETAIL A
(NOTE POSITION OF CKT 1)

DATE	SUPERCEDES			
7/16/24	-	38AXZ,38AXD,38AXQ 25/28 CONDENSING UNIT	38AU002470	-

Fig. 4 — 38AXQ*25 Unit Dimensions

Table 2 — 38AXQ Corner Weights

38AXQ UNIT	STD. UNIT WT.		CORNER A		CORNER B		CORNER C		CORNER D		CENTER OF GRAVITY in. (mm)			UNIT HEIGHT in. (mm)
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	X	Y	Z	H
*16	768	348	236	107	183	83	153	69	196	89	39-1/4 (997)	19-3/4 (502)	23 (584)	50-3/8 (1280)
*25	1015	460	354	161	224	102	170	77	268	122	37-1/4 (946)	26 (660)	23 (584)	50-3/8 (1280)

Table 3 — Physical Data — 38AXQ*16-25 Units — 60 Hz English

UNIT	38AXQ*16	38AXQ*25
Nominal Capacity (tons)	15	20
Operating Weights (lb)		
Aluminum-Fin Coils	768	1015
Refrigeration System	Puron Advance™ (R-454B)	Puron Advance™ (R-454B)
No. Circuits / No. Comp. / Type	2 / 2 / Scroll	2 / 2 / Scroll
Shipping Charge A/B (lb)	9.0 / 9.0	9.0 / 9.0
System Charge with Fan Coil[a] A/B (lb)	24 / 25	23.5 / 22.5
Metering Device	Acutrol	Acutrol
High-Press. Trip / Reset (psig)	630 / 505	630 / 505
Low-Press. Trip / Reset (psig)	27 / 44	27 / 44
Compressor		
Oil Charge A/B (oz)	54 / 56	81 / 81
Speed (rpm)	3500	3500
Outdoor Coil		
Material	Al/Cu	Al/Cu
Coil Type	RTPF	RTPF
Rows/Fins Per Inch (FPI)	2 / 17	2 / 17
Total Face Area (ft^2)	47.1	55.3
Outdoor Fan / Motor		
Qty / Motor Drive Type	3 / Direct	4 / Direct
Motor hp / rpm	1/4 / 1100	1/4 / 1100
Fan Diameter (in.)	22	22
Nominal Airflow (cfm)	10,000	14,000
Watts (total)	970	1150
Piping Connections (in. ODS)		
Qty / Vapor (in. ODS)	2 / 1-3/8	2 / 1-3/8
Qty / Liquid (in. ODS)	2 / 1/2	2 / 1/2

NOTE(S):

a. Approximate system charge with 25 ft piping of sizes indicated with matched 40RLQ.

LEGEND

ODS — Outside Diameter Sweat (socket)
RTPF — Round Tube/Plate Fin

Table 4 — Physical Data — 38AXQ*16-25 Units — 60 Hz SI

UNIT	38AXQ*16	38AXQ*25
NOMINAL CAPACITY (kW)	52.8	70.3
OPERATING WEIGHTS (kg)		
Aluminum-Fin Coils	348	460
REFRIGERATION SYSTEM	Puron Advance™ (R-454B)	Puron Advance™ (R-454B)
No. Circuits / No. Comp. / Type	2 / 2 / Scroll	2 / 2 / Scroll
Shipping Charge A/B (kg)	4.1 / 4.1	4.1 / 4.1
System Charge with Fan Coil[a] A/B (kg)	12.8 / 12.1	12.2 / 12.2
Metering Device	Acutrol	Acutrol
High-Press. Trip / Reset (kPa)	4344 / 3482	4344 / 3482
Low-Press. Trip / Reset (kPa)	186 / 303	186 / 303
COMPRESSOR		
Oil Charge A/B (L)	1.6 / 1.7	2.4 / 2.4
Speed (r/s)	58	58
OUTDOOR COIL		
Material	Al/Cu	Al/Cu
Coil Type	RTPF	RTPF
Rows/Fins Per Meter	2 / 17	2 / 17
Total Face Area (m^2)	4.4	4.6
OUTDOOR FAN / MOTOR		
Qty / Motor Drive Type	3 / Direct	4 / Direct
Motor hp / r/s	1/4 / 18	1/4 / 18
Fan Diameter (mm)	559	559
Nominal Airflow (L/s)	4719	6607
Watts (total)	970	1150
PIPING CONNECTIONS (mm ODS)		
Qty / Vapor	2 / 34.9	2 / 34.9
Qty / Liquid	2 / 12.7	2 / 12.7

NOTE(S):

a. Approximate system charge with 7.6 m piping of sizes indicated with matched 40RLQ.

ODS — Outside Diameter Sweat (socket)
RTPF — Round Tube/Plate Fin

INSTALLATION

Jobsite Survey

Complete the following checks before installation.

1. Consult local building codes and the NEC (National Electrical Code) ANSI/NFPA 70 for special installation requirements.
2. Determine unit location (from project plans) or select unit location.
3. Check for possible overhead obstructions which may interfere with unit lifting or rigging.

Step 1 — Plan for Unit Location

Select a location for the unit and its support system (pad, rails or other) that provides for the minimum clearances required for safety. This includes the clearance to combustible surfaces, unit performance and service access below, around and above unit as specified in unit drawings. See Fig. 5.

Select a unit mounting system that provides adequate height to allow for removal and disposal of frost and ice that will form during the heating-defrost mode.

NOTE: Consider also the effect of adjacent units on airflow performance and control box safety clearance.

Do not install the outdoor unit in an area where fresh air supply to the outdoor coil may be restricted or when recirculation from the condenser fan discharge is possible. Do not locate the unit in a well or next to high walls.

Evaluate the path and required line length for interconnecting refrigeration piping, including suction riser requirements (outdoor unit above indoor unit), liquid line lift (outdoor unit below indoor unit) and hot gas bypass line. Relocate sections to minimize the length of interconnecting tubing.

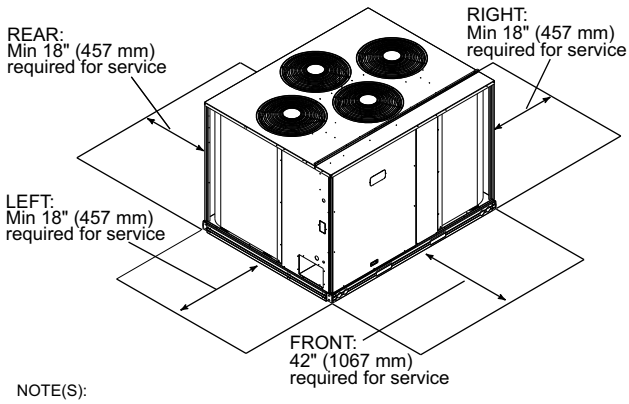
IMPORTANT: DO NOT BURY REFRIGERATION LINES.

REQUIREMENTS OF A2L REFRIGERANT PIPING

The following must be adhered to for refrigerant piping:

- Installation of pipe-work must be kept to a minimum, with minimum piping lengths whenever possible.
- Connecting joints shall only be made in easily accessible locations for service purposes.
- There shall be no bends in pipe-work lines with a centerline bend radius less than 2.5 times the external diameter.
- Pipework must be protected from potential damage during normal operation, service or maintenance.

Although unit is weatherproof, avoid locations that permit water from higher level runoff and overhangs to fall onto the unit.



NOTE(S):
1. Observe requirements for 39" (914 mm) operating clearance on either Left or Rear coil opening.
2. Complete clearance above the unit is recommended to prevent recirculation.

Fig. 5 — Service Clearance Dimensional Drawing

Step 2 — Complete Pre-Installation Checks

CHECK UNIT ELECTRIC CHARACTERISTIC

Confirm before installation of unit that voltage, amperage and circuit protection requirements listed on unit data plate agree with power supply provided.

UN-CRATE UNIT

Remove unit packaging except for the top skid assembly, which should be left in place until after the unit is rigged into its final location.

INSPECT SHIPMENT

File a claim with shipping company if the shipment is damaged or incomplete.

CONSIDER SYSTEM REQUIREMENTS

- Consult local building codes and National Electrical Code (NEC, U.S.A.) for special installation requirements.
- Allow sufficient space for airflow clearance, wiring, refrigerant piping, and servicing unit. See Fig. 3 and 4 for unit dimensions and weight distribution data.
- Locate the unit so that the outdoor coil (condenser) airflow is unrestricted on all sides and above.
- The unit may be mounted on a level pad directly on the base channels or mounted on raised pads at support points. See Tables 3 and 4 for unit operating weights. See Fig. 3 and 4 for weight distribution based on recommended support points.

NOTE: If vibration isolators are required for a particular installation, use the data in Fig. 3 and 4 to make the proper selection.

Step 3 — Prepare Unit Mounting Support

SLAB MOUNT

Provide a level concrete slab that extends a minimum of 6 in. (150 mm) beyond unit cabinet. Install a gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.

Rig and Mount the Unit

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

All panels must be in place when rigging. Unit is not designed for handling by fork truck when packaging is removed.

If using top crate as spreader bar, once unit is set, carefully lower wooden crate off building roof top to ground. Ensure that no people or obstructions are below prior to lowering the crate.

Step 4 — Rigging

These units are designed for overhead rigging. Refer to the rigging label for preferred rigging method. Spreader bars are not required if top crating is left on the unit. All panels must be in place when rigging. As further protection for coil faces, plywood sheets may be placed against the sides of the unit, behind cables. Run cables to a central suspension point so that the angle from the horizontal is not less than 45 degrees. Raise and set the unit down carefully.

If it is necessary to roll the unit into position, mount the unit on longitudinal rails, using a minimum of 3 rollers. Apply force to the rails, not the unit. If the unit is to be skidded into position, place it on a large pad and drag it by the pad. Do not apply any force to the unit.

Raise from above to lift the unit from the rails or pad when unit is in its final position.

After the unit is in position, remove all shipping materials and top crating.

Step 5 — Check Refrigerating Equipment

The following checks shall be made to installations using A2L refrigerants:

- The actual charge is in accordance with the room size within which the refrigerant containing parts are installed.
- Supplementary ventilation machinery and outlets are operating adequately and are not obstructed.
- Warning markings on the equipment is visible and legible, with those that are not being either replaced or corrected.
- Refrigerant piping or components are installed in a position where they are unlikely to be exposed to any substance which may corrode them, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against said corrosion.

Step 6 — Determine Refrigerant Line Sizes

Select the recommended line sizes for 38AXQ unit from the appropriate tables.

Determine the linear length of interconnecting piping required between the outdoor unit and indoor unit (evaporator). Consider and identify also the arrangement of the tubing path (quantity and type of elbows in both lines), liquid line solenoid size, filter drier and any other refrigeration specialties located in the liquid line. Refer to the indoor unit installation instructions for additional details on refrigeration specialties devices.

Determine equivalent line length adjustments for path and components and add to linear line lengths. See Table 5, Equivalent Lengths for Common Fittings, for usual fitting types. Also identify adjustments for refrigeration specialties. Refer to Part 3 of the Carrier System Design Manual for additional data and information on equivalent lengths.

Table 5 — Equivalent Lengths for Common Fittings (ft)

NOMINAL TUBE OD (in.)	ELBOWS				
	90° Std	90° Lrad	90° Street	45° Std	45° Street
3/8	1.3	0.8	2.2	0.6	1.0
1/2	1.4	0.9	2.3	0.7	1.1
5/8	1.6	1.0	2.5	0.8	1.3
3/4	1.8	1.2	2.9	0.9	1.5
7/8	2.0	1.4	3.2	0.9	1.6
1-1/8	2.6	1.7	4.1	1.3	2.1
1-3/8	3.3	2.3	5.6	1.7	3.0
1-5/8	4.0	2.6	6.3	2.1	3.4
2-1/8	5.0	3.3	8.2	2.6	4.5

NOMINAL TUBE OD (in.)	TEES			
	Branch Flow	Straight-Thru		
		No Reduct	Reduce 25%	Reduce 50%
3/8	2.6	0.8	1.1	1.3
1/2	2.7	0.9	1.2	1.4
5/8	3.0	1.0	1.4	1.6
3/4	3.5	1.2	1.7	1.8
7/8	4.0	1.4	1.9	2.0
1-1/8	5.0	1.7	2.3	2.6
1-3/8	7.0	2.3	3.1	3.3
1-5/8	8.0	2.6	3.7	4.0
2-1/8	10.0	3.3	4.7	5.0

NOTE: Equivalent line lengths will vary based on tube diameter. Calculate equivalent line length for each pipe by adding equivalent length adjustments to linear lengths for each pipe.

Check Tables 6-9 for liquid and suction line diameters based on the position of the condenser relative to the evaporator. These tables can be used to look up the required suction line sizes based on the model number, units size, and number of line sets required.

Table 6 — Liquid Line Diameter — Condenser Above Evaporator

UNIT	NOMINAL TONNAGE	CIRCUITS		LINEAR LENGTH (ft)	0-25	26-50		51-75		76-100	
				EQUIV. LINEAR LENGTH (ft)	0-37	38-74		75-112		113-149	
					Nominal	Nominal	Allowable	Nominal	Allowable	Nominal	Allowable
38AXQ*16 40RLQA16	15 Tons	2	A Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	—	—
				Max. Lift (ft)	60	57	61	54	60	—	—
			B Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	—	—
				Max. Lift (ft)	60	41	45	38	44	—	—
38AXQ*25 40RLQA25	20 Tons	2	A Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	5/8	3/4
				Max. Lift (ft)	53	48	55	44	54	52	55
			B Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	1/2	5/8
				Max. Lift (ft)	53	64	72	58	70	52	69

Table 7 — Suction Line Diameter — Condenser Above Evaporator[a,b,c]

UNIT	NOMINAL TONNAGE	CIRCUITS		SUCTION RISER TYPE	LINEAR LENGTH (ft)	0-25	26-50		51-75		76-100	
					EQUIV. LINEAR LENGTH (ft)	0-37	38-74		75-112		113-149	
						Nominal	Nominal	Allowable	Nominal	Allowable	Nominal	Allowable
38AXQ*16 40RLQA16	15 Tons	2	A Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Capacity Loss	—	0.1%	—	0.4%	—	0.6%	0.0%
				Speed Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Suction Riser Dia. (in.) (A)	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-3/8
					Capacity Loss	—	0.1%	—	0.4%	—	0.6%	0.0%
				Double Suction Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Suction Riser Dia. (in.) (A)	7/8	7/8	7/8	7/8	7/8	7/8	7/8
					Suction Riser Dia. (in.) (B)	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-3/8
					Capacity Loss	0.1%	0.6%	0.0%	0.9%	0.1%	1.1%	0.2%
			B Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	—	1-3/8	—	1-3/8	—
					Capacity Loss	—	—	—	—	—	—	—
				Speed Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	—	1-3/8	—	1-3/8	—
					Suction Riser Dia. (in.) (A)	1-1/8	1-1/8	—	1-1/8	—	1-1/8	—
					Capacity Loss	—	—	—	—	—	—	—
				Double Suction Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	—	1-3/8	—	1-3/8	—
					Suction Riser Dia. (in.) (A)	7/8	7/8	—	7/8	—	7/8	—
					Suction Riser Dia. (in.) (B)	1-1/8	1-1/8	—	1-1/8	—	1-1/8	—
					Capacity Loss	—	—	—	0.1%	—	0.2%	—
38AXQ*25 40RLQA25	20 Tons	2	A Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Capacity Loss	—	—	—	0.0%	—	0.2%	—
				Speed Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Suction Riser Dia. (in.) (A)	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-3/8
					Capacity Loss	—	—	—	0.0%	—	0.2%	—
				Double Suction Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Suction Riser Dia. (in.) (A)	7/8	7/8	7/8	7/8	7/8	7/8	7/8
					Suction Riser Dia. (in.) (B)	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-3/8
					Capacity Loss	—	0.2%	—	0.3%	—	0.5%	—
			B Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Capacity Loss	—	—	—	0.1%	—	0.3%	—
				Speed Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Suction Riser Dia. (in.) (A)	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-3/8
					Capacity Loss	—	—	—	0.1%	—	0.3%	—
				Double Suction Riser	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Suction Riser Dia. (in.) (A)	7/8	7/8	7/8	7/8	7/8	7/8	7/8
					Suction Riser Dia. (in.) (B)	1-1/8	1-1/8	1-3/8	1-1/8	1-3/8	1-1/8	1-3/8
					Capacity Loss	—	0.3%	—	0.5%	—	0.6%	0.0%

NOTE(S):

a. A continuous rise of 0-10ft; no riser required.
A continuous rise of 11-30ft; speed riser required.
A continuous rise of 31-75ft; double riser required.
A continuous rise of more than 75ft is not recommended.

b. See Fig. 6 for speed riser diagram.
Tube S is the horizontal line size.
Tube A is the reduced diameter riser size.

c. See Fig. 7 for double riser diagram.
Tube S is the horizontal line size.
Tube A is the reduced diameter riser size without bottom trap.
Tube B is the parallel riser size with bottom oil trap.

Table 8 — Liquid Line Diameter — Condenser Below Evaporator

UNIT	NOMINAL TONNAGE	CIRCUITS		LINEAR LENGTH (ft)	0-25	26-50		51-75		76-100	
				EQUIV. LINEAR LENGTH (ft)	0-37	38-74		75-112		113-149	
					Nominal	Nominal	Allowable	Nominal	Allowable	Nominal	Allowable
38AXQ*16 40RLQA16	15 Tons	2	A Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	—	—
				Max. Lift (ft)	60	57	61	54	60	—	—
			B Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	—	—
				Max. Lift (ft)	60	41	45	38	44	—	—
38AXQ*25 40RLQA25	20 Tons	2	A Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	5/8	3/4
				Max. Lift (ft)	53	48	55	44	54	52	55
			B Circuit	Liquid Line Dia. (in.)	1/2	1/2	5/8	1/2	5/8	1/2	5/8
				Max. Lift (ft)	53	64	72	58	70	52	69

Table 9 — Suction Line Diameter — Condenser Level or Below Evaporator

UNIT	NOMINAL TONNAGE	CIRCUITS		SUCTION RISER TYPE	LINEAR LENGTH (ft)	0-25	26-50		51-75		76-100	
					EQUIV. LINEAR LENGTH (ft)	0-37	38-74		75-112		113-149	
						Nominal	Nominal	Allowable	Nominal	Allowable	Nominal	Allowable
38AXQ*16 40RLQA16	15 Tons	2	A Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Capacity Loss	—	0.1%	—	0.4%	—	0.6%	0.0%
			B Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	—	1-3/8	—	1-3/8	—
					Capacity Loss	—	—	—	—	—	—	—
38AXQ*25 40RLQA25	20 Tons	2	A Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Capacity Loss	—	—	—	0.0%	—	0.2%	—
			B Circuit	None	Suction Line Dia. (in.) (S)	1-3/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8
					Capacity Loss	—	—	—	0.1%	—	0.3%	—

LIQUID LIFT

A liquid lift condition exists when the outdoor unit is located below the indoor (evaporator) unit and liquid flows vertically up in a portion of the liquid line. The vertical column of liquid reduces the available state point sub-cooling at the evaporator coil's thermal expansion valve. This effect reduces the length of liquid lift (feet of elevation) that a liquid line size can accommodate. Longer linear tube lengths will also reduce the amount of liquid lift possible.

Check Tables 6-9 for maximum liquid lift capabilities for line sizes. Note for size 16 that condenser coil type also effects maximum liquid lift; ensure the lines for this unit's specific coil type are being used.

Reselect the liquid line tube size if necessary. If maximum available tube size cannot provide the required lift distance on this installation, relocate the outdoor unit to reduce the equivalent line length or the lift requirement.

SUCTION RISER

A suction riser condition exists when the outdoor unit is located above the indoor (evaporator) unit and suction vapor must flow vertically up to return to the compressor. Oil return is a concern when the suction tube size is too large to produce the minimum refrigerant velocity to ensure oil return at minimum load conditions.

Follow guidelines given in Tables 6-9 to know when to use a suction riser or double suction riser. Check Table 10 for suction riser conditions in cooling and heating.

NOTE: The maximum suction tube size for 38AXQ units sizes 16-25 at minimum load conditions is 1-5/8 in.

See Fig. 6 for speed riser reference, where tube S is the horizontal line size and tube A is the reduced diameter riser size.

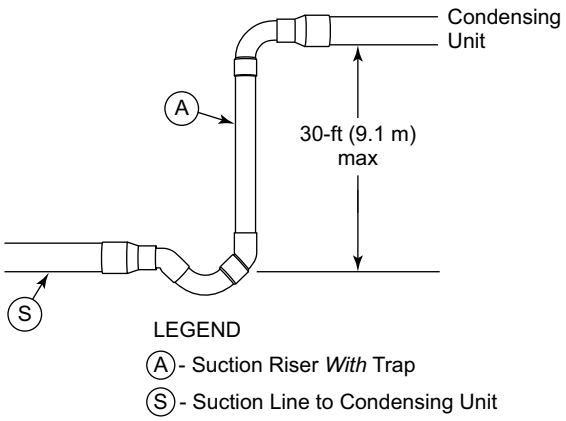


Fig. 6 — Suction Line Piping — Speed Riser

See Fig. 7, for double riser reference, where, tube S is the horizontal line size, tube A is the reduced diameter riser size without bottom trap, and tube B is the parallel riser size with bottom oil trap.

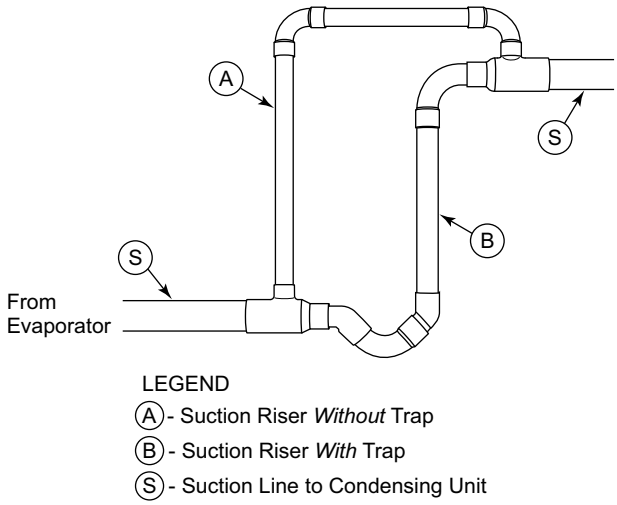


Fig. 7 — Suction Line Piping — Double Riser

Step 7 — Complete Refrigerant Piping Connections

Refrigerant lines must be carefully designed and constructed to ensure equipment reliability and efficiency. Line length, pressure drop, compressor oil return, and vertical separation are several of the design criteria that must be evaluated. See Table 5.

IMPORTANT: DO NOT BURY REFRIGERANT LINES.

IMPORTANT: A refrigerant receiver is not provided with the unit. Do not install a receiver.

CHECK VERTICAL SEPARATION

If there is any vertical separation between the indoor and outdoor units, check to ensure that the separation is within allowable limits. Relocate equipment if necessary.

PROVIDE SAFETY RELIEF

If local codes dictate an additional safety relief device, purchase locally and install locally. Installation will require the recovery of the factory shipping charge before the factory tubing can be cut and the supplemental relief device is installed.

REFRIGERANT LINE SIZING

Consider the length of the piping required between the outdoor and indoor units. The maximum allowable line length is 100 ft (30.5 m). See Table 5. Refrigerant vapor piping should be insulated.

