Application Engineering

Copeland Outdoor Refrigeration Unit X-Line User Manual/ Digital X-Line Unit User Manual

BULLETIN NO: AE5-1412 R7

Contents

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Appendices

Table and Figures

Scan to watch an overview video of an X-Line installation.

Scan to access an interactive course about XCM25D. You will need to login or create an account