RISERS IN HEAT PUMP PIPING SYSTEMS

Elevation differences between the outdoor unit and the indoor unit in heat pump systems will create two riser line conditions – one in the liquid line in one mode and one in the vapor line in the opposite mode. See the following table to identify which lines are risers in this installation.

Table 10 — Riser Conditions

MODE	38AXQ UNIT BELOW ID UNIT	38AXQ UNIT ABOVE ID UNIT
	Riser in	Riser in
Cooling	Liquid	Vapor (Suction Gas)
Heating	Vapor (Discharge Gas)	Liquid

LIQUID LINE RISER

Refer to Piping Recommendations, Table 5; observe Max Lift limits for liquid line according to unit mode, equivalent line length and pipe size.

VAPOR LINE RISER

Refer to Table 11 for maximum pipe size in single pipe vapor risers. All pipe size recommendations in Piping Recommendations, Table 5, satisfy these maximum vapor line sizes. If this installation is re-using existing piping, check the vapor line sizes against these maximum values; replace riser sections with these pipe sizes if necessary.

Table 11 — Maximum Vapor Line Sizes

38AXQ UNIT	38AXQ UNIT BELOW ID UNIT	38AXQ UNIT ABOVE ID UNIT
	Max Diameter, Single Pipe (in.)	
16	1-5/8	1-5/8
25	1-5/8	1-5/8

INSTALL FILTER DRIERS AND MOISTURE INDICATORS

Every unit MUST have bi-directional filter driers in the liquid lines. Locate the filter driers at the indoor unit, close to the evaporator coil's thermostatic expansion valve (TXV) inlets.

38AXQ units include two Puron Advance™-duty filter driers, shipped in cartons attached to the unit basepan. Remove the filter driers and prepare to install in the liquid lines at the evaporator coil. Do not remove connection fitting plugs until ready to connect and braze the filter driers into the liquid line positions. See Table 12.

Installation of liquid line moisture indicating sight glass in each circuit is recommended. Locate the sight glass(es) between the outlet of the filter drier and the TXV inlet.

Refer to Table 13 for recommendations on refrigeration specialties.

Select the filter drier for maximum unit capacity and minimum pressure drop. Complete the refrigerant piping from the indoor unit to the outdoor unit before opening the liquid and suction lines at the outdoor unit.

Table 12 — Puron-Duty Filter Drier(s)

MODEL SIZE	QTY	LIQUID LINE OD	DESSICANT VOLUME	PART NO. REF
38AXQ*16	2	1/2 in.	16 cu. in.	KH43LS102
38AXQ*25	2	1/2 in.	16 cu. in.	KH43LS102

Table 13 — Refrigerant Specialties Part Numbers

LIQUID LINE SIZE (in.)	LIQUID LINE SOLENOID VALVE (LLSV)	SOLENOID COIL	SIGHT GLASS
1/2	EF680035 plus EF680039 biflow kit	EF680037	KM680004
5/8	EF680036 plus EF680039 biflow kit	EF680037	KM680005

INSTALL LIQUID LINE SOLENOID VALVES

It is recommended that bi-directional solenoid valves be placed in the main liquids line for circuits 1 and 2 (see Fig. 8) between the outdoor unit and the indoor coil. Locate the solenoid valves at the end of the liquid lines, near the outdoor unit connections, with flow direction arrow pointed at the outdoor unit. Refer to Table 13. (A liquid line solenoid valve is required when the liquid line length exceeds 75 ft [23 m].) This valve prevents refrigerant migration (which causes oil dilution) to the compressor during the off cycle, at low outdoor ambient temperatures. Wire the solenoid according to the unit label diagram.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Failure to use a solenoid valve relay (SUR) accessory may cause overload of Comfort Alert Diagnostic Module (CADM) and compressor alarm lock out.

CAPACITY CONTROL LIQUID LINE SOLENOID VALVE

Evaporator capacity control via liquid solenoid valve is not recommended for use with 38AXQ models.

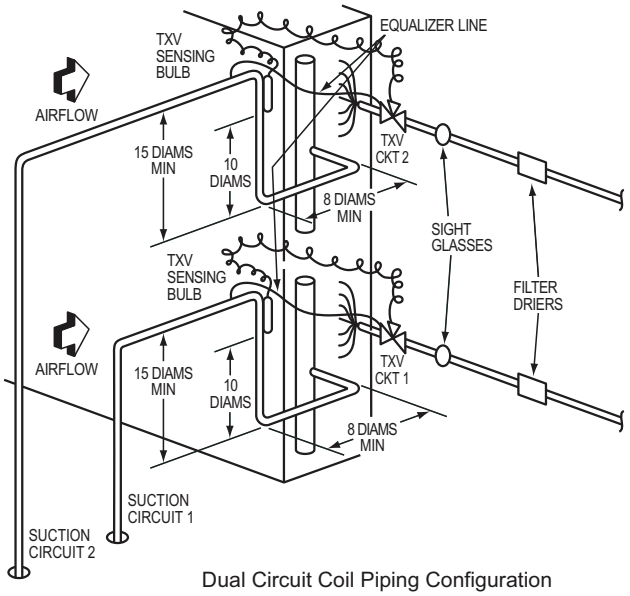


Fig. 8 — Location of Sight Glasses and Filter Driers

MAKE PIPING CONNECTIONS

Piping connections at the 38AXQ unit are ball valves with stub tube extensions. Do not open the unit service valves until all interconnecting tube brazing as been completed. The stub tube connections include 1/4 in. SAE service fittings with Schrader valve cores (see Fig. 9). Before making any brazed connections to the unit service valves, remove both Schrader valve caps and cores and save for re-installation. Connect a source for nitrogen to one of these service fittings during tube brazing to prevent the formation of copper oxides inside the tubes at brazed joints.

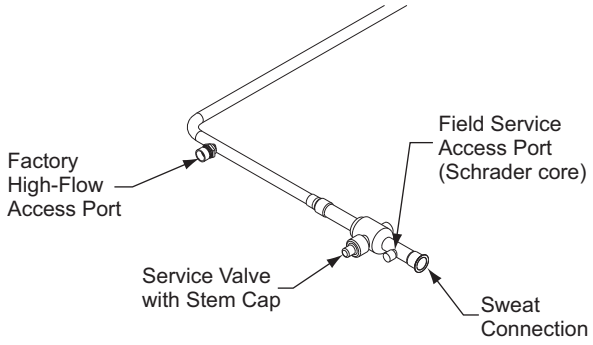


Fig. 9 — Typical Piping Connection Assembly

When connecting the field tubing to the 38AXQ service valves, wrap the valves in wet rags to prevent overheating. Pressure-test all joints from outdoor unit connections over to the indoor coil, using nitrogen as pressure and with soap-and-bubbles.

When pressure-testing is completed, remove the nitrogen source at the outdoor unit service valves and re-install the two Schrader valve cores. Torque the cores to 2-3 in.-lb (23-34 N-cm).

Where vapor line is exposed to outdoor air, line must be insulated. See Table 14 for insulation requirements.

Table 14 — Insulation for Vapor Line Exposed to Outdoor Conditions

LENGTH OF EXPOSED VAPOR LINE[a]		INSULATION THICKNESS[b]	
ft	m	in.	mm
10	3	3/8	10
25	8	1/2	13
50	15	3/4	19

NOTE(S):

a. Recommended vapor line insulation for piping exposed to outdoor conditions to prevent loss of heating during heating cycle. When vapor line goes through interior spaces, insulation should be selected to prevent condensation on cooling cycle. Heating capacity should be reduced 1000 Btuh (295 W) if over 35 ft (11 m) of vapor line with 3/4 in. (19 mm) insulation is exposed to outdoor conditions.

b. Closed cell foam insulation with a thermal conductivity of: 0.28 Btu • in./ft^2 • h • °F (0.04 W/m • °C).

EVACUATION/DEHYDRATION

Evacuate and dehydrate the connected refrigeration system(s) (excluding the 38AXQ unit) to 500 microns using a two-stage vacuum pump attached to the service ports outside the 38AXQ service valves, following description in GTAC II, Module 4, System Dehydration.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

R-454B refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on R-454B refrigerant equipment.

IMPORTANT: Charge in Cooling mode only!

PRELIMINARY CHARGE

Before starting the unit, charge R-454B liquid refrigerant into the high side of each 38AX circuit through the liquid service valve(s).

NOTE: See “Adjust Refrigerant Charge” on page 23 for details on refrigerant charge adjustment. Be sure that all condenser fans are operating while charging the unit.

Allow high and low side pressures to equalize. If pressures do not equalize readily, charge R-454B vapor (using special service manifold with expansion device) into the suction line service port for the low side of system to assure charge in the evaporator. Refer to GTAC II, Module 5, Charging, Recover, Recycling, and Reclamation for liquid charging procedures.

Table 15 includes the amount of charge per foot of liquid line, based on line diameter. To calculate the total charge needed in the system:

1. Determine the nominal charge at 25 ft of line set found in Table 3, based on the unit model.
2. For any additional line set past 25 ft, multiply the additional length by the charge per foot of line set in Table 15, taking into account the liquid line size.
3. Add together the nominal charge from Step 1 and the additional charge calculated in Step 2.
4. If factory charge has not been removed from the system, subtract 9.0 lb from the charge calculated in Step 3.

Table 15 — Charge per Foot of Line Set

LIQUID LINE SIZE (in.)	CHARGE lb/ft
3/8	0.034
1/2	0.066
5/8	0.103
3/4	0.153
7/8	0.204
1-1/8	0.346

For linear line lengths longer than 125 ft (38 m), contact your local Carrier representative for system charge value.

A2L CHARGING REQUIREMENTS

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Step 8 — Install Accessories

Accessories requiring modifications to unit wiring should be completed now. These accessories may include Winter Start controls, Low Ambient controls, phase monitor, Compressor Lockout. Refer to the instructions shipped with the accessory. Additionally, for low ambient controls, refer to Table 16.

Table 16 — Minimum Outdoor Air Operating Temperature

UNIT	PERCENT COMPRESSOR CAPACITY	MINIMUM OUTDOOR TEMP °F (°C)[a]	
		Standard Unit	Head Pressure Control[b]
38AXQ*16	100	35 (1.7)	–20 (–28.9)
38AXQ*25	100	35 (1.7)	–20 (–28.9)

NOTE(S):

a. Applies to Cooling mode of operation only.
b. Wind baffles (field-supplied and field-installed) are recommended for all units with low ambient head pressure control. Refer to Low Ambient Control Installation Instructions (shipped with accessory) for details.

Step 9 — Complete Electrical Connections

⚠ WARNING

ELECTRIC SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC; ANSI/NFPA 70, latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

⚠ WARNING

Failure to follow this warning could result in personal injury or death.

Do not use gas piping as an electrical ground.

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code); ANSI/NFPA 70, latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

NOTE: Check all factory and field electrical connections for tightness. Field-supplied wiring shall conform with the limitations of 63°F (33°C) rise.

FIELD POWER SUPPLY

If equipped with optional Powered Convenience Outlet: The power source leads to the convenience outlet’s transformer primary are not factory connected. Installer must connect these leads according to required operation of the convenience outlet. If an always-energized convenience outlet operation is desired, connect the source leads to the line side of the unit-mounted disconnect. (Check with local codes to ensure this method is acceptable in your area.) If a de-energize via unit disconnect switch operation of the convenience outlet is desired, connect the source leads to the load side of the unit disconnect. On a unit without a unit-mounted disconnect, connect the source leads to compressor contactor C with unit field power leads.

All units except 208/230-v units are factory wired for the voltage shown on the nameplate. If the 208/230-v unit is to be connected to a 208-v power supply, the control transformer must be rewired by moving the black wire with the 1/4 in. female spade connector

from the 230-v connection and moving it to the 208-v 1/4 in. male terminal on the primary side of the transformer. Refer to unit label diagram for additional information.

Field power wires are connected to the unit at line-side pressure lugs on compressor contactor C and TB1 (see wiring diagram label for control box component arrangement) or at factory-installed option non-fused disconnect switch. Max wire size is no.4 AWG (copper only).

NOTE: TEST LEADS - Unit may be equipped with short leads (pigtails) on the field line connection points on contactor C or optional disconnect switch. These leads are for factory run-test purposes only; remove and discard before connecting field power wires to unit connection points. Make field power connections directly to line connection pressure lugs only.

Route the field power supply in through the opening designated in Fig. 10 and 11.

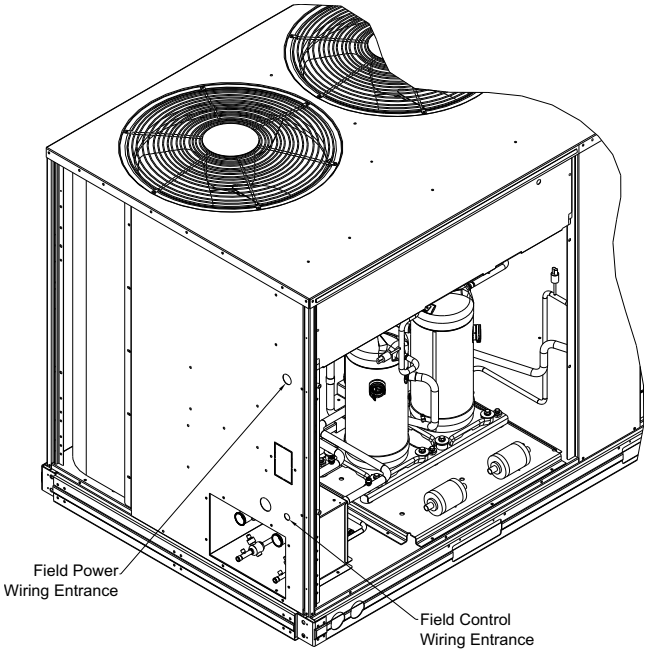


Fig. 10 — 38AXQ 16 Field Power and Control Wire Routing

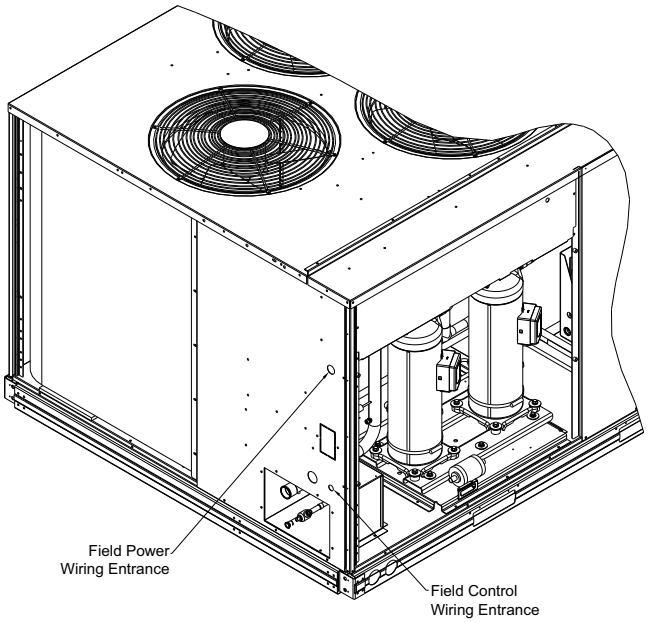


Fig. 11 — 38AXQ 25 Field Power and Control Wiring

⚠ WARNING

FIRE HAZARD

Failure to follow this warning could result in intermittent operation or performance satisfaction. Do not connect aluminum wire between disconnect switch and condensing unit. Use only copper wire. (See Fig. 12.)

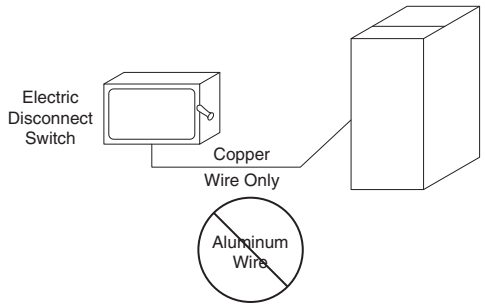


Fig. 12 — Disconnect Switch and Unit

UNITS WITHOUT FACTORY-INSTALLED DISCONNECT

When installing units, provide a disconnect switch per NEC (National Electrical Code) of adequate size. Disconnect sizing data is provided on the unit informative plate. Locate on unit cabinet or within sight of the unit per national or local codes. Do not cover unit informative plate if mounting the disconnect on the unit cabinet.

UNITS WITH FACTORY-INSTALLED DISCONNECT

The factory-installed option disconnect switch is located in a weatherproof enclosure located under the main control box. The manual switch handle is accessible through an opening in the access panel.

ALL UNITS

All field wiring must comply with NEC and all local codes. Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 13 for power wiring connections to the unit power terminal block and equipment ground. Maximum wire size is no. 4 ga AWG per pole.

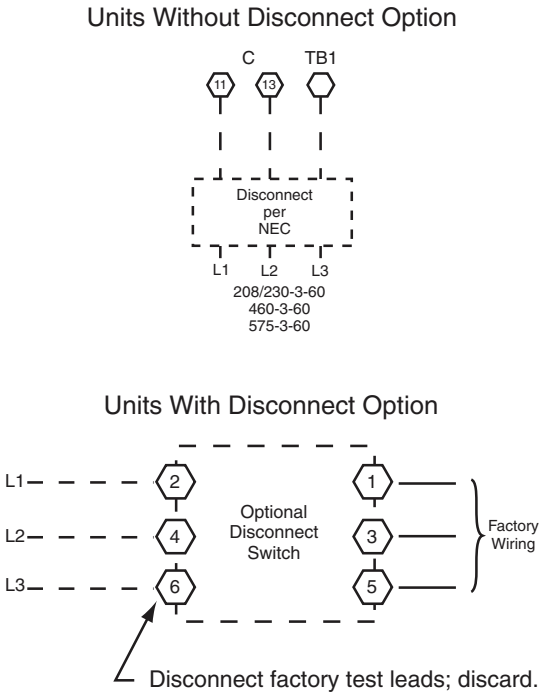


Fig. 13 — Power Wiring Connections

Provide a ground-fault and short-circuit over-current protection device (fuse or breaker) per NEC Article 440 (or local codes). Refer to unit informative data plate for MOCP (Maximum Overcurrent Protection) device size.

All field wiring must comply with the NEC and local requirements. Care should be taken to ensure all field wiring is not in contact with the discharge line or sharp edges.

See Table 17 for recommended torque of the ground lug screw when using approved electrical wire for the electrical ground.

Table 17 — Recommended Torque of Ground Lug Field Connection

AWG	Torque (in.-lb)
16	35±4
14	35±4
12	35±4
10	35±4
8	40±5
6	45±5.5
4	45±5.5

VOLTAGE AND CURRENT BALANCE

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. See Table 18. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in the legend for Table 18, Note a (see page 21) to determine the percent of voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

Convenience Outlets

⚠ WARNING

ELECTRICAL OPERATION HAZARD

Failure to follow this warning could result in personal injury or death.

Units with convenience outlet circuits may use multiple disconnects. Check convenience outlet for power status before opening unit for service. Locate its disconnect switch, if appropriate, and open it. Tag-out this switch, if necessary.

Two types of convenience outlets are offered on 38AXQ models: Non-powered and unit-powered. Both types provide a 125-volt GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged waterproof access cover, located on the end panel of the unit. See Fig. 14.

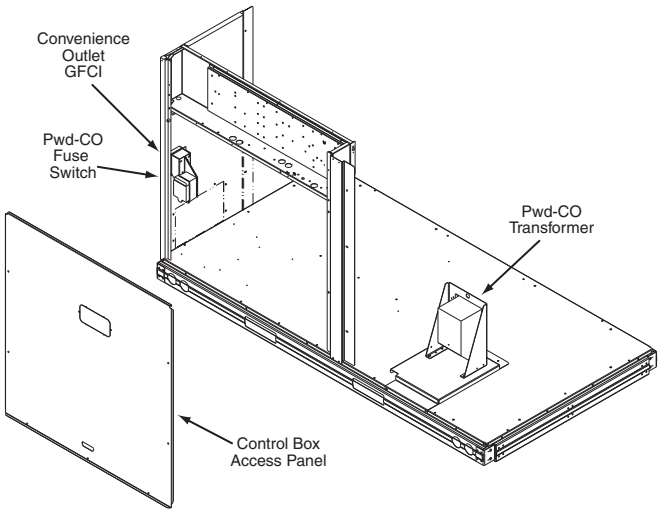


Fig. 14 — Convenience Outlet Location

Non-powered type: This type requires the field installation of a general-purpose 125-volt 15-A circuit powered from a source elsewhere in the building. Observe national and local codes when selecting wire size, fuse or breaker requirements and disconnect switch size and location. Route 125-v power supply conductors into the bottom of the utility box containing the duplex receptacle.

Unit-powered type: A unit-mounted transformer is factory-installed to stepdown the main power supply voltage to the unit to 115-v at the duplex receptacle. This option also includes a manual switch with fuse, located in a utility box and mounted on a bracket behind the convenience outlet; access is through the unit's control box access panel. See Fig. 14.

The primary leads to the convenience outlet transformer are not factory-connected. Selection of primary power source is a customer-option. If local codes permit, the transformer primary leads can be connected at the line-side terminals on the unit-mounted non-fused disconnect; this will provide service power to the unit when the unit disconnect switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect switch is open. See Fig. 15.

Duty Cycle: The unit-powered convenience outlet has a duty cycle limitation. The transformer is intended to provide power on an intermittent basis for service tools, lamps, etc; it is not intended to provide 15-amps loading for continuous duty loads (such as electric heaters for overnight use). Observe a 50% limit on circuit loading above 8-amps (i.e., limit loads exceeding 8-amps to 30 minutes of operation every hour).

Test the GFCI receptacle by pressing the TEST button on the face of the receptacle to trip and open the receptacle. Check for proper grounding wires and power line phasing if the GFCI receptacle does not trip as required. Press the RESET button to clear the tripped condition.

Fuse on power type: The factory fuse is a Bussman™[1] "Fusetron™"[1] T-15, non-renewable screw-in (Edison base) type plug fuse. Using unit-mounted convenience outlets: Units with unit-mounted convenience outlet circuits will often require that two disconnects be opened to de-energize all power to the unit. Treat all units as electrically energized until the convenience outlet power is also checked and de-energization is confirmed. Observe National Electrical Code Article 210, Branch Circuits, for use of convenience outlets.

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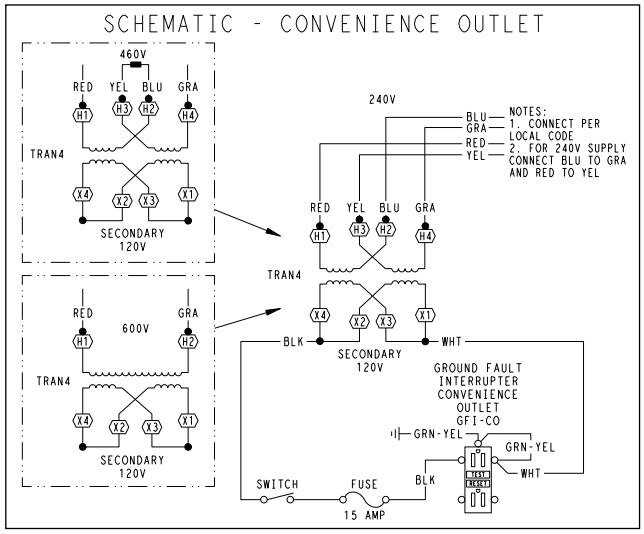


UNIT VOLTAGE	CONNECT AS	PRIMARY CONNECTIONS	TRANSFORMER TERMINALS
208, 230	240	L1: RED + YEL L2: BLU + GRA	H1 + H3 H2 + H4
460	480	L1: RED Splice BLU + YEL L2: GRA	H1 H2 + H3 H4
575	600	L1: RED L2: GRA	H1 H2

Fig. 15 — Powered Convenience Outlet Wiring

Installing Weatherproof Cover

A weatherproof while-in-use cover for the factory installed convenience outlets is now required by UL standards. This cover cannot be factory mounted due its depth; it must be installed at unit installation. For shipment, the convenience outlet is covered with a blank cover plate.

The weatherproof cover kit is shipped in the unit's control box. The kit includes the hinged cover, a backing plate and gasket.

DISCONNECT ALL POWER TO UNIT AND CONVENIENCE OUTLET.

Remove the blank cover plate at the convenience outlet; discard the blank cover.

Loosen the two screws at the GFCI duplex outlet, until approximately 1/2 in. (13 mm) under screw heads are exposed. Press the gasket over the screw heads. Slip the backing plate over the screw heads at the keyhole slots and align with the gasket; tighten the two screws until snug (do not overtighten).

Mount the weatherproof cover to the backing plate as shown in Fig. 16. Remove two slot fillers in the bottom of the cover to permit service tool cords to exit the cover. Check for full closing and latching.

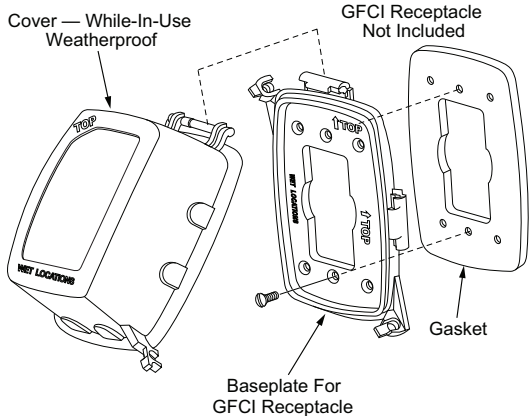


Fig. 16 — Weatherproof Cover Installation

ALL UNITS

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. See Table 18. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in the legend for Table 18, Note a (see page 21) to determine the percent of voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

FIELD CONTROL WIRING

38AXQ unit control voltage is 24 v. See Fig. 17 for typical field control connections and the unit's label diagram for field-supplied wiring details. Route the field control wiring in through the opening designated in Fig. 10 and 11 to the connections terminal board in the unit's control box.

Remainder of the system controls connection will vary according to the specific construction details of the indoor section. Figure 17 depicts typical connections to a Carrier 40RLQ fan coil unit. Plan for field connections carefully and install control wiring correctly per the project plan. Additional components and supplemental transformer accessory may be required.

The 38AXQ unit requires an external temperature control device. This device can be a thermostat (field-supplied) or a thermostatic emulation device provided as part of a third-party Building Management System.

THERMOSTAT

Install a Carrier-approved accessory thermostat according to installation instructions included with the accessory. For complete economizer function, select a two-stage cooling thermostat. Locate the thermostat accessory on a solid wall in the conditioned space to sense average temperature in accordance with the thermostat installation instructions.

If the thermostat contains a logic circuit requiring 24-v power, use a thermostat cable or equivalent single leads of different colors with minimum of five leads. If the thermostat does not require a 24-v source (no "C" connection required), use a thermostat cable or equivalent with minimum of four leads. Check the thermostat installation instructions for additional features which might require additional conductors in the cable.

For wire runs up to 50 ft (15 m), use no. 18 AWG (American Wire Gauge) insulated wire (35°C minimum). For 50 to 75 ft (15 to 23 m), use no. 16 AWG insulated wire (35°C minimum). For over 75 ft (23 m), use no. 14 AWG insulated wire (35°C minimum). All wire sizes larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.

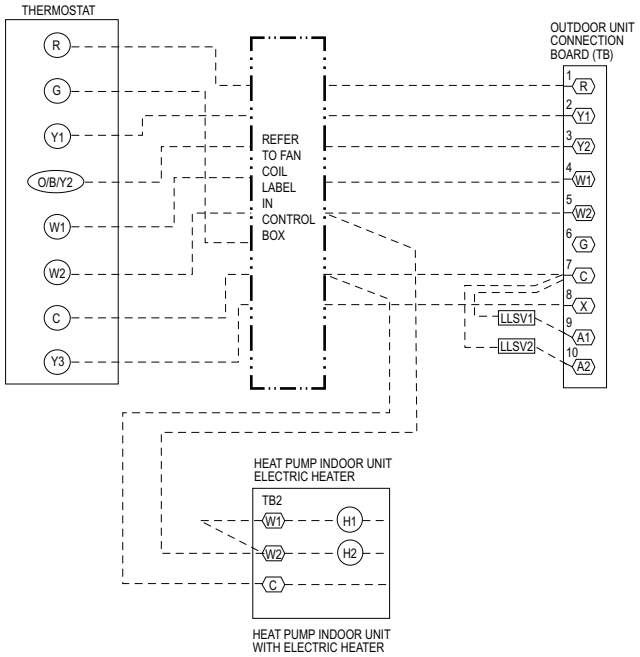


Fig. 17 — Typical Remote Thermostat Connections

Table 18 — Electrical Data — 38AXQ*16-25 60 Hz Units

UNIT	NOMINAL POWER SUPPLY (V-Ph-Hz)[a]	VOLTAGE RANGE		COMPRESSOR[b]				WITHOUT POWERED CONVENIENCE OUTLET					
				No. 1		No. 2		OFM (ea)		Power Supply		Disconnect Size	
		Min	Max	RLA	LRA	RLA	LRA	Qty	FLA	MCA[c]	Fuse or HACR Brkr[d]	FLA	LRA
38AXQ*16	208/230-3-60	187	253	26.3	179	27.7	179	3	1.5	65/65	90/90	67/67	367/367
	460-3-60	414	506	10.9	95	11.5	103	3	0.8	28	35	29	204
	575-3-60[e]	518	633	9.2	65	9.0	78	3	0.7	23	30	23	149
38AXQ*25	208/230-3-60	187	253	28.3	255	35.6	255	4	1.5	79/79	100/100	80/80	522/522
	460-3-60	414	506	14.0	123	16.4	140	4	0.8	38	50	39	271
	575-3-60[e]	518	633	12.3	94	13.8	108	4	0.7	32	45	33	210

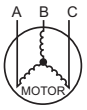
UNIT	NOMINAL POWER SUPPLY (V-Ph-Hz)[a]	VOLTAGE RANGE		COMPRESSOR[b]				WITH POWERED CONVENIENCE OUTLET					
				No. 1		No. 2		OFM (ea)		Power Supply		Disconnect Size	
		Min	Max	RLA	LRA	RLA	LRA	Qty	FLA	MCA[c]	Fuse or HACR Brkr[d]	FLA	LRA
38AXQ*16	208/230-3-60	187	253	26.3	179	27.7	179	3	1.5	70/70	90/90	73/73	372/372
	460-3-60	414	506	10.9	95	11.5	103	3	0.8	30	40	31	206
	575-3-60[e]	518	633	9.2	65	9.0	78	3	0.7	24	30	25	151
38AXQ*25	208/230-3-60	187	253	28.3	255	35.6	255	4	1.5	84/84	100/100	86/86	527/527
	460-3-60	414	506	14.0	123	16.4	140	4	0.8	40	50	41	273
	575-3-60[e]	518	633	12.3	94	13.8	108	4	0.7	34	45	35	212

NOTE(S):

a. Unbalanced 3-Phase Supply Voltage: Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the formula below to determine the percentage of voltage imbalance.
b. Motor RLA and LRA values are established in accordance with Underwriters Laboratories (UL) Standard 60335-2-40.
c. The MCA values are calculated in accordance with NEC Article 440.
d. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.
e. The 575-v units are UL, Canada-listed only.

$$\text{\% Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 230-3-60



AB = 224-v
BC = 231-v
AC = 226-v

$$\text{Average Voltage} = \frac{(224 + 231 + 226)}{3} = \frac{681}{3} = 227$$

Determine maximum deviation from average voltage.

(AB) 227-224 = 3-v

(BC) 231-227 = 4-v

(AC) 227-226 = 1-v

Maximum deviation is 4-v.

Determine percent of voltage imbalance.

$$\text{\% Voltage Imbalance} = 100x \frac{4}{227} = 1.76\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

LEGEND

BRKR — Circuit Breaker
FLA — Full Load Amps
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps Protection
NEC — National Electrical Code
RLA — Rated Load Amps

Step 10 — Wind Baffles for Low Ambient Control

Units with low ambient control (either as factory-installed option or field-installed accessory) require the addition of wind baffles to ensure full range low ambient operation. Material data and dimensions for wind baffles are included in Appendix C, Low Ambient Control, starting on page 49. Fabricate the wind baffles and mount per instructions.

PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, review Start-Up Checklist at the back of this book. The Checklist assures proper start-up of a unit and provides a record of unit condition, application requirements, system information, and operation at initial start-up.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Do not attempt to start the heat pump system, even momentarily, until the following steps have been completed. Compressor damage may result.

System Check

1. Check all indoor section and other equipment auxiliary components. Consult the manufacturer's instructions regarding any other equipment connected to the condensing unit. If the unit has field-installed accessories, be sure all are properly installed and correctly wired. If used, the airflow switch must be properly installed.
2. Be sure the unit is properly leak checked and dehydrated.
3. Check tightness of all electrical connections.
4. Open the liquid line and suction line service valves.
5. Be sure the unit is properly charged. See "Preliminary Charge", below.
6. The electrical power source must agree with the unit's nameplate rating.
7. The crankcase heater must be firmly attached to the compressor crankcase. Be sure the crankcase is warm (heater must be on for 24 hours before starting compressor).

Turn On Crankcase Heater

Turn on the crankcase heater for 24 hours before starting the unit to be sure all the refrigerant is out of the oil. To energize the crankcase heater, proceed as follows:

1. Set the space thermostat set point above the space temperature so there is no demand for cooling.
2. Close the field disconnect.

Preliminary Charge

Before starting the unit, charge liquid refrigerant into the high side of the system through the liquid service valve. The amount of refrigerant added must be at least 80% of the operating charge listed in the Physical Data table (Tables 3 and 4 on pages 7 and 8). Allow high and low side pressures to equalize before starting compressor. If pressures do not equalize readily, charge vapor on low side of system to assure charge in the evaporator. Refer to GTAC II, Module 5, Charging, Recover, Recycling, and Reclamation for liquid charging procedures.

A2L CHARGING REQUIREMENTS

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Prior to starting compressor, a preliminary charge of refrigerant must be added to avoid possible compressor damage.

START-UP

38AXQ Units

The compressor crankcase heater must be on for 24 hours before start-up. After the heater has been on for 24 hours, the unit can be started. If no time elapsed since the preliminary charge step was completed, it is unnecessary to wait the 24-hour period.

PRELIMINARY CHECKS

1. Check that electric power supply agrees with unit nameplate data.
2. Verify that the compressor crankcase heater is securely in place.
3. Check that the compressor crankcase heater has been on at least 24 hours.
4. Recheck for leaks using the procedure outlined in the Pre-Start-Up section, Leak Test and Dehydration. If any leaks are detected, repair as required. Evacuate and dehydrate as described in the Leak Test and Dehydration section.
5. Ensure that the preliminary charge has been added as described in the Pre-Start-Up section, Preliminary Charge.
6. All internal wiring connections must be tight, and all barriers and covers must be in place.

NOTE: The units are factory charged with the required amount of oil. If recharging in required, use Emkarate®[1] RL 32-3MAF.

COMPRESSOR ROTATION

On 3-phase units with scroll compressors, it is important to be certain that the compressor is rotating in the proper direction. 38AXQ units are equipped with a Comfort Alert Diagnostic Module (CADM). Alert Code 7 indicates reverse power phasing.

To correct phase order:

1. Turn off power to the unit, tag disconnect.
2. Reverse any two of the unit power leads.
3. Reapply power to the compressor, verify correct pressures.

To verify the compressor is rotating in the proper direction:

1. Connect service gauges to the suction and liquid pressure fittings.
2. Energize the compressor.

1. Third-party trademarks and logos are the property of their respective owners.

3. The suction pressure should drop and the liquid pressure should rise, as is normal on any start-up.

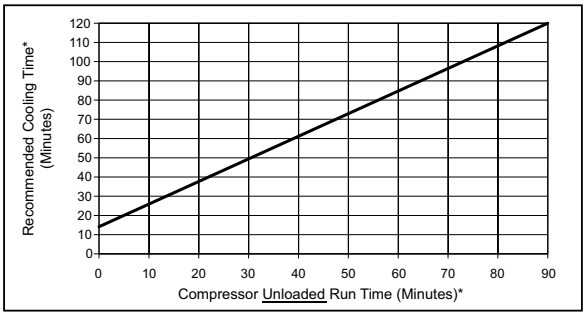
COMPRESSOR OVERLOAD

This overload interrupts power to the compressor when either the current or internal motor winding temperature becomes excessive, and automatically resets when the internal temperature drops to a safe level. This overload may require up to 60 minutes (or longer) to reset. If the internal overload is suspected of being open, disconnect the electrical power to the unit and check the circuit through the overload with an ohmmeter or continuity tester.

ADVANCED SCROLL TEMPERATURE PROTECTION (ASTP)

A label located above the terminal box identifies Copeland™[1] Scroll compressor models that contain this technology. See Fig. 18. Advanced Scroll Temperature Protection (ASTP) is a form of internal discharge temperature protection, that unloads the scroll compressor when the internal temperature reaches approximately 300°F. At this temperature, an internal bi-metal disk valve opens and causes the scroll elements to separate, which stops compression. Suction and discharge pressures balance while the motor continues to run. The longer the compressor runs unloaded, the longer it must cool before the bi-metal disk resets. See Fig. 19.

Fig. 18 — Advanced Scroll Temperature Protection Label



NOTES:
1 . Various factors, including high humidity, high ambient temperature, and the presence of a sound blanket will increase cool-down times.
*Times are approximate.

Fig. 19 — Recommended Minimum Cool-Down Time After Compressor is Stopped

To manually reset ASTP, the compressor should be stopped and allowed to cool. If the compressor is not stopped, the motor will run until the motor protector trips, which occurs up to 90 minutes later. Advanced Scroll Temperature Protection will reset automatically before the motor protector resets, which may take up to 2 hours.

START UNIT

Set the space thermostat to a set point above space temperature so that there is no demand for cooling. Close the 38AXQ disconnect switch. Only the crankcase heater will be energized.

Reset the space thermostat below ambient so that a call for cooling is ensured.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Never charge liquid into the low-pressure side of the system. Do not overcharge. During charging or removal of refrigerant, be sure indoor-fan system is operating. Ensure both outdoor fan motors are running; bypass any low ambient sensor function.

ADJUST REFRIGERANT CHARGE

The unit must be charged in Cooling mode only. Refer to Cooling Charging Charts, Fig. 21 and 22. For applications with line lengths greater than 100 ft, contact Carrier representative. Vary refrigerant until the conditions of the chart are met. The charts are based on charging the units to the correct subcooling for the various operating conditions. Accurate pressure gauge and temperature sensing device are required. Connect the pressure gauge to the service port on the liquid line service valve. Mount the temperature sensing device on the liquid line close to the liquid line service valve, and insulate it so that outdoor ambient temperature does not affect the reading. Indoor airflow must be within the unit's normal operating range. Operate the unit for a minimum of 15 minutes. Ensure that pressure and temperature readings have stabilized. Plot the liquid pressure and temperature on chart and add or reduce the charge to meet the curve. Adjust the charge to conform with the charging chart, using the liquid pressure and temperature to read the chart.

38AXZ16-28 CHECK COMPRESSOR OIL LEVEL

After adjusting the refrigerant charge, allow the unit to run fully loaded for 20 minutes. Stop the compressors and check the oil level. Oil level should be 1/3 to 1/2 up on the sight glass (see Fig. 20).

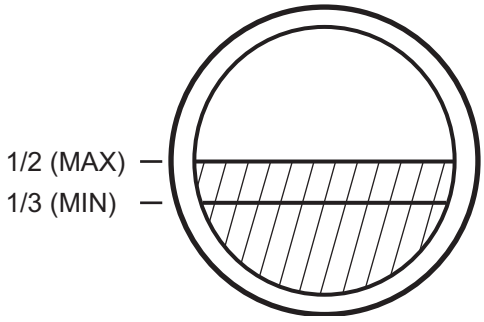


Fig. 20 — Recommended Oil Level — 38AXZ*25

Add oil only if necessary to bring the oil into view in the sight glass. If oil is added, run the circuit for an additional 10 minutes, then stop and check oil level. If the level remains low, check the piping system for proper design for oil return; also, check the system for leaks. If checking the oil level with unit running in part load, let unit run one hour, then run at full load for 10 minutes. If oil does not return to acceptable sight glass levels, check for correct suction piping and line sizing.

FINAL CHECKS

Ensure that all safety controls are operating, control panel covers are on, and the service panels are in place.A minimum reading of 2 degrees of sub-cooling is required before plotting liquid pressure and temperatures on the charts.

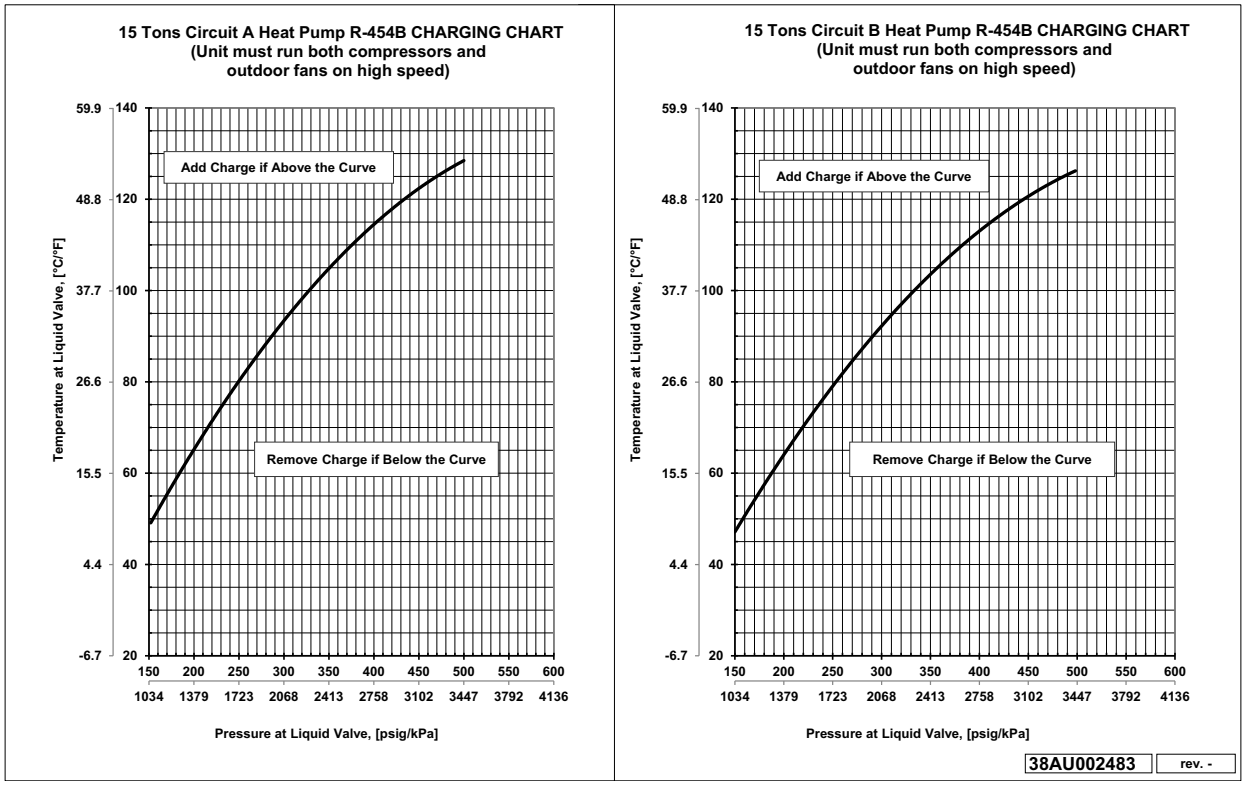


Fig. 21 — 38AXQ*16 Charging Chart

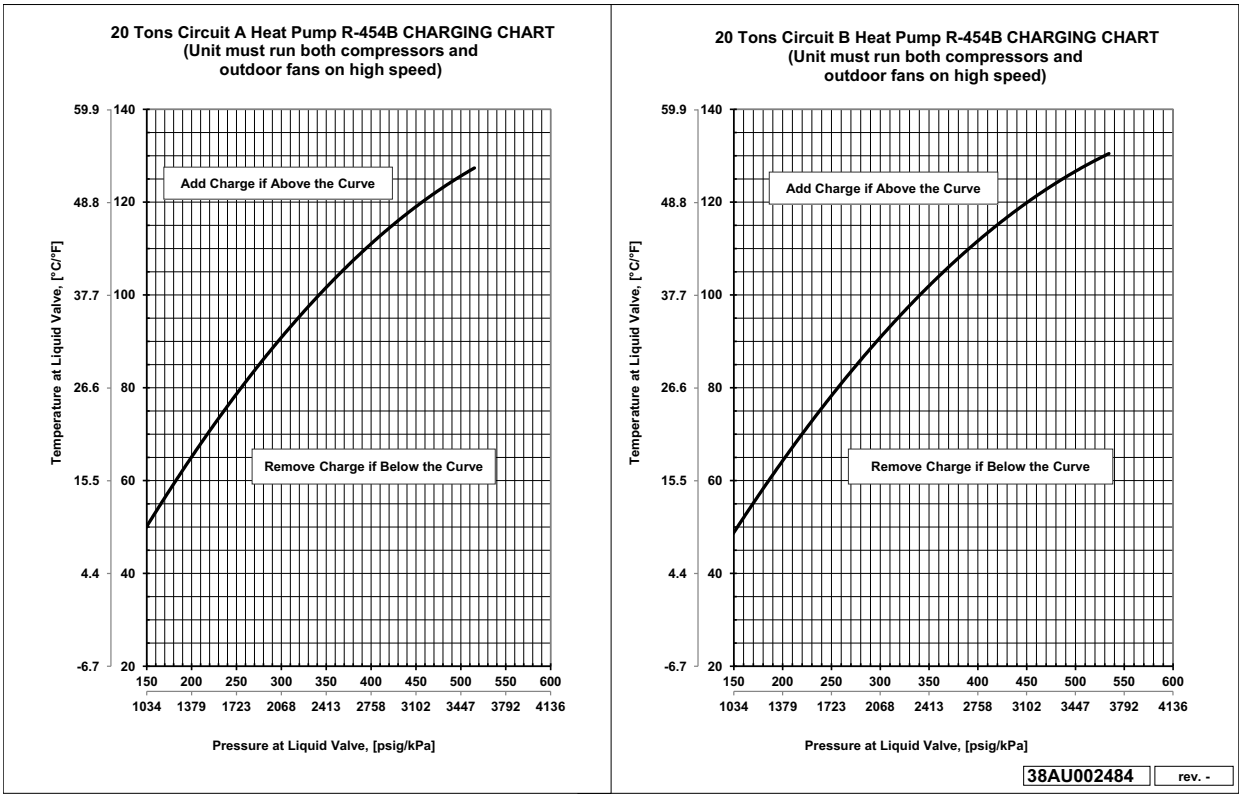


Fig. 22 — 38AXQ*25 Charging Chart

OPERATING SEQUENCE

Base Unit Controls

INDOOR (SUPPLY) FAN

If the thermostat fan operation is selected as Continuous, then the indoor (supply) fan motor, which is remotely located in the fan coil, runs continuously. If the thermostat fan operation is selected as Automatic, then the indoor (supply) fan motor runs when there is a call for cooling, heating, or ventilation. When thermostat is satisfied, the indoor (supply) fan motor stops. If there is a fan fault or a shutdown condition in the fan coil, then the indoor (supply) fan will not run if there is a call for ventilation, cooling, or heating and the 38AXQ unit will act as if it is not receiving a cooling or heating demand.

COOLING, UNIT WITHOUT ECONOMIZER

When thermostat calls for Cooling, terminal Y1 is energized. The 38AXQ's Defrost Board (DFB) receives this input at P2-5. DFB issues 24-v outputs at OF, P3-7 (RVS1) and P3-10 (COMP1). The OF output energizes outdoor fan relay (OFR); all outdoor fan motors start and run, subject to ambient temperature (refer to Fan Cycling section). The output RVS1 energizes the reversing valve solenoid 1 (RVS1); Reversing Valve 1 switches to Cooling position.

Compressor Lockout Relay (CLR) is energized, closing its normally open contacts and allowing the Defrost Board to accept a Y2 thermostat signal. Loader Control Relay (LCR) is also energized, closing its contacts between terminals 2 and 4 and allowing the compressor loader to get energized once the Defrost Board receives a Y3 thermostat signal.

Output P3-10 (COMP1, 24-v) is received at CADM1 terminal Y. If anti-recycle time delay period has not expired, safety pressure switches are open, and/or lockout alarms are active, then CADM1 relay will remain open, preventing compressor start. When safety pressure switches are closed and CADM1 time delay expires, the CADM1 relay closes, energizing Solenoid Valve Relay SVR1 and compressor contactor C1. SVR1 contacts close, energizing the external liquid line solenoid valve. Solenoid valve LLSV1 opens. Compressor contactor C1 closes, energizing the compressor motor. Compressor 1 starts and system runs in Cooling mode.

On a thermostat call for Stage 2 Cooling, terminal Y2 is energized; 24-v passes through CLR normally open contacts (terminals 2 and 4) and the Defrost Board receives this input at P2-4. DFB issues 24-v at P3-6 (RVS2) and P3-8 (COMP2). Output P3-6 energizes Reversing Valve Solenoid 2 (RVS2); Reversing Valve 2 switches to Cooling position. Output PL3-8 is received at CADM2 terminal Y. If anti-recycle time delay period has not expired, safety pressure switches on Circuit 2 are open, and/or lockout alarms are active, then CADM2 relay will remain open, preventing Compressor 2 start. When safety pressure switches are closed and CADM2 time delay expires, CADM2 relay closes, energizing Solenoid Valve Relay 2 (SVR2) and compressor contactor C2. SVR2 contacts close, energizing the external Liquid Line Solenoid Valve 2 (LLSV2). LLSV2 opens. Compressor contactor C2 closes, energizing the compressor motor on COMP2. Compressor 2 starts and the system runs in second-stage cooling mode.

On a thermostat call for Stage 3 Cooling, terminal X (Y3) is energized. 24-v passes through LCR normally open contacts (terminals 2 and 4) and enters CADM1-Y2. CADM1 DC SOL terminal outputs 24-vdc to the compressor loader plug (LDR) and Compressor 1 operates at full capacity.

As space cooling load is satisfied, thermostat outputs Y3, Y2, and Y1 are sequentially de-energized, removing 24-v at 38AXQ terminals X (Y3), Y2, and Y1. Compressor 1 loader plug is de-energized on Y3 opening. Circuit 2 compressor stops on Y2 opening; SVR2 is de-energized and LLSV2 closes, and CADM2 begins its three-minute anti-recycle time delay. On Y1 opening, Circuit 1 compressor stops, all outdoor fan motors stop, and SVR1 relay is de-energized. Liquid line solenoid valve LLSV1 is de-energized and valve closes. Compressor Lockout Relay and Loader Control Relay are de-energized. CADM1 begins its three-minute anti-recycle time delay.

If either the Loss of Charge (LOC) Switch or High Pressure Switch (HPS) on either circuit opens while Y1, Y2, or Y3 remain energized, then the compressor contactor C and relay SVR on the corresponding circuit are de-energized; compressor stops and liquid line solenoid is de-energized (valve closes). Corresponding CADM initiates a TRIP event (cooling demand sensed at CADM terminal Y but no current is measured at T1, T2, T3 motor sensors); CADM relay opens and RED LED is illuminated. TRIP condition maintains lockout of compressor operation until CADM is manually reset. Reset CADM by cycling unit main power.

Reversing valve solenoid (RVS) is energized in Cooling modes. This solenoid will remain energized until the next Heating mode is initiated.

COOLING, UNIT WITH ECONOMIZER

Refer to fan coil unit installation instructions and economizer accessory installation instructions for operating sequences when system is equipped with accessory economizer.

HEATING

When the thermostat calls for first stage heating, terminal W1 is energized. The 38AXQ's Defrost Board (DFB) receives this input at P2-7. The DFB removes the output at P3-7 (RVS1) and P3-6 (RVS2); the reversing valve solenoids are de-energized and the reversing valves move to Heating position.

DFB issues outputs at OF, P3-10 (COMP1), and P3-8 (COMP2). Outdoor fan relay OFR is energized; all outdoor fan motors run.

Outputs P3-10 (COMP1, 24-v) is received at CADM1 terminal Y and P3-8 (COMP2, 24-v) is received at CADM2 terminal Y. If anti-recycle time delay period has not expired and/or safety pressure switches are open on a particular circuit, then outdoor lockout alarms are active and corresponding CADM relay will remain open, preventing compressor start. When safety pressure switches are closed and CADM1 and 2 time delay expires, the CADM 1 and 2 relay closes, energizing Solenoid Valve Relays SVR1 and 2 and compressor contactors C1 and C2. SVR1 and 2 contacts close, energizing the external liquid line solenoid valves. Solenoid valves LLSV1 and LLSV2 open. Compressor contactors C1 and C2 close, energizing the compressor motors. 24-v is also received at CADM1 terminal Y2 through the Loader Control Relay (LCR) normally closed terminals 3 and 4. CADM1 DC SOL terminal outputs 24-vdc to the compressor loader plug (LDR). Compressors start, running at full capacity, and system runs in Heating mode, providing Stage 1 Heat.

When the space heating load is satisfied terminal W1 is de-energized. Compressors and outdoor fan operations stop. Liquid line solenoid LLSV is de-energized and valve closes. CADM begins its three-minute anti-recycle time delay.

If either the Loss of Charge (LOC) Switch or High Pressure Switch (HPS) on either circuit opens while W1 remains energized, then the compressor contactor C and relay SVR on the corresponding circuit are de-energized; compressor stops and liquid line solenoid is de-energized (valve closes). Corresponding CADM initiates a TRIP event (compressor demand sensed at CADM terminal Y but no current is measured at T1, T2, T3 motor sensors); CADM relay opens and RED LED is illuminated. TRIP condition maintains lockout of compressor operation until CADM is manually reset. Reset CADM by cycling unit main power.

Reversing valve solenoid remains de-energized until the next Cooling cycle is initiated.

DEFROST CYCLE

During the Heating Mode, frost and ice can develop on the outdoor coil. Defrost sequence will clear the frost and ice from the coil by briefly reversing the Heating sequence periodically.

A window to test for a need to run the Defrost cycle opens at a fixed period after the end of the last Defrost cycle or the previous test window closed. The window period is determined by the configuration settings on the DFB's DIP switches (see unit wiring diagram).

If the outdoor coil's Defrost Thermostat 2 switch (DFT2) is closed (shorting DFB terminals DFT2 and DFT2), the Defrost cycle will start. Output at OF is removed; outdoor fans stop during the Defrost cycle. Output P3-6 (RVS2) is energized; reversing valve solenoid RVS1 is energized and reversing valve changes position, placing Circuit 2 in a Cooling mode flow, directing hot gas into the outdoor coil where its heat melts the frost and loosens the ice on the coil face. If DFT1 is also closed, then output P3-7 (RVS1) is removed and RVS1 is energized and changes position, placing Circuit 1 in cooling mode flow.

During the Defrost cycle, output EHEAT is also energized (if not already energized by a thermostat W2 demand); supplemental heater will be energized. During the Defrost Cycle, LED1 on the DFB will be illuminated. The Defrost cycle ends when DFT1 and 2 are both open (as liquid temperature exiting the coil rises above DFT setpoint) or the defrost cycle runs for 10 minutes. Output at EHEAT is removed; supplemental heater will be de-energized (unless thermostat has a W2 demand). Output at OF is restored; outdoor fans start again. Outputs P3-7 (RVS1) and P3-6 (RSV2) are removed; reversing valves return to Heating position.

Defrost cycle is fixed at a maximum 10 minute duration limit. The period to test and initiate a Defrost cycle can be configured for 30, 60, 90 or 120 minutes.

SUPPLEMENTAL HEAT/EMERGENCY HEAT

Supplemental heat type is determined by 40RLQ indoor unit options and accessories. This heat is initiated when the indoor unit W2 terminal is energized by the thermostat. (Or as detailed in "Defrost Cycle" on page 25.) The thermostat may energizes W2 as supplemental (second stage) heat at larger space heating demand, or when selected as emergency heat mode. When the space heating demand decreases below the second stage limit, or emergency heat is turned off, W2 is de-energized, and supplemental heat is turned off.

COOLING AND HEATING SHUTDOWN

Partial or complete cooling or heating functions may shutdown caused by loss of main power, open pressure switches, diagnostic alarms, or open internal compressor protections. See Service section for further details.

FAN CYCLING

The 38AXQ unit is equipped with a temperature switch that will shut down up to two outdoor fans in cooling mode when the outdoor temperature falls below 60°F (16°C) to ensure continuous operation in both stages. The outdoor fan will turn back on when the temperature rises above 65°F (18°C). In 38AXQ 16 units, Outdoor Fans 2 and 3 will shut off; in 38AXQ 25 units, Outdoor Fans 2 and 4 will shut off. In heating mode, the temperature switch is bypassed through the Temperature Bypass Relay (TBR), ensuring that all fans run at full speed. See Fig. 23 and 24 for outdoor fan labeling.

MAINTENANCE

These items should be part of a routine maintenance program, to be checked every month or two, until a specific schedule for each can be identified for this installation:

Quarterly Inspection (and 30 days after initial start)

INDOOR SECTION

- Belt tension checked
- Belt condition checked
- Condenser coil cleanliness checked
- Pulley alignment checked
- Return air filter replacement
- Outdoor hood inlet filters cleaned
- Fan shaft bearing locking collar tightness checked
- Condensate drain checked

Heating

- Power wire connections
- Fuses ready
- Manual-reset limit switch is closed

See Tables 19 and 20 for unit specific maintenance checklists.

Seasonal Maintenance

These items should be checked at the beginning of each season (or more often if local conditions and usage patterns dictate):

AIR CONDITIONING

- Condenser fan motor mounting bolts tightness
- Compressor mounting bolts
- Condenser fan blade positioning
- Control box cleanliness and wiring condition
- Wire terminal tightness
- Refrigerant charge level
- Evaporator coil cleaning
- Evaporator blower motor amperage

Table 19 — Outdoor Unit Maintenance Checklist

MAINTENANCE CHECKLIST[a]	RECOMMENDED INTERVAL[b]	
Outdoor unit specific:	**Monthly**	**Annual**
Clear away debris and vegetation near unit.	X	
Inspect cabinet for damage. Replace components that are damaged or severely rusted.		X
Inspect electrical disconnect for proper function. Repair or replace as necessary.		X
Inspect electrical wiring and connections. Tighten loose connections. Inspect and perform functional test of equipment as needed to ensure proper function. Repair or replace damaged or overheated components and wiring.		X
Check refrigerant system subcooling and superheat.		X
Inspect inside of unit. Clean if debris is present.		X
Inspect condenser coil. Clean if dust, dirt, or debris is present. Rinse unit with fresh water.[c]		X[d]
Inspect motor and fan for damage. Make sure fans spin freely.		X

NOTE(S):

a. The above list may not include all maintenance items. Inspection intervals may vary depending on climate and opening hours. Consult your Carrier dealer about a service contact for seasonal inspections.
b. Monthly maintenance items and outdoor unit rinsing may be performed by the customer. All other maintenance items and all service work must be performed by a qualified service technician. Read all warning labels.
c. Do not use harsh chemicals or high pressure water on coils. More frequent rinsing is required near a sea coast.
d. Monthly rinsing of the condenser coil is recommended if the unit is located in a corrosive climate.

Table 20 — Indoor Unit Maintenance Checklist

MAINTENANCE CHECKLIST[a]	RECOMMENDED INTERVAL[b]	
Indoor unit specific: (for accessories refer to unit specific literature)	**Monthly**	**Annual**
Inspect, clean, or replace air filter if dirty.	X	
Inspect and clean blower assembly (includes blower housing, wheel, and motor). Inspect belts and motor pulley. Lubricate shaft bearings.		X
Inspect internal and external cabinet. Clean as needed.		X
Inspect electrical disconnect for proper function. Repair or replace as necessary.		X
Inspect electrical components, wiring, and connections. Tighten loose connections. Repair or replace damaged components and wiring.		X
Inspect evaporator coil. Clean if dust, dirt, or debris is present.[c]		X
Clean condensate pan, trap, and drain lines (more frequent maintenance may be required in humid climates - consult your local HVAC dealer).		X
Inspect motor and fan for damage. Make Inspect airflow system (ductwork). Check for leaks and repair as needed.		X

NOTE(S):

a. The above list may not include all maintenance items. Inspection intervals may vary depending on climate and opening hours. Consult your Carrier dealer about a service contact for seasonal inspections.
b. Monthly maintenance items and outdoor unit rinsing may be performed by the customer. All other maintenance items and all service work must be performed by a qualified service technician. Read all warning labels.
c. Do not use harsh chemicals or high pressure water on coils. More frequent rinsing is required near a sea coast.

SERVICE

Refrigeration System

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

This system uses R-454B refrigerant, which has higher pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gauge set, hoses, and recovery system must be designed to handle R-454B refrigerant. If unsure about equipment, consult the equipment manufacturer.

COMPRESSOR OIL

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in damage to components.

The compressor is in a R-454B refrigerant system and uses a polyolester (POE) oil. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Avoid exposure of the oil to the atmosphere.

A2L Servicing Requirements

Prior to, and during the work being performed on an appliance containing A2L refrigerants, the area must be checked with an appropriate refrigerant detector to ensure that the person or persons performing work are aware of a potentially toxic or flammable atmosphere. The area must also be surveyed to ensure there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

Should any hot work need to be performed on the refrigerant system, or associated parts, appropriate fire extinguishing equipment shall be available nearby. Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.

All maintenance staff and others working in the local area shall also be instructed on the nature of work being carried out. Work in confined spaces shall be avoided wherever possible.

Servicing Systems on Roofs with Synthetic Materials

POE (polyolester) compressor lubricants are known to cause long term damage to some synthetic roofing materials. Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service which may risk exposure of compressor oil to the roof, take appropriate precautions to protect roofing. Procedures which risk oil leakage include but are not limited to compressor replacement, repairing refrigerants leaks, replacing refrigerant components such as filter drier, pressure switch, metering device, coil, accumulator, or reversing valve.

Synthetic Roof Precautionary Procedure:

1. Cover extended roof working area with an impermeable polyethylene (plastic) drop cloth or tarp. Cover an approximate 10 x 10 ft (3.3 x 3.3 m) area.
2. Cover area in front of the unit service panel with a terry cloth shop towel to absorb lubricant spills and prevent run-offs, and protect drop cloth from tears caused by tools or components.
3. Place terry cloth shop towel inside unit immediately under component(s) to be serviced and prevent lubricant run-offs through the louvered openings in the base pan.
4. Perform required service.
5. Remove and dispose of any oil contaminated material per local codes.

LIQUID LINE FILTER DRIER

The factory-provided reversible filter drier is specifically designed to operate with Puron Advance™ refrigerant. Replace the filter drier with factory-authorized components only with a filter drier with desiccant made from 100% molecular sieve grade XH-11. Filter drier must be replaced whenever the refrigerant system is opened.

When removing a filter drier, use a tubing cutter to cut the drier from the system. Do not unsweat a filter drier from the system. Heat from unsweating will release moisture and contaminants from drier into system.

FIELD REFRIGERANT ACCESS PORTS

Field service access to refrigerant pressures is through the access ports located at the service valves (see Fig. 23-24). These ports are 1/4 in. SAE Flare couplings with Schrader check valves and service caps. Use these ports to admit nitrogen to the field tubing during brazing, to evacuate the tubing and evaporator coil, to admit initial refrigerant charge into the low-side of the system and when checking and adjusting the system refrigerant charge. When service activities are completed, ensure the service caps are in place and secure; check for leaks. If the Schrader check valve must be removed and re-installed, tighten to 2-3 in.-lb (23-34 N-cm).

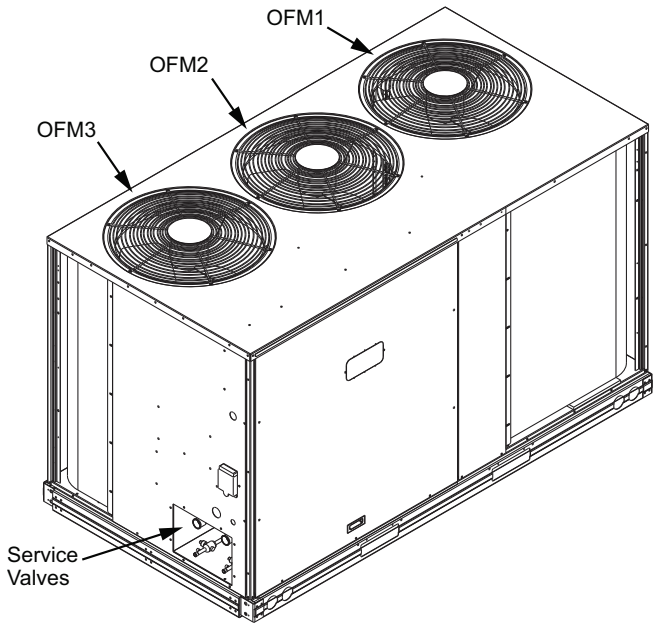


Fig. 23 — 38AXQ*16 Exterior

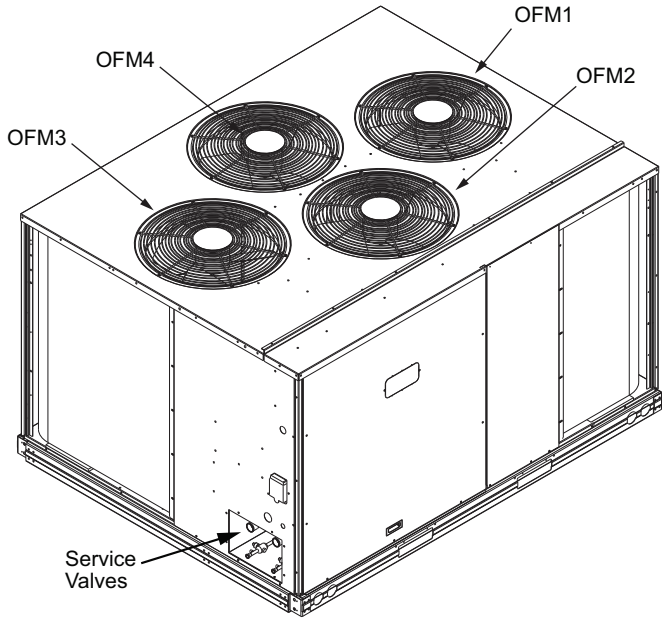


Fig. 24 — 38AXQ*25 Exterior

OUTDOOR COIL METERING DEVICES

The metering devices are multiple fixed-bore devices (Acutrol™) swaged into the horizontal outlet tubes from the liquid header, located at the entrance to each evaporator coil circuit path. These are non-adjustable. Service requires replacing the entire liquid header assembly.

To check the indoor coil, disconnect the supply fan signal (A04-A06 direct-drive fans) or contactor (IFC) coil, then start the circuit in a Cooling Mode (jumper R to Y1 or Y2) and observe the frosting pattern on the face of the indoor coil. A frost pattern should develop uniformly across the face of the indoor coil starting at each tube at the Acutrol nipple locations.

To check the outdoor coil, disconnect the outdoor fan motor. Start the circuit in a Heating Mode (jumper R to W1 or W2) and observe the frost pattern on the face of the outdoor coil.

Failure to develop frost at an outlet tube can indicate a plugged or a missing orifice.

REFRIGERANT SYSTEM PRESSURE ACCESS PORTS

There are two access ports in each circuit - on the suction tube near the compressor and on the discharge tube near the compressor. (See Fig. 25-26.) These are brass fittings with black plastic caps. The hose connection fittings are standard 1/4 in. SAE Male Flare couplings.

The brass fittings are two-piece High Flow valves, with a receptacle base brazed to the tubing and an integral spring-closed check valve core screwed into the base. (See Fig. 27.) This check valve is permanently assembled into this core body and cannot be serviced separately; replace the entire core body if necessary. Service tools are available from RCD that allow the replacement of the check valve core without having to recover the entire system refrigerant charge. Apply compressor refrigerant oil to the check valve core's bottom o-ring. Install the fitting body with 96 ± 10 in.-lb (1085 ±23 N-cm) of torque; do not overtighten.

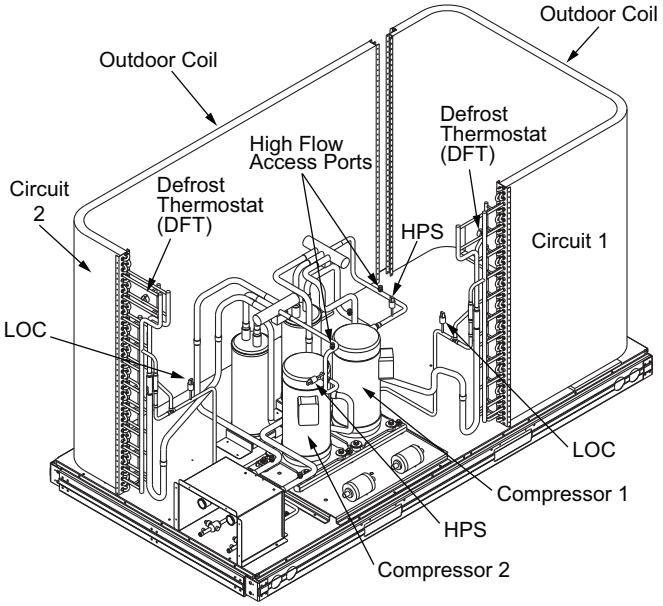


Fig. 25 — 38AXQ*16 Interior

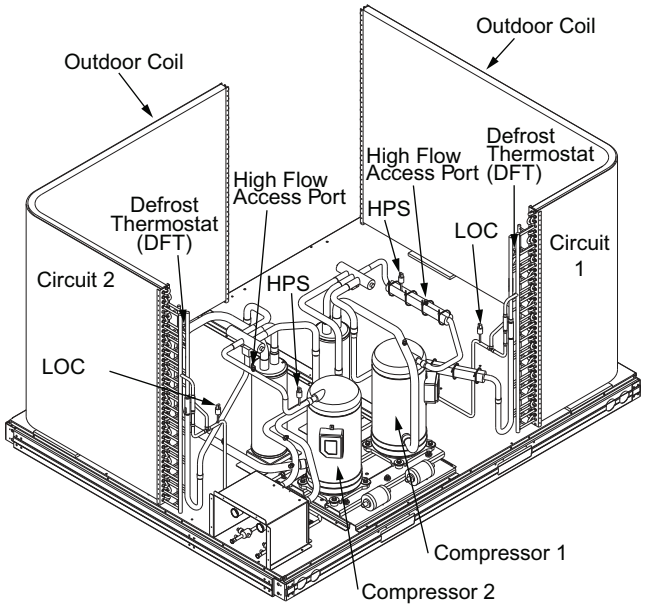


Fig. 26 — 38AXQ*25 Interior

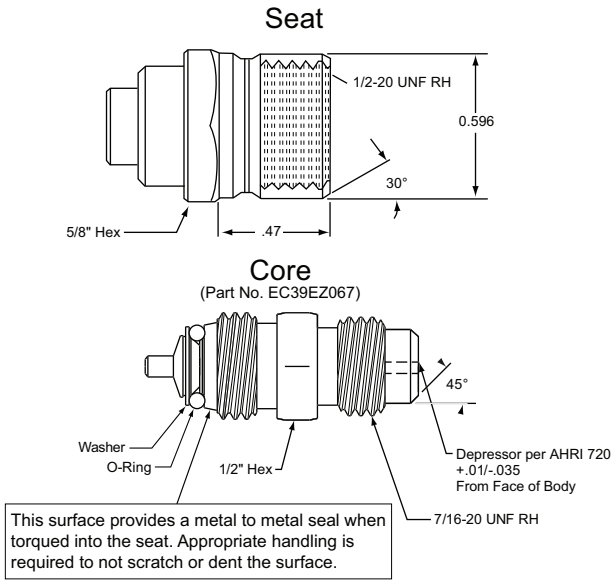


Fig. 27 — CoreMax®[1] Access Port Assembly

Compressor Protection

COMPRESSOR OVERCURRENT

The compressor has internal limbered motor protection.

COMPRESSOR OVERTEMPERATURE PROTECTION (IP)

The compressor has an internal protector to protect it against excessively high discharge gas temperatures.

CRANKCASE HEATER

The heater prevents refrigerant migration and compressor oil dilution during shutdown whenever compressor is not operating. The heater is wired to cycle with the compressor; the heater is off when compressor is running, and on when compressor is off.

The crankcase heater will operate as long as the power circuit is energized. The main disconnect must be on to energize the crankcase heater.

IMPORTANT: Never open any switch or disconnect that energizes the crankcase heater unless unit is being serviced or is to be shut down for a prolonged period. After a prolonged shutdown on a service job, energize the crankcase heater for 24 hours before starting the compressor.

1. Third-party trademarks and logos are the property of their respective owners.

HIGH PRESSURE SWITCH

The system is provided with a high pressure switch mounted on the discharge line. The switch is stem-mounted and brazed into the discharge tube. Trip setting is 630 ±10 psig (4344 ±69 kPa) when hot. Reset is automatic at 505 ±20 psig (3482 ±140 kPa).

LOSS OF CHARGE SWITCH

The system is protected against a loss of charge and low evaporator coil loading condition by a loss of charge switch located on the liquid line and a freeze protection thermostat on the indoor coil. The switch is stem-mounted. Loss of Charge Switch trip setting is 27 psig ±3 psig (186 ±21 kPa). Reset is automatic at 44 ±5 psig (303 ±5 kPa).

The factory installed loss of charge pressure switch (LOC) has open/close settings which do not provide indoor coil freeze protection. The control provides a location on terminal board TB2 to add a field supplied indoor coil freeze protection switch, if additional protection is wanted. The freeze protection switch can be wired into the 24VAC control circuit in series with the high pressure switch and loss of charge switch as shown in Fig. 28. Note that the wire to the compressor contactor must be moved from the LPS terminal to the FPT terminal, as shown.

A recommended indoor coil freeze protection switch is P/N HH18HB015 (30°F ±5°F open, 45°F ±5°F close) which can be mounted on a return bend of the indoor coil. For dual-circuits, a separate switch is used for each half of the indoor coil and are wired as shown in Fig. 28.

OUTDOOR FAN MOTOR PROTECTION

The outdoor fan motor is internally protected against overtemperature.

CONTROL CIRCUIT, 24-V

The control circuit is protected against overcurrent conditions by a circuit breaker mounted on control transformer TRAN. Reset is manual.

Commercial Defrost Control

The Commercial Defrost Control Board (DFB) coordinates thermostat demands for supply fan control, 1 or 2 stage cooling, 1 or 2 stage heating, emergency heating and defrost control with unit operating sequences. See Fig. 29 for board arrangement.

The DFB is located in the 38AXQ unit's main control box (see Fig. 30). All connections are factory-wired. Refer to Table 21 for details of DFB Inputs and Outputs.

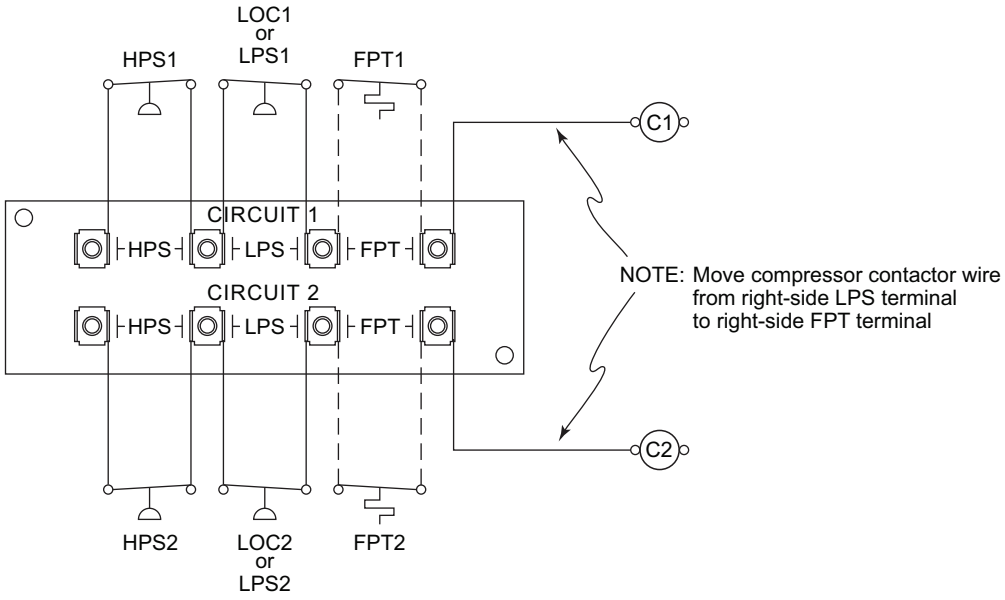


Fig. 28 — Field Wiring of Indoor Coil Freeze Protection Switch (FPT) (Dual Circuit Shown)

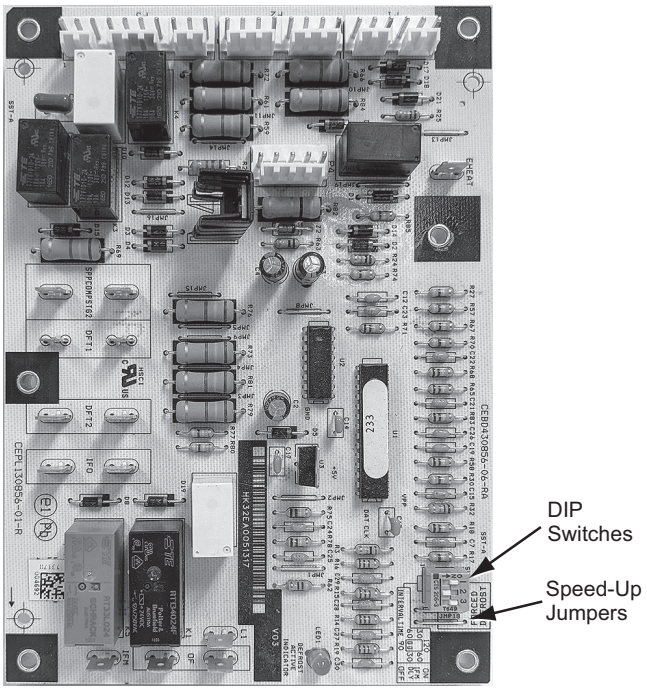


Fig. 29 — Defrost Control Board (DFB) Arrangement

REVERSING VALVE CONTROL

The DFB has two outputs for unit reversing valve control. Operation of the reversing valves is based on internal logic; this application does not use an "O" or "B" signal to determine reversing valve position. Reversing valves are energized during the Cooling stages and de-energized during Heating cycles. Once energized at the start of a Cooling stage, the reversing valve will remain energized until the next Heating cycle demand is received. Once de-energized at the start of a Heating cycle, the reversing valves will remain de-energized until the next Cooling stage is initiated.

COMPRESSOR CONTROL

The DFB receives inputs indicating Stage 1 Cooling and Stage 1 Heating from the space thermostat or third-party Building Management System; it generates commands to start compressors with or without reversing valve operation to produce Stage 1 Cooling (one compressor), or Stage 1 Heating (both compressors run).

Table 21 — 38AXQ Defrost Board I/O and Jumper Configurations[a]

POINT NAME	TYPE OF I/O	CONNECTION PIN NO.	UNIT CONNECTION	NOTE
INPUTS				
G Fan	DI, 24-vac	P2-3		Not used
Y1 Cool 1	DI, 24-vac	P2-5	TB-Y1	
W1 Heat 1	DI, 24-vac	P2-7	TB-W1	
R Power	24-vac	P3-1	TRAN2	
C Common	24-vac, ground	P3-3	TRAN2	
DFT1 Defrost Switch	DI, 24-vac	DFT-1 to DFT-1	DFB	
DFT2 Defrost Switch	DI, 24-vac	DFT-2 to DFT-2	DFB	
OUTPUTS				
OF OD Fan	DO, 24-vac	OF	OFR	
RVS1	DO, 24-vac	P3-7 to P3-5	RVS1	Energize in COOL
RVS2	DO, 24-vac	P3-6 to P3-4	RVS2	Energize in COOL
COMP 1	DO, 24-vac	P3-10	CADM1-Y	
TB-W2	DO, 24-vac	E-HEAT	HR	
CONFIGURATION				
Select Jumper	24-vac	P1-1		
1 Compressor	24-vac	P1-2		
SPEED-UP CONFIGURATION				
Speed-Up Jumper		JMP17		
Speed-Up Jumper		JMP18		

NOTE(S):

a. Jumper for 1-3 secs: Factory Test, defrost runs for 12 seconds or less. Jumper for 5-20 secs: Forced Defrost, defrost runs for 30 secs if DFT2 is open.

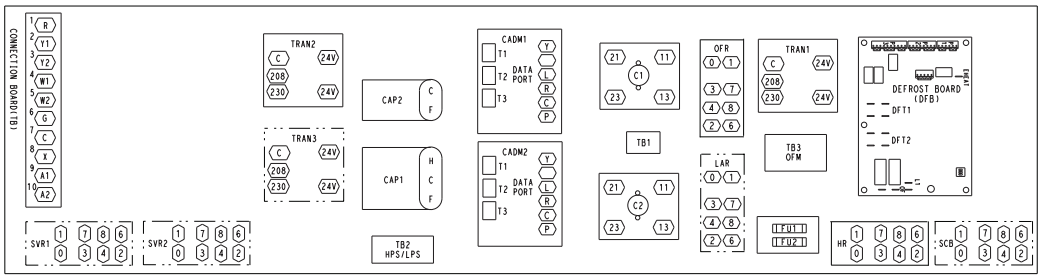


Fig. 30 — Defrost Control Board (DFB) Location

DEFROST

The defrost control mode is a time/temperature sequence. There are two time components: The continuous run period and the test/defrost cycle period. The temperature component is provided by the defrost thermostats (DFT1 and DFT2) mounted on the outdoor coil.

The continuous run period is a fixed time period between the end of the last defrost cycle (or start of the current Heating cycle) during which no defrost will be permitted. This period can be set at 30, 60, 90 or 120 minutes by changing the positions of DIP switches SW1 and SW2 (see Fig. 31 and Table 22). The default run period is 60 minutes.

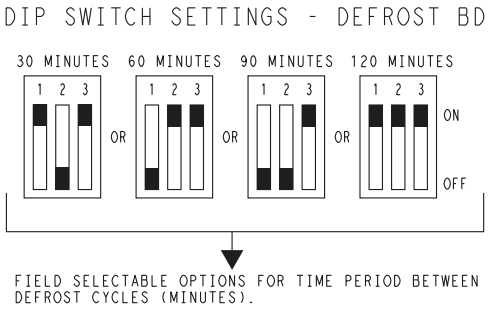


Fig. 31 — DIP Switch Settings — Defrost Board

At the end of the continuous run period, the defrost control will test for a need to defrost. DFT2 (located on the bottom circuit of the outdoor coil) controls the start and termination of the defrost cycle. If DFT2 is still open, the defrost test/run window is closed and the control repeats the continuous run period. If DFT2 is closed, the defrost cycle is initiated in Circuit 2. The defrost period will end when DFT2 opens (indicating the outdoor coil has been cleared of frost and ice) or a 10 minute elapsed period expires, whichever comes first.

Circuit 1's defrost thermostat DFT1 (located on the upper circuit of the outdoor coil) cannot initiate a unit defrost cycle; only DFT2 may do this. But once Circuit 2 is in defrost, the DFB will monitor the status of DFT1. If DFT1 closes during a Circuit 2 defrost cycle, Circuit 1 will also enter a defrost cycle. Circuit 1's defrost cycle will end when DFT1 opens (indicating the upper portion of the outdoor coil is cleared of frost and ice) or the Circuit 2 defrost cycle is terminated.

At the end of the unit defrost cycle, the unit will be returned to Heating cycle for a full continuous run period. If the space heating load is satisfied and compressor operation is terminated, the defrost control will remember where the run period was interrupted. On restart in Heating, the defrost control will resume unit operation at the point in the run period where it was last operating.

DEFROST THERMOSTATS

These are temperature switches that monitor the surface temperature of the outdoor coil circuits. These switches are mounted on the liquid tube exiting the outdoor coil heating circuits. These switches close on temperature drop at 30°F (–1°C) and reset open on temperature rise at 80°F (27°C).

INDOOR FAN OFF DELAY

The DFB can provide a 30 sec delay on Indoor Fan Off if the thermostat's fan selector switch is set on AUTO control. DIP Switch SW3 on the DFB selects use of the fan off time delay feature. Setting SW3 in the OPEN position turns the Fan Off Delay feature on; setting SW3 in the CLOSED position disables this feature. The delay period begins when Y1 demand or W1 demand by the space thermostat is removed.

DEFROST SPEEDUP FUNCTIONS

The DFB permits the servicer to speed-up the defrost cycle. There are two speed-up sequences: relative speed-up and an immediate forced defrost. Speed-up sequences are initiated by shorting jumper wires JMP17 and JMP18 together (see Fig. 29); use a straightedge screwdriver.

Shorting the jumpers for a period of 1 to 3 secs reduces the defrost timer periods by a factor of 0.1 sec/minute. (For example, the 90 min run period is reduced to 9 secs.) The DFB will step the unit through a Heating cycle and a Defrost cycle using these reduced time periods. This mode ends after the Defrost cycle.

Shorting the jumpers for a period of 5 to 20 secs bypasses the remaining continuous run period and places the unit in a Forced Defrost mode. If the controlling DFT is closed when this mode is initiated, the unit will complete a normal defrost period that will terminate when the controlling DFT opens or the 10 minute defrost cycle limit is reached. If the controlling DFT is open when this mode is initiated, the Defrost cycle will run for 30 secs. Both modes end at the end of the Defrost cycle.

Table 22 — Dip Switch Position

	SWITCH NO.													
	1	**2**		**1**	**2**		**1**	**2**		**1**	**2**		**3**	
1	•		1		•	1		1	1	•	•	1		On
0		•	0	•		0	•	•	0			0	•	Off
	30 minutes			60 minutes			90 minutes			120 minutes			Fan Delay	

Comfort Alert Diagnostic Module

The Comfort Alert Diagnostic Module (CADM) monitors and analyzes data from the Copeland Scroll three-phase compressor and the thermostat demand. The CADM also provides a 3-minute anti-recycle time delay to compressor cycling.

The CADM detects causes for electrical and system related failures. Flashing LEDs communicate the Alert codes to guide service technicians in accurately and quickly troubleshooting the system and determining root cause for the failure.

Inputs to the CADM include 24-vac power, demand signal Y, compressor contactor coil (common side) and compressor power leads (from the compressor contactor).

INPUT	TERMINAL	VOLTAGE
Control Power	R	24-V
Control Common	C	24-V
Demand	Y	24-V
Contactor Coil	P	24-V
Compressor T1	T1	Line
Compressor T2	T2	Line
Compressor T3	T3	Line

Control of the compressor contactor coil is through a contact between terminals P and C.

Communications of status and alert conditions is through three LEDs located on the top edge of the module housing (see Fig. 32): POWER (green), ALERT (yellow), and TRIP (red).

The POWER LED indicates the presence of control power to the CADM.

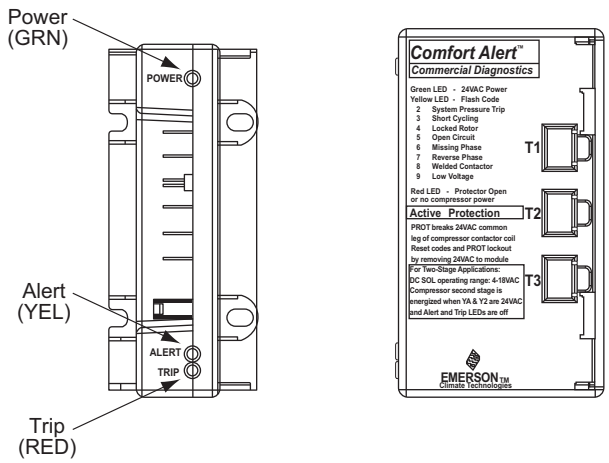


Fig. 32 — CADM Housing/LED Locations

The ALERT LED indicates an abnormal condition exists in the system through a flash code. The ALERT LED will blink a number of times consecutively, pause and the repeat the process. The number of blinks, defined in Table 23, correlates to a particular abnormal condition; troubleshooting tips are provided for each Alert code. Reset of the ALERT may be automatic or manual. If the fault condition causing the Alert is self-corrected, the Alert code will be removed and the CADM will automatically reset and allow the system to restart normally. Manual reset for lockouts requires that main power to the 38AXQ unit be recycled after the cause for the Alert condition has been detected and corrected.

The TRIP LED indicates either a time-delay period is currently active (RED LED is blinking) or the module has locked out the compressor (RED LED is on steady). A lockout condition will occur for some faults as identified in Table 23. Reset of the TRIP LED requires that unit main power be recycled after the loss of power to the compressor condition has been detected and corrected.

Simultaneous Blinking of YELLOW and RED LEDs indicates control power input to the CADM is low. Check control circuit transformer and wiring.

Troubleshooting the CADM Wiring – Flashing LEDs also indicate wiring problems to the CADM. See Table 24 for discussion of additional LED flash codes and troubleshooting instructions.

Table 23 — LED Status Codes

STATUS LED	STATUS LED DESCRIPTION	STATUS LED TROUBLESHOOTING INFORMATION
Green "POWER"	Module has power	Supply voltage is present at module terminals
Red "TRIP" LED On Solid	Thermostat demand signal Y is present, but the compressor is not running.	1. Compressor protector is open 2. Condensing unit power disconnect is open 3. Compressor circuit breaker or fuse(s) is open 4. Broken supply wires or connector is not making contact 5. Compressor power wires not routed through Comfort Alert 6. Compressor contactor has failed open
Red "TRIP" LED Flashing	The anti-short cycle timer (3 minutes), in module is preventing compressor restart.	
Module locks out compressor when compressor damaging ALERT code appears. Lockout ALERT codes are noted in the Status LED Description. During a compressor lock out, 24VAC power must be removed from module to manually reset.		
Yellow "ALERT" LED On Solid	A short circuit or over current condition exists on PROT terminal.	1. Compressor contactor coil shorted 2. Electrical load too high for PROT circuit (maximum 1 Amp) 3. 24 V AC wired directly to PROT terminal
Yellow "ALERT" Flash Code 2	System Pressure Trip Discharge pressure out of limits or compressor overload (if no high pressure switch in system) LOCKOUT	1. High head pressure 2. Condenser coil poor air circulation (dirty, blocked, damaged) 3. Condenser fan is not running 4. If low pressure switch is open: Refer to Code 3 for troubleshooting
Yellow "ALERT" Flash Code 3	Short Cycling Compressor is running only briefly LOCKOUT	1. If low pressure switch is open: a. Low refrigerant charge b. Evaporator blower is not running c. Evaporator coil is frozen d. Faulty metering device e. Condenser coil is dirty f. Liquid line restriction (filter drier blocked if present) 2. If high pressure switch is open, go to Flash Code 2 information 3. Intermittent thermostat demand signal 4. System or control board defective
Yellow "ALERT" Flash Code 4	Locked Rotor LOCKOUT	1. Low line voltage to compressor 2. Excessive liquid refrigerant in compressor 3. Compressor bearings are seized
Yellow "ALERT" Flash Code 5	Open Circuit	1. Condensing unit power disconnect is open 2. Compressor circuit breaker or fuses are open 3. Compressor contactor has failed open 4. High pressure switch is open and requires manual reset 5. Broken supply wires or connector is not making contact 6. Unusually long compressor protector reset time due to extreme ambient temperature 7. Compressor windings are damaged
Yellow "ALERT" Flash Code 6	Missing Phase LOCKOUT	1. Compressor fuse is open on one phase 2. Broken wire or connector on one phase 3. Compressor motor winding is damaged 4. Utility supply has dropped one phase
Yellow "ALERT" Flash Code 7	Reverse Phase LOCKOUT	1. Compressor running backward due to supply phase reversal
Yellow "ALERT" Flash Code 8	Welded Contactor Compressor always runs	1. Compressor contactor has failed closed 2. Thermostat demand signal not connected to module
Yellow "ALERT" Flash Code 9	Low Voltage Control circuit < 18VAC	1. Control circuit transformer is overloaded 2. Low line voltage to compressor

Table 24 — CADM Troubleshooting

MISWIRED MODULE INDICATION	RECOMMENDED TROUBLESHOOTING ACTION
Green LED is not on, module does not power up	Determine if both R and C module terminals are connected. Verify voltage in present at module's R and C terminals. NOTE: The CADM requires a constant nominal 24VAC power supply. The wiring to the module's R and C terminals must be directly from the control transformer. The module cannot receive its power from another device that will interrupt the 24VAC power supply. See Fig. A-F in Appendix B for the 38AXQ power wiring diagrams.
Green LED Intermittent, module powers up only when compressor runs	Determine if R and Y terminals are wired in reverse. Verify module's R and C terminals have a constant source. See "NOTE" above for details on R and C wiring.
TRIP LED is on but system and compressor check OK	Verify Y terminal is wired properly per the 38AXQ wiring diagram (see Fig. A-F in Appendix B). Verify voltage at contactor coil falls below 0.5VAC when off. Verify 24VAC is present across Y and C when thermostat demand signal is present. If not, R and C are reverse wired.
TRIP LED and ALERT LED flashing together	Verify R and C terminals are supplied with 19-28VAC.
ALERT Flash Code 3 (Compressor Short Cycling) displayed incorrectly	Verify Y terminal is connected to 24VAC at contactor coil. Verify voltage at contactor coil falls below 0.5VAC when off.
ALERT Flash Code 5 or 6 (Open Circuit, Missing Phase) displayed incorrectly	Check that compressor T1 and T3 wires are through module's current sensing holes. Verify Y terminal is connected to 24VAC at contactor coil. Verify voltage at contactor coil falls below 0.5VAC when off.
Alert Flash Code 8 (Welded Contactor) displayed incorrectly	Determine if module's Y terminal is connected. Verify Y terminal is connected to 24VAC at contactor coil. Verify 24VAC is present across Y and C when thermostat demand signal is present. If not, R and C are reverse wired. Verify voltage at contactor coil falls below 0.5VAC when off.

Outdoor Fans

Each fan is supported by a formed-wire mount bolted to the fan deck and covered with a wire guard. Fan motors have permanently lubricated bearings.

1. Shut off unit power supply. Install lockout tag.
2. Remove outdoor fan assembly (grille, motor, and fan).
3. Loosen fan hub setscrews.
4. Adjust fan height as shown in Fig. 33.
5. Tighten setscrews to 84 in.-lb (949 N-cm).
6. Replace outdoor fan assembly.

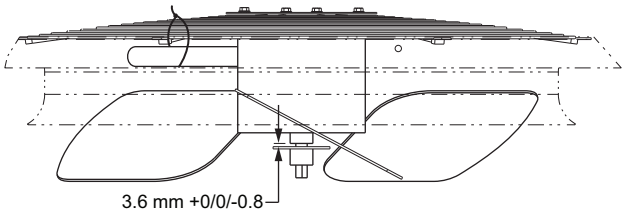


Fig. 33 — Outdoor Fan Blade Position

Lubrication

FAN MOTORS

The fan motors have sealed bearings. No provisions are made for lubrication.

COMPRESSOR

The compressor has its own oil supply. Loss of oil due to a leak in the system should be the only reason for adding oil after the system has been in operation.

Outdoor Coil Maintenance and Cleaning Recommendation

Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit. The following maintenance and cleaning procedures are recommended as part of the routine maintenance activities to extend the life of the coil.

REMOVE SURFACE LOADED FIBERS

Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges can be easily bent over and damage the coating of a protected coil) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

PERIODIC CLEAN WATER RINSE

A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Periodic cleaning as described below is recommended.

⚠ CAUTION

PERSONAL INJURY AND UNIT DAMAGE HAZARD

Failure to follow this caution may result in personal injury or equipment damage.

Only approved cleaning is recommended.

ROUTINE CLEANING OF INDOOR COIL SURFACES

Periodic cleaning with Totaline® coil cleaner is essential to extend the life of coils. This cleaner is available from the Replacement Components Division as part number P902-0301 for one gallon container, and part number P902-0305 for a 5 gallon container. It is recommended that all coils, including standard aluminum, pre-coated, copper/copper or e-coated coils be cleaned with the Totaline coil cleaner as described below. Coil cleaning should be part of the unit's regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Avoid the use of:

- coil brighteners
- acid cleaning prior to painting
- high pressure washers
- poor quality water for cleaning

Totaline coil cleaner is nonflammable, hypoallergenic, non bacterial, and a USDA accepted biodegradable agent that will not harm the coil or surrounding components such as electrical wiring, painted metal surfaces, or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.

Totaline Coil Cleaner Application Equipment:

- 2-1/2 gallon garden sprayer
- Water rinse with low velocity spray nozzle

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in corrosion and damage to the unit.

Harsh chemicals, household bleach or acid or basic cleaners should not be used to clean outdoor or indoor coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the Totaline coil cleaner as described above.

⚠ CAUTION

UNIT RELIABILTY HAZARD

Failure to follow this caution may result in reduced unit performance

High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop.

Totaline Coil Cleaner Application Instructions:

NOTE: Proper eye protection such as safety glasses is recommended during mixing and application.

1. Turn off unit power.
2. Remove screws holding rear corner post and top cover in place. Pivot top cover up 12 to 18 inches (305 to 457 mm) and support with a rigid support. See Fig. 34.

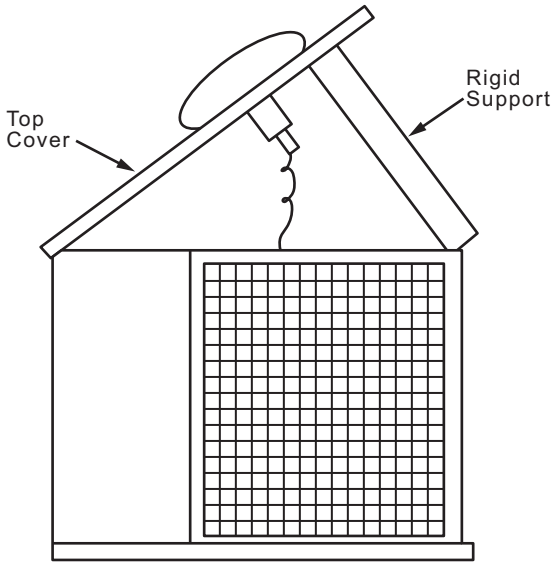


Fig. 34 — Pivot and Support Top Cover

3. Remove all surface loaded fibers and dirt with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges can be easily bent over and damage to the coating of a protected coil) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against surface loaded coil will drive the fibers and dirt into the coil, making cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

4. Using a low velocity garden hose thoroughly wet finned surfaces with clean water. Be careful not to bend the fins.
5. Mix Totaline coil cleaner in a 2-1/2 gallon garden sprayer according to the instructions included with the cleaner. The optimum solution temperature is 100°F (38°C).

NOTE: Do NOT USE water in excess of 130°F (54°C), as the enzymatic activity will be destroyed.

6. Thoroughly apply Totaline coil cleaner solution to all coil surfaces including the finned area, tube sheets and coil headers.
7. Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
8. Ensure cleaner thoroughly penetrates deep into finned areas.
9. Interior and exterior finned areas must be thoroughly cleaned.
10. Finned surfaces should remain wet with cleaning solution for 10 minutes.
11. Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10-minute saturation is achieved.
12. Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.
13. Replace top cover and rear corner posts.

Service Parts

Listings of service parts for all units are available from the Replacement Components Division's Parts Information Catalog (PIC). PIC is available at Totaline stores, distributor and service office parts departments and online at HVACPartners.com.

When entering PIC, the full unit model number is required. The model number includes the Design Revision reference value (see Position 13 on the unit's information data plate). The unit model number is available from the unit's information data plate. (Do not use the "catalog number" when using PIC. The "catalog number" suppresses the Design Revision value; failure to include Design Revision value may cause an incorrect unit parts list to be displayed.) Find appropriate model from sales packages listed. Be sure to choose correct voltage and Design Revision.

PIC is a product of RCD. To comment to the PIC program, use the "Comment" button inside the PIC program.

Evacuation, Removal, and Recovery

When breaking into the refrigerant circuit to make repairs - or for any other purpose - conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

The following procedure shall be adhered to:

1. Safely remove refrigerant following local and national regulations.
2. Evacuate.
3. Purge the circuit with inert gas (optional for A2L refrigerants).
4. Evacuate (optional for A2L refrigerants).
5. Continuously flush or purge with inert gas when using flame to open circuit.
6. Open the circuit.

For appliances containing flammable refrigerants, purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process may need to be repeated several times until the system is free from refrigerant. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant. Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect coupling and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer not arranged. Do not mix refrigerants in recovery units, and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

At no point during this process should the outlet for the vacuum pump be close to any potential ignition sources, and ventilation shall be available.

FASTENER TORQUE VALUES

See Table 25 for information regarding fastener torque values.

Table 25 — Fastener Torque Values

Compressor mounting bolts	65-75 in.-lb (734-847 N-cm)
Condenser fan motor mounting bolts	20 ±2 in.-lb (226 ±23 N-cm)
Condenser fan hub setscrew	84 ±2 in.-lb (949 ±136 N-cm)
High-flow service port	96 ±10 in.-lb (1085 ±23 N-cm)
Schrader-type service check valve	2-3 in.-lb (23-34 N-cm)
Compressor oil sight glass thread	330±31 in.-lb (23-34 N-cm)
Compressor to Compressor rail torque	120-168 in.-lb (1356-1898 N-cm)
Compressor rail to base pan torque	70 ±5 in.-lb (791 ±57 N-cm)

DECOMMISSIONING

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate the system electrically.
3. Before attempting the procedure, ensure that:
   a. Mechanical handling equipment is available, if required for handling refrigerant cylinders
   b. All personal protective equipment is available and being used correctly
   c. The recovery process is supervised at all times by a competent person
   d. Recovery equipment and cylinders conform to the appropriate standards
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that the cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80% of volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from the site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labeled that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

TROUBLESHOOTING

PROBLEM	CAUSE	REMEDY
Compressor and Outdoor Fan Will Not Start.	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker. Determine root cause.
	Defective thermostat, contactor, transformer, control relay, or capacitor.	Replace component.
	Insufficient line voltage.	Determine cause and correct.
	Incorrect or faulty wiring.	Check wiring diagram and rewire correctly.
	Thermostat setting too high.	Lower thermostat setting below room temperature.
	High pressure switch tripped.	See problem “Excessive head pressure.”
	Low pressure switch tripped.	Check system for leaks. Repair as necessary.
	Freeze-up protection thermostat tripped.	See problem “Suction pressure too low.”
	Fan fault or shutdown condition in fan coil unit active, preventing thermostat signals passing from fan coil unit to 38AXQ.	Address fault in VFD (40RLQ) or other shutdown condition.
Compressor Will Not Start But Outdoor Fan Runs.	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor or allow enough time for internal overload to cool and reset.
	Defective run/start capacitor, overload, start relay.	Determine cause and replace compressor.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker. Determine cause.
Compressor Cycles (Other Than Normally Satisfying Thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor.	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked outdoor coil or dirty air filter.	Determine cause and correct.
	Defective run/start capacitor, overload, or start relay.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty outdoor-fan (cooling) or indoor-fan (heating) motor or capacitor.	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor Operates Continuously.	Dirty air filter.	Replace filter.
	Unit undersized for load.	Decrease load or increase unit size.
	Thermostat set too low (cooling).	Reset thermostat.
	Low refrigerant charge.	Locate leak; repair and recharge.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Outdoor coil dirty or restricted.	Clean coil or remove restriction.
Compressor Makes Excessive Noise.	Compressor rotating in the wrong direction.	Reverse the 3-phase power leads as described in Start-Up.
Excessive Head Pressure.	Dirty outside air or return air filter (heating).	Replace filter.
	Dirty outdoor coil (cooling).	Clean coil.
	Refrigerant overcharged.	Recover excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condensing air restricted or air short-cycling.	Determine cause and correct.
Head Pressure Too Low.	Low refrigerant charge.	Check for leaks; repair and recharge.
	Compressor scroll plates defective.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
Excessive Suction Pressure.	High heat load.	Check for source and eliminate.
	Compressor scroll plates defective.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction Pressure Too Low.	Dirty air filter (cooling).	Replace filter.
	Dirty or heavily iced outdoor coil (heating).	Clean outdoor coil. Check defrost cycle operation.
	Low refrigerant charge.	Check for leaks; repair and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Insufficient indoor airflow (cooling mode).	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.
	Outdoor ambient below 25°F (cooling).	Install low-ambient kit.
	Outdoor fan motor(s) not operating (heating).	Check fan motor operation.

APPENDIX A — QUICK REFERENCE GUIDE
AIR CONDITIONER AND HEAT PUMP WITH PURON ADVANCE™

- Puron Advance™ (R-454B) refrigerant operates at 50 percent to 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with Puron Advance™ refrigerant.
- Puron Advance™ refrigerant cylinders are gray with a red band near the top
- Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400 or DOT BW400.
- Puron Advance™ refrigerant systems should be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose when charging into suction line with compressor operating.
- Manifold sets should be 700 psig high side and 180 psig low side with 550 psig low-side retard.
- Use hoses with 700 psig service pressure rating.
- Leak detectors should be designed to detect HFC refrigerant.
- Puron Advance™ refrigerant, as with other HFCs, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- Use only factory specified liquid-line filter driers with rated working pressures greater than 600 psig.
- Do not install a suction-line filter drier in liquid-line.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere.
- POE oils may cause damage to certain plastics and roofing materials.
- Wrap all filter driers and service valves with wet cloth when brazing.
- A factory approved, liquid-line filter drier is required on every unit.
- Do not use an R-22 TXV.
- If indoor unit is equipped with a TXV, it must be changed to a Puron Advance™ TXV.
- Never open system to atmosphere while it is under a vacuum.
- When system must be opened for service, recover refrigerant, break vacuum with dry nitrogen before opening system.
- Always replace filter drier after opening system for service.
- Do not vent Puron Advance™ refrigerant into the atmosphere.
- Do not use capillary tube coils.
- Observe all warnings, cautions, and bold text.
- All Puron Advance™ heat pumps must have indoor TXV.
- Do not leave Puron Advance™ suction line driers in place for more than 72 hours.

APPENDIX B — WIRING DIAGRAMS

WIRING TYPE	38AXQ SIZE	ELECTRICAL CHARACTERISTICS	DIAGRAM NUMBER	PAGE NUMBER
POWER WIRING	16	575-3-60	38AU002450	40
		208/230-3-60	38AU002451	41
		460-3-60	38AU002452	42
	25	575-3-60	38AU002453	43
		208/230-3-60	38AU002454	44
		460-3-60	38AU002455	45
CONTROL WIRING	16, 25	575-3-60 208/230-3-60 460-3-60	38AU002458	46

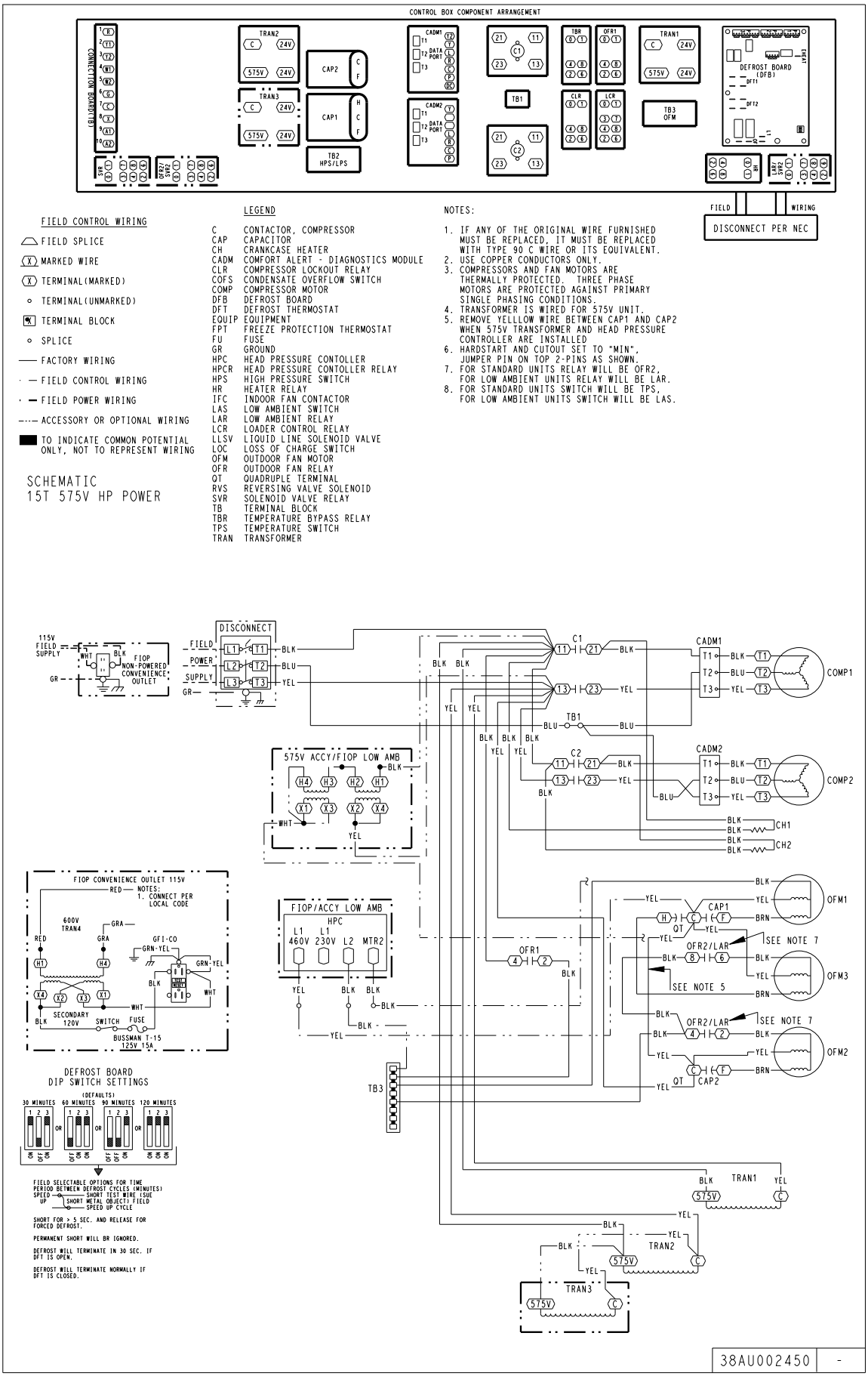


Fig. A — 38AXQ*16 Power Schematic (575-3-60 shown)

APPENDIX B — WIRING DIAGRAM (cont)

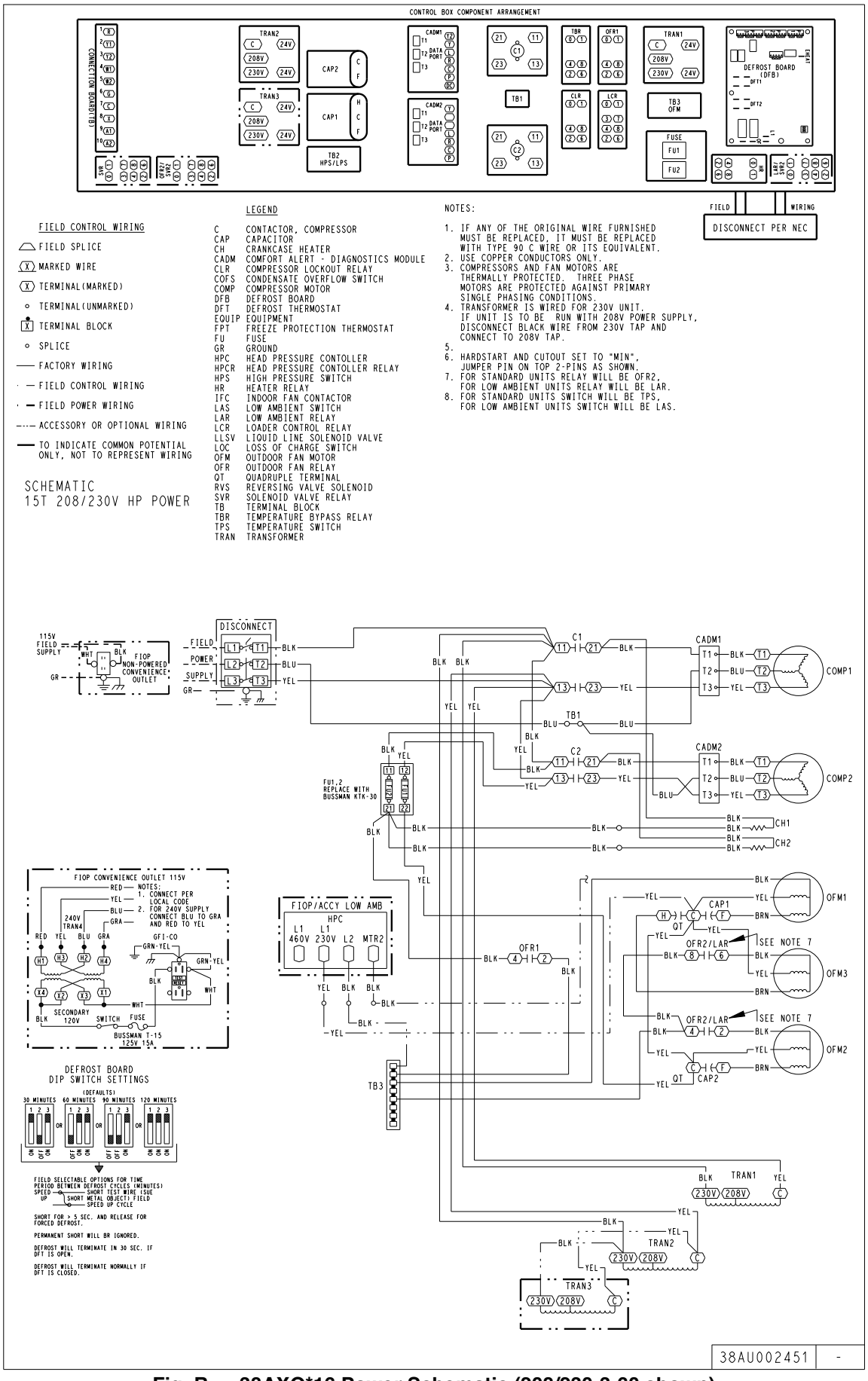


Fig. B — 38AXQ*16 Power Schematic (208/230-3-60 shown)

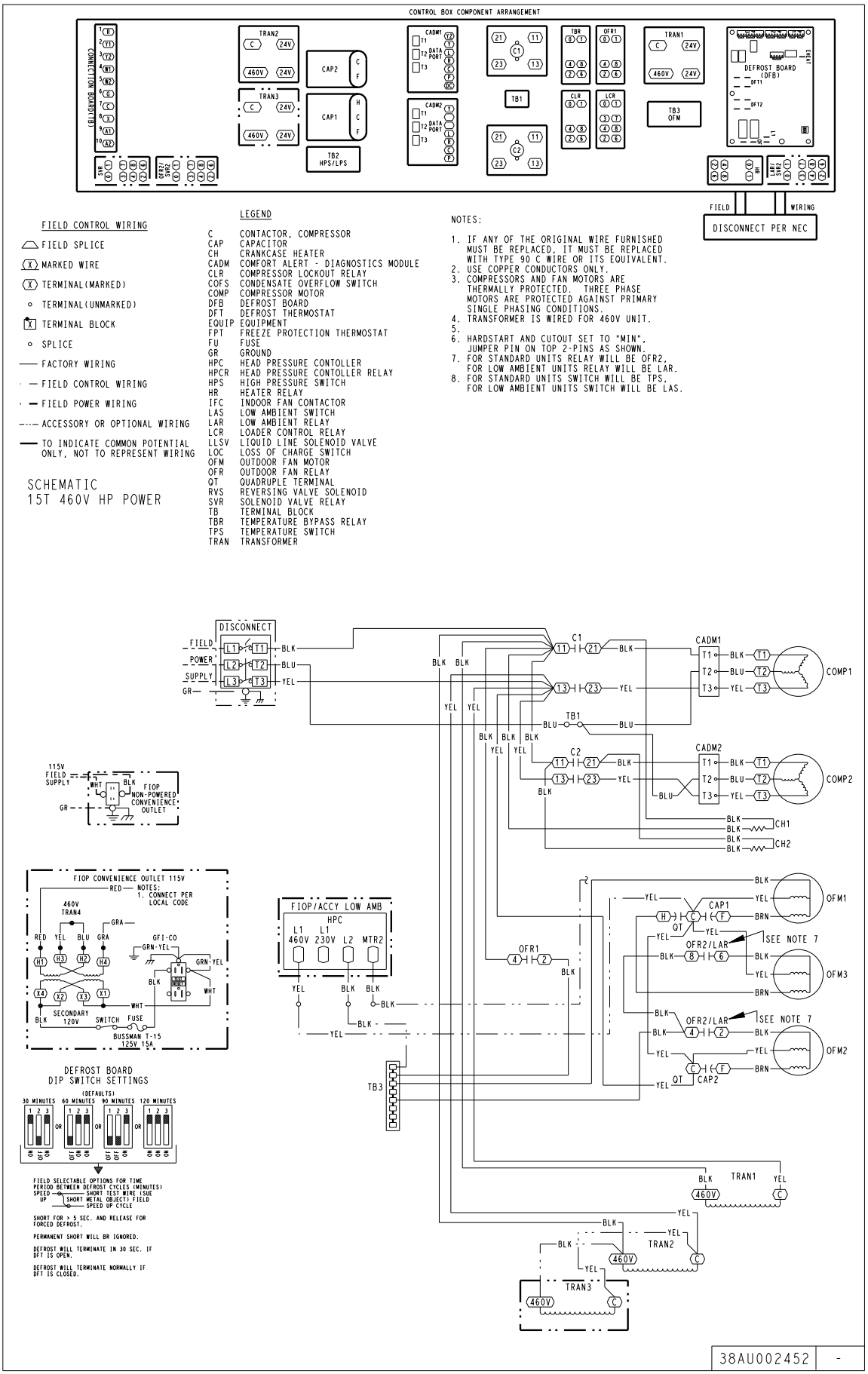


Fig. C — 38AXQ*16 Power Schematic (460-3-60 shown)

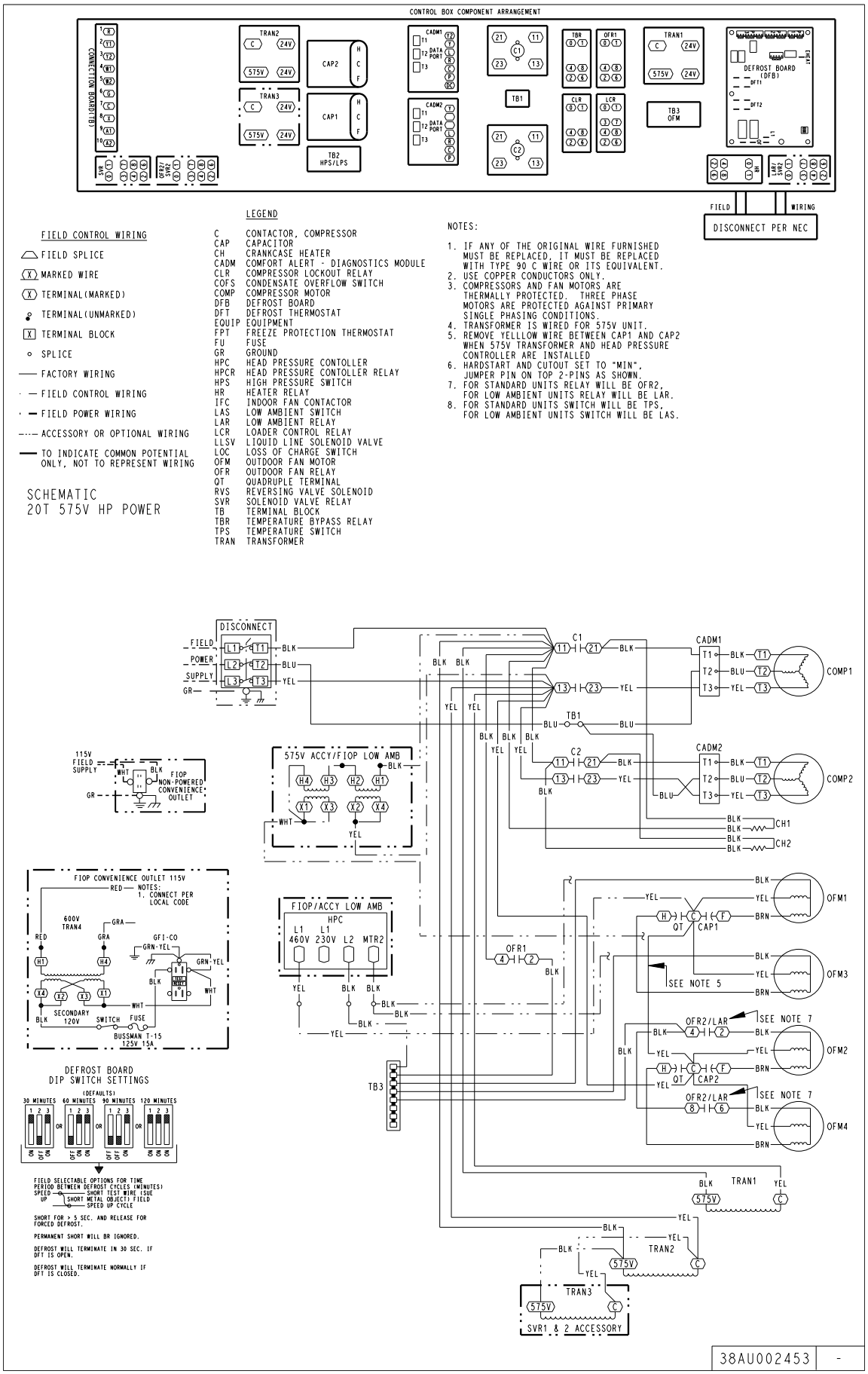


Fig. D — 38AXQ*25 Power Schematic (575-3-60 shown)

APPENDIX B — WIRING DIAGRAM (cont)

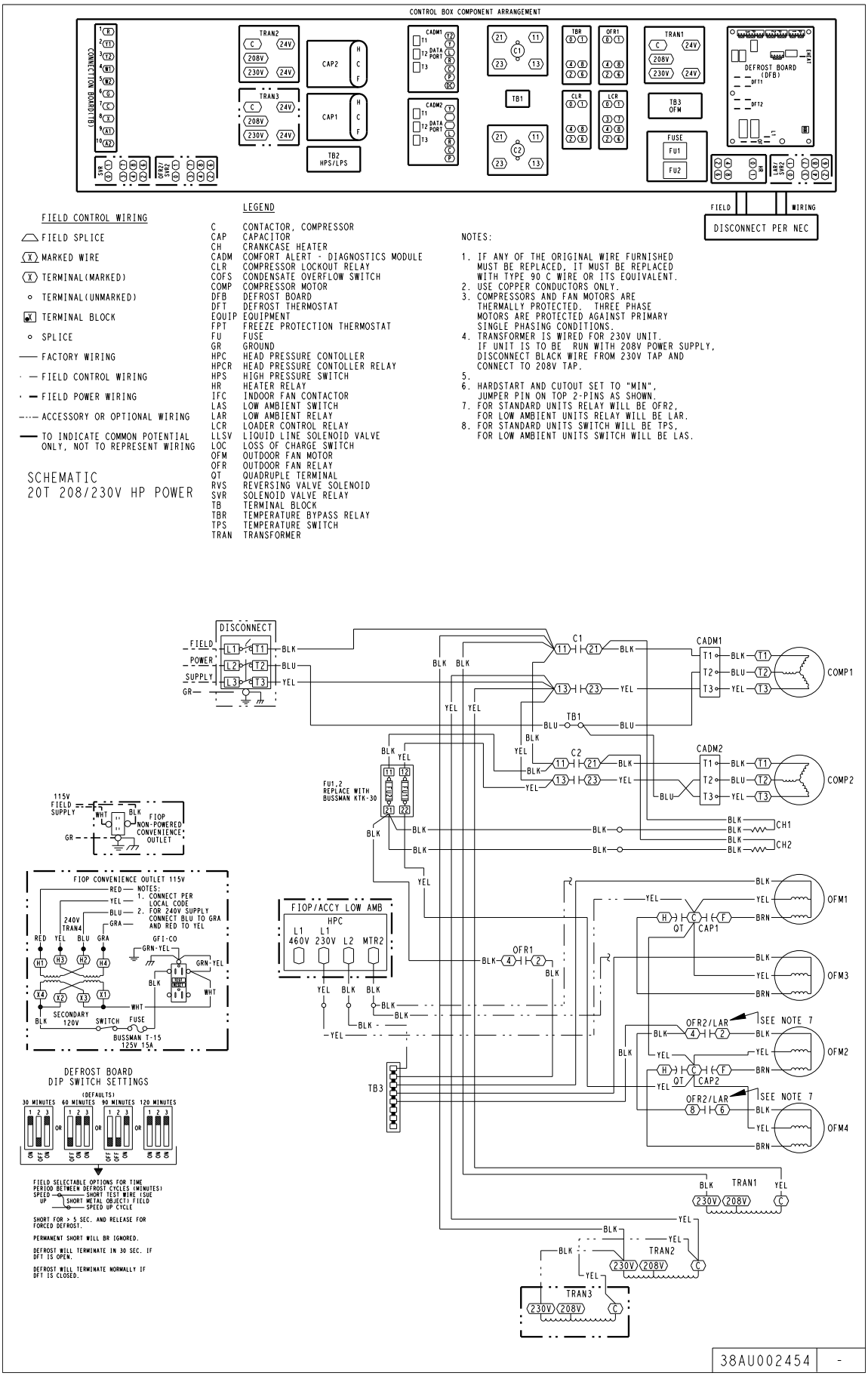


Fig. E — 38AXQ*25 Power Schematic (208/230-3-60 shown)

APPENDIX B — WIRING DIAGRAM (cont)

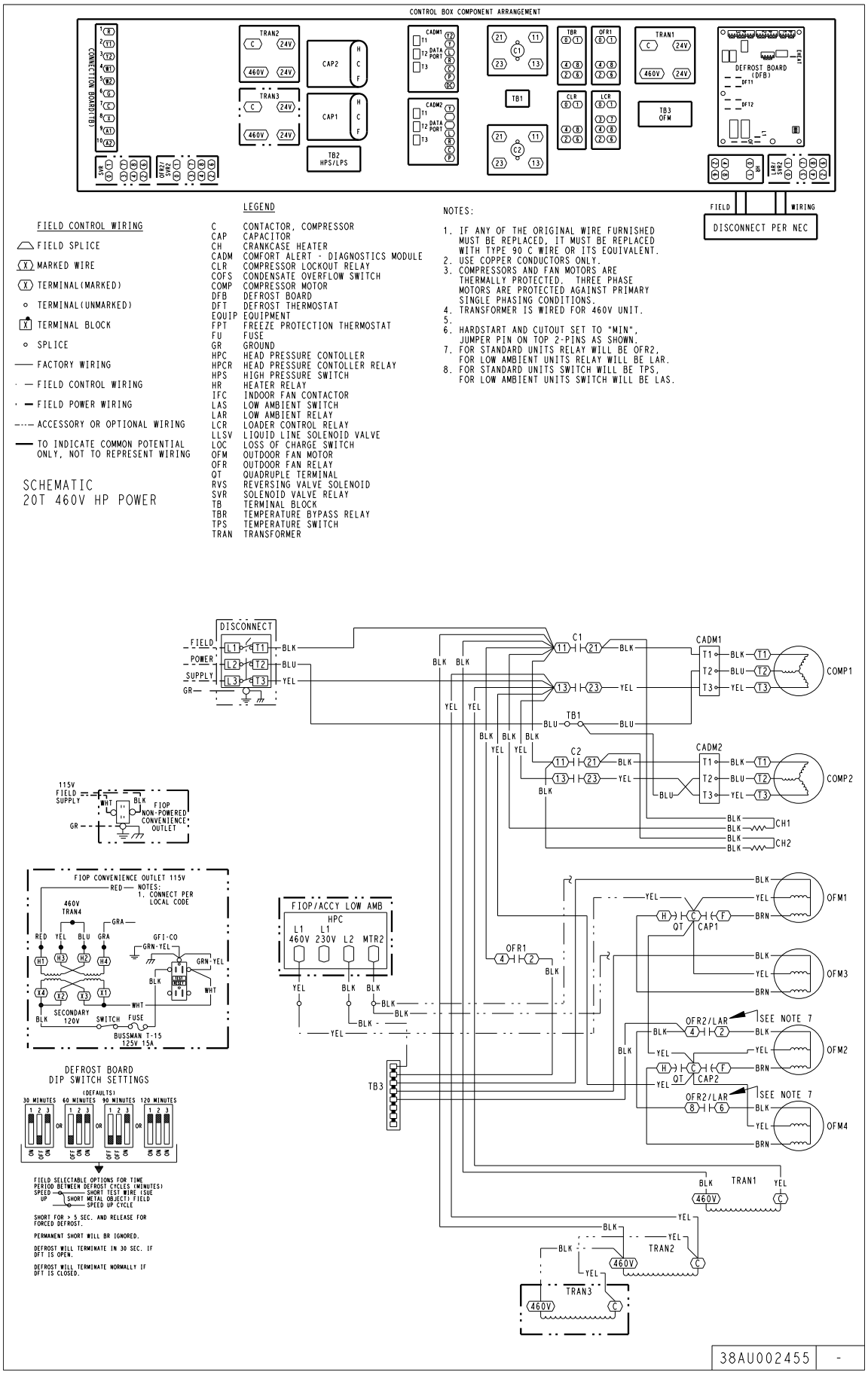


Fig. F — 38AXQ*25 Power Schematic (460-3-60 shown)

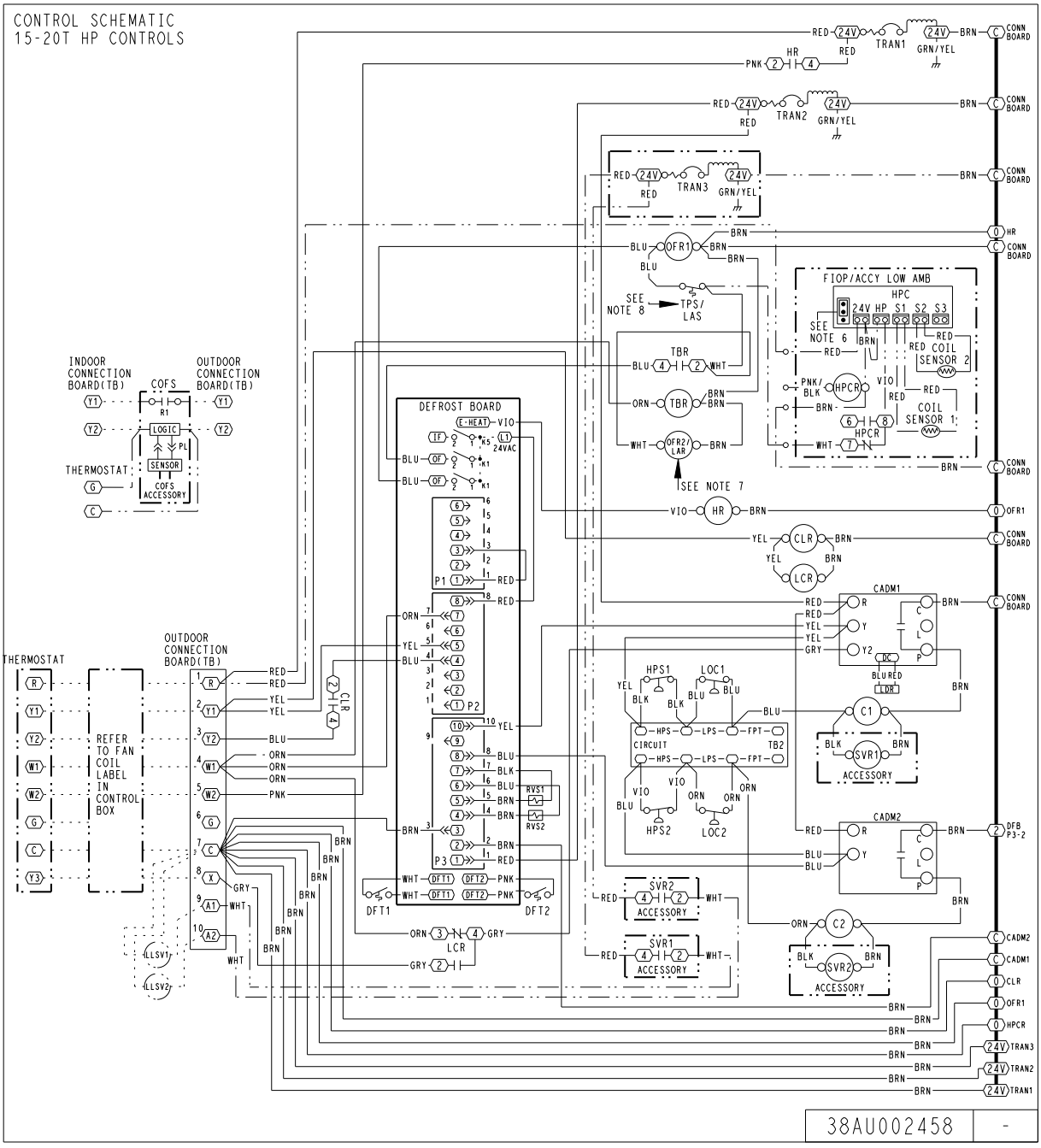


Fig. G — 38AXQ*16-25 Control Schematic

APPENDIX C — LOW AMBIENT OPTION — FACTORY INSTALLED

Units with the factory installed low ambient option are equipped with a low ambient head pressure control which regulates fan speed. Two temperature sensors, mounted on circuits 1 and 2 of the outdoor coil (see Fig. H and I), control the speed of approved outdoor fan motors in order to maintain a constant head pressure in the outdoor coil. The control maintains the appropriate head pressure at low ambient temperatures down to –20°F (–28°C).

Wind baffles are required to prevent wind cross currents from causing abnormally low condensing temperatures.

- Use 20-gauge sheet metal to fabricate wind baffles (see Fig. J and Table A) and mounting brackets (see Fig. K).

NOTE: Mounting brackets are for use on 15 ton model units only.

- Install the wind baffles as show in Fig. L, for 15 ton units and Fig. M, for 20 ton units.

Operation

Fan on/off control is provided by an outdoor fan relay (OFR).

In cooling mode, fan motor speed of outdoor motors OFM1 for 38AXQ*16 or OFM1 and OFM3 for 38AXQ*25 is regulated by the speed control temperature sensors on outdoor coil circuits 1 and 2 for a minimum coil condensing temperature of approximately 100°F (37.8°C) at higher outdoor ambient temperature and 80°F (26.7°C) at lower ambient. Additionally, outdoor fan motor OFM2 and OFM3 for 38AXQ*16 or OFM2 and OFM4 for 38AXQ*25 are turned on/off by the low ambient temperature switch, LAS, operating the low ambient relay (LAR). The LAS control temperatures are open 60°F ± 2.16°F, close 65°F ± 2.16°F (open 15.6°C ± 1.2°C, close 18.6°C ± 1.2°C).

To override the speed control for full fan speed operation during service or maintenance, either:

a. remove sensor and place in hot water >120°F (>49°C), or

b. rewire to bypass control by connecting speed control input and output power wires.

Troubleshooting

OBSERVATION	POSSIBLE REMEDY
Fans will not start	All fans: Check power and wiring Check outdoor fan relay (OFR) OFM1, OFM3 only: Check speed control sensor location Check speed sensor resistance OFM2, OFM4 only: Check low ambient switch (LAS) Check low ambient relay (LAR)
Cooling — Center outdoor fans (OFM2, OFM4) off below approximately 60°F (15.6°C) outdoor ambient.	Normal operation
Cooling — Center outdoor fans (OFM2, OFM4) not on above approximately 65°F (18.6°C) outdoor ambient	Check low ambient switch (LAS) Check low ambient relay (LAR)
Cooling — Slow fan speed for outer fans (OFM1, OFM3) at start or during low outdoor ambient	Normal operation
Cooling — Slow fan speed for outer fans (OFM1, OFM3) above 85°F (29°F) outdoor ambient (should be full speed)	Check speed control sensor location Check speed control sensor resistance Check fan motor capacitor
Cooling— Motor current into speed control is greater than motor nameplate FLA	Normal operation Up to 30% higher amps at partial speed at low ambient

Speed Control Sensor Resistance

TEMPERATURE		RESISTANCE
°F ± 2°F	**°C ± 1C**	**Ohms, nominal**
–22	–30	88350
–4	–20	48485
14	–10	27650
32	0	16325
50	10	9950
68	20	6245
77	25	5000
86	30	4028
104	40	2663
122	50	1801
140	60	1244
158	70	876

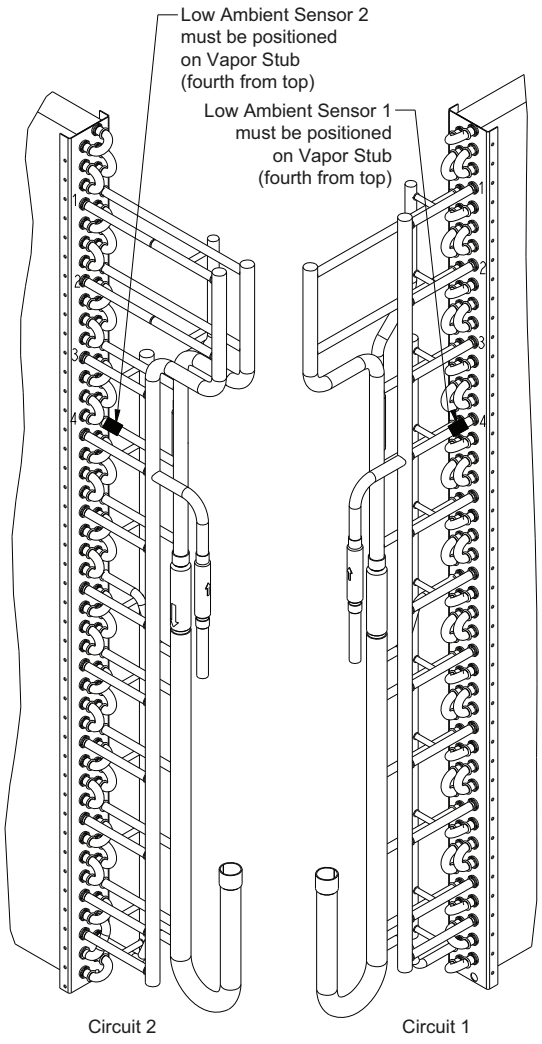


Fig. H — Low Ambient Sensor Location: 38AXQ*16

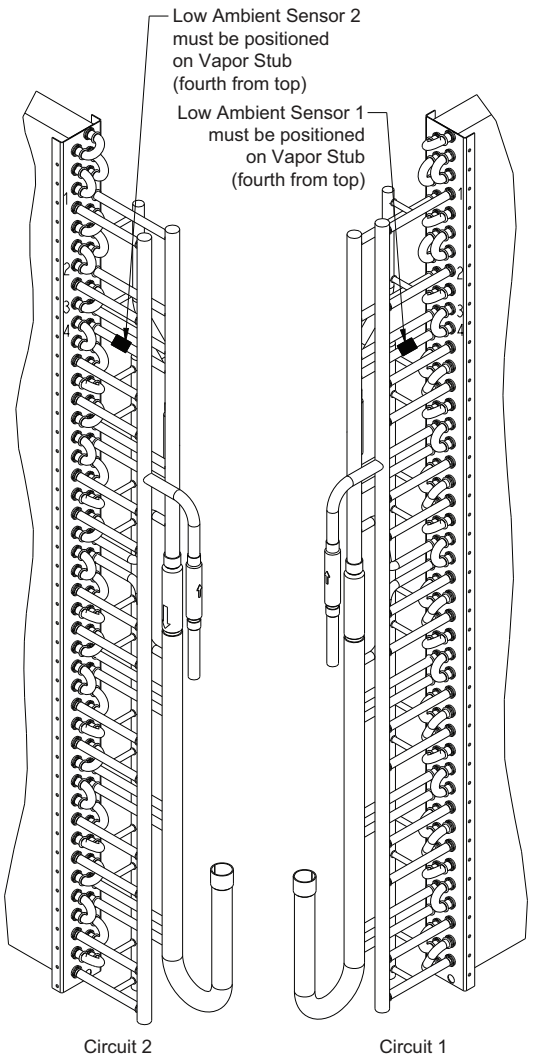
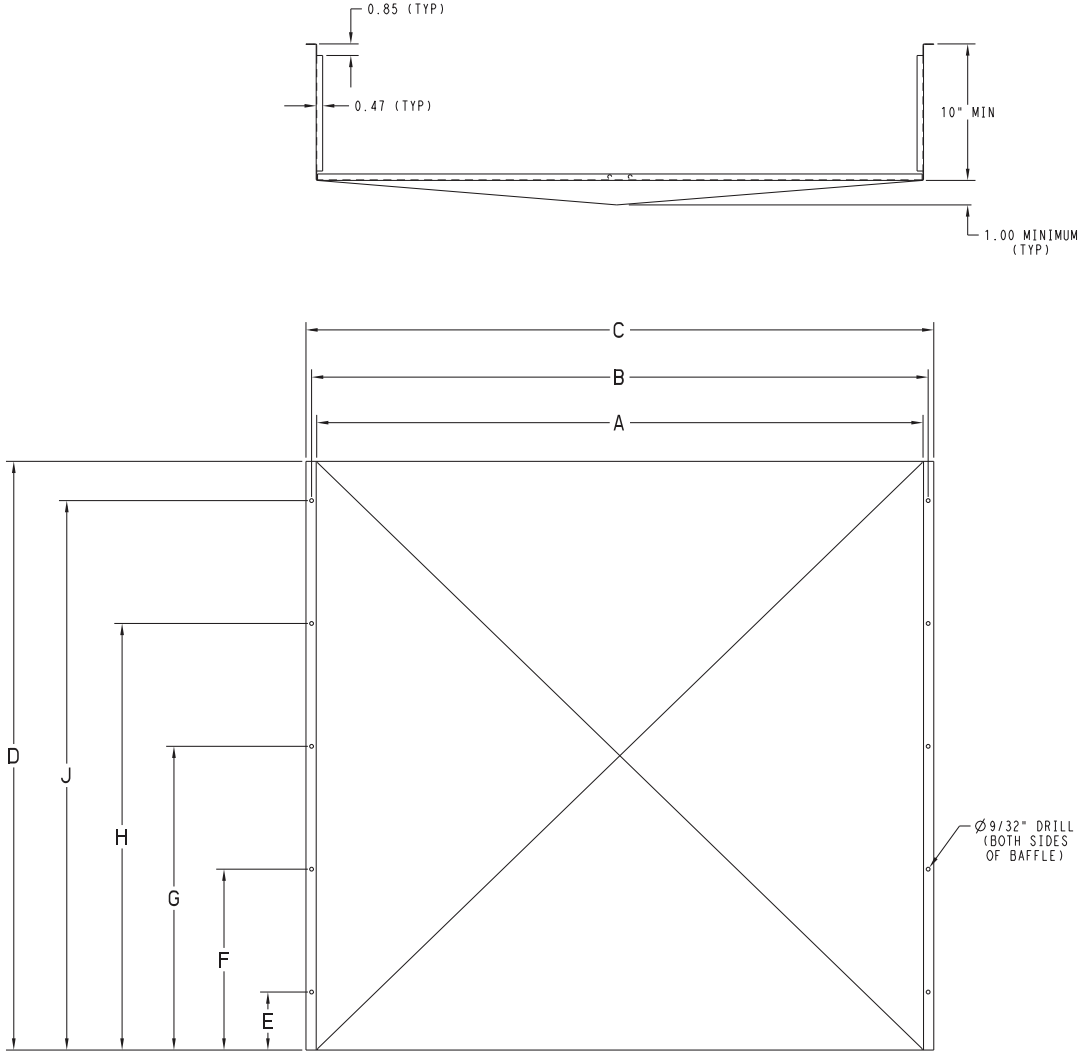


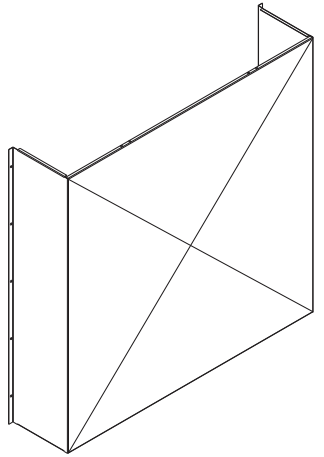
Fig. I — Low Ambient Sensor Location: 38AXQ*25

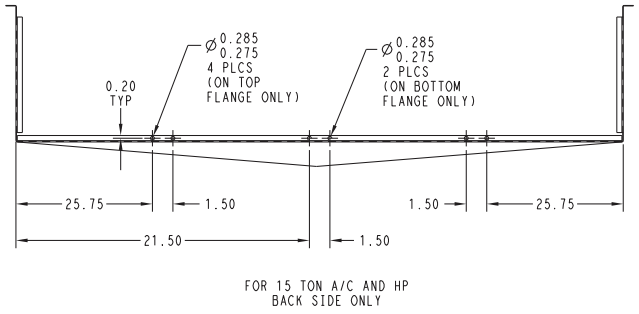
Table A — Wind Baffle Dimension

DIMENSIONS (in.)										
UNIT	**Baffle**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**
38AXQ*16	Left side	19-3/4	20-1/2	21-1/4	43-1/8	8-3/8	18	27-1/4	40	—
	Back	80-1/4	81	81-3/4	43-1/8	8-3/8	18	27-1/4	40	—
	Right Side	38-3/4	39-1/2	40-1/4	43-1/8	8-3/8	18	27-1/4	40	—
	Front	34-1/8	34-7/8	35-5/8	43-1/8	6-7/8	16-1/2	25-3/4	38-1/2	—
38AXQ*25	Left side	32-7/8	33-5/8	34-3/8	43-1/8	4-1/4	13-1/4	22-1/4	31-1/4	40-1/4
	Back	77-7/8	78-1/2	79-1/4	43-1/8	4-1/4	13-1/4	22-1/4	31-1/4	40-1/4
	Right Side	61-1/8	61-7/8	62-5/8	43-1/8	3-3/4	12-3/4	21-3/4	30-3/4	39-3/4
	Front	40-1/8	40-7/8	41-5/8	43-1/8	3-1/4	12-3/4	21-3/4	30-3/4	39-3/4

DIMENSIONS (mm)										
UNIT	**Baffle**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**
38AXQ*16	Left side	501	520	539	1095	212	457	694	1015	—
	Back	2037	2056	2075	1095	212	457	694	1015	—
	Right Side	983	1002	1021	1095	212	457	694	1015	—
	Front	866	885	904	1095	174	419	656	977	—
38AXQ*25	Left side	834	853	872	1095	108	337	565	794	1022
	Back	1468	1487	1506	1095	108	337	565	794	1022
	Right Side	1551	1570	1589	1095	95	324	552	781	1010
	Front	764	784	803	1095	95	324	552	781	1010

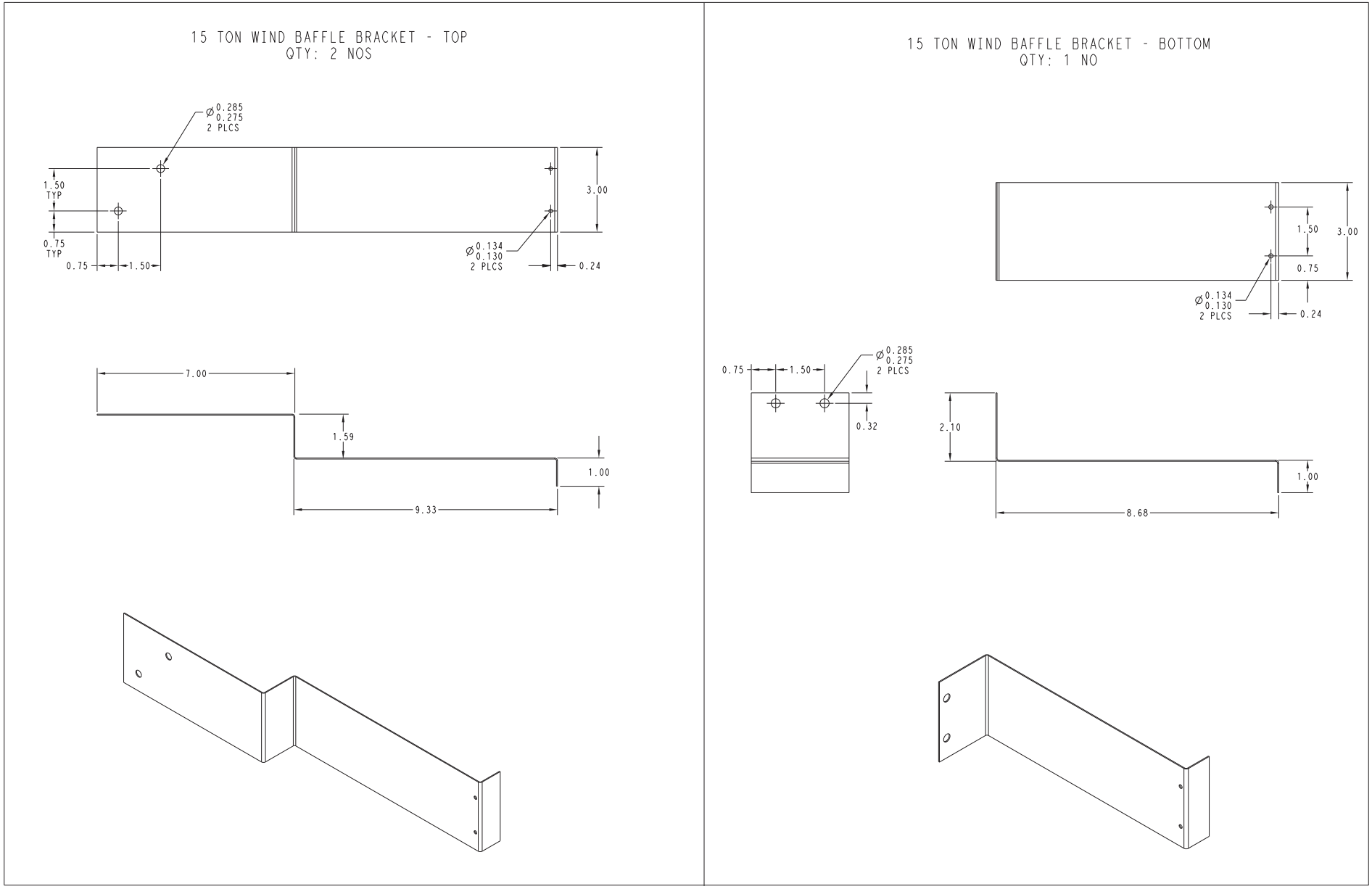






NOTE: Dimensions are in inches.

Fig. J — Wind Baffles — Fabrication



NOTE: Dimensions are in inches.

Fig. K — 15 Ton Wind Baffle Brackets — Fabrication

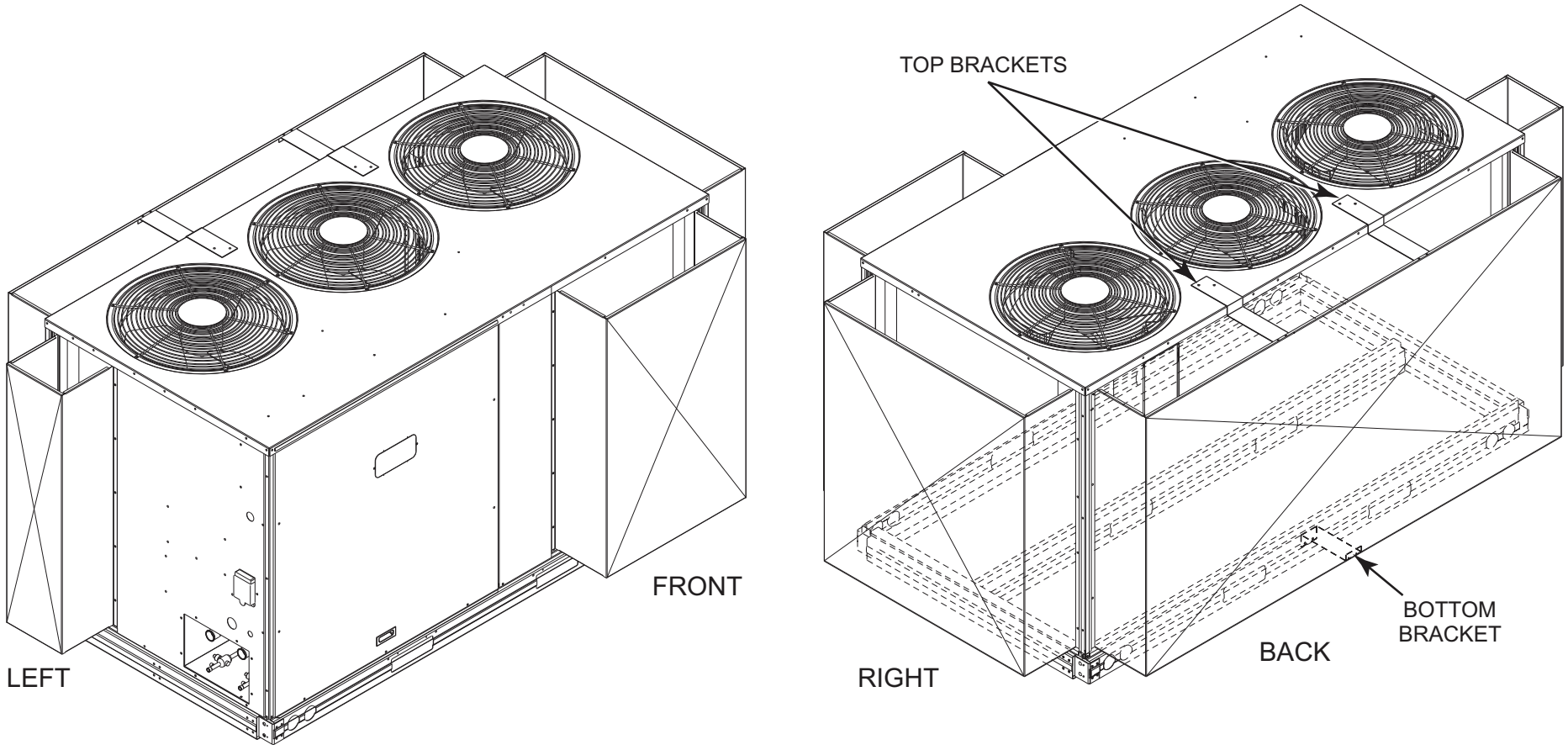


Fig. L — Wind Baffle Installation — 15 Ton Units

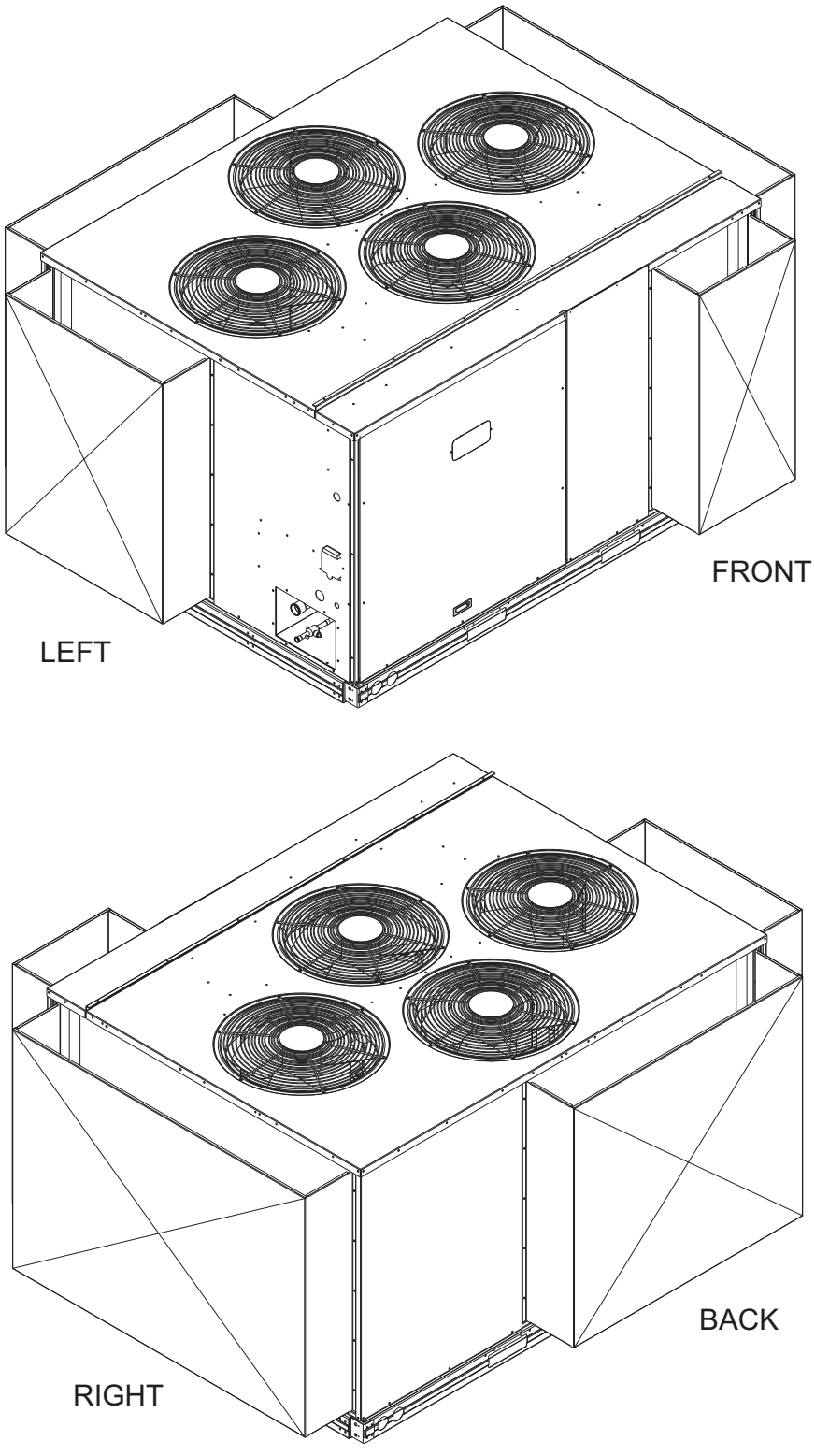


Fig. M — Wind Baffle Installation — 20 Ton Units

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START-UP CHECKLIST FOR 38AXQ*16-25 HEAT PUMP CONDENSING UNIT

(Remove and use for job file)

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation, Start-Up and Service Instruction document.

I. PRELIMINARY INFORMATION

OUTDOOR: MODEL NO. _____ SERIAL NO. _____

INDOOR: AIR HANDLER MANUFACTURER _____

MODEL NO. _____ SERIAL NO. _____

ADDITIONAL ACCESSORIES _____

II. PRE-START-UP

OUTDOOR UNIT

IS THERE ANY SHIPPING DAMAGE? (Y/N) _____

IF SO, WHERE: _____

_____

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N) _____

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) _____

HAS THE GROUND WIRE BEEN CONNECTED? (Y/N) _____

VERIFY GROUND INTEGRITY WITH CONTINUITY TEST? (Y/N) _____

HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N) _____

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) _____

CONTROLS

ARE THERMOSTAT AND INDOOR FAN CONTROL WIRING CONNECTIONS MADE AND CHECKED? (Y/N) _____
(Thermostat wiring must be made directly to the fan coil unit)

ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N) _____

HAS CRANKCASE HEATER BEEN ENERGIZED FOR 24 HOURS? (Y/N) _____

INDOOR UNIT

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE? (Y/N) _____

ARE PROPER AIR FILTERS IN PLACE? (Y/N) _____

HAVE FAN AND MOTOR PULLEYS BEEN CHECKED FOR PROPER ALIGNMENT? (Y/N) _____

DO THE FAN BELTS HAVE PROPER TENSION? (Y/N) _____

HAS CORRECT FAN ROTATION BEEN CONFIRMED? (Y/N) _____

PIPING

ARE LIQUID LINE SOLENOID VALVES LOCATED AT THE INDOOR COILS AS REQUIRED? (Y/N) _____

HAVE LEAK CHECKS BEEN MADE AT COMPRESSOR, OUTDOOR AND INDOOR COILS, TXVs (Thermostatic Expansion Valves), SOLENOID VALVES, FILTER DRIERS, AND FUSIBLE PLUGS WITH A LEAK DETECTOR? (Y/N) _____

LOCATE, REPAIR, AND REPORT ANY LEAKS.

HAVE LIQUID LINE SERVICE VALVES BEEN OPENED? (Y/N) _____

HAVE SUCTION LINE SERVICE VALVES BEEN OPENED? (Y/N) _____

CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB _____V AC _____V BC _____V
(AB + AC + BC)/3 = AVERAGE VOLTAGE = _____V
MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____V
VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = _____
IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!
CALL LOCAL POWER COMPANY FOR ASSISTANCE.

CHECK INDOOR UNIT FAN SPEED AND RECORD _____
CHECK OUTDOOR UNIT FAN SPEED AND RECORD _____
AFTER AT LEAST 10 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

SUCTION PRESSURE	CIR 1: _____	CIR 2: _____
SUCTION LINE TEMP	CIR 1: _____	CIR 2: _____
LIQUID PRESSURE	CIR 1: _____	CIR 2: _____
LIQUID LINE TEMP	CIR 1: _____	CIR 2: _____
ENTERING OUTDOOR UNIT AIR TEMP	_____	
LEAVING OUTDOOR UNIT AIR TEMP	_____	
INDOOR UNIT ENTERING-AIR DB (dry bulb) TEMP	_____	
INDOOR UNIT ENTERING-AIR WB (wet bulb) TEMP	_____	
INDOOR UNIT LEAVING-AIR DB TEMP	_____	
INDOOR UNIT LEAVING-AIR WB TEMP	_____	
COMPRESSOR 1 AMPS (L1/L2/L3)	_____ / _____ / _____	
COMPRESSOR 2 AMPS (L1/L2/L3)_____ / _____ / _____		

NOTES:

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.
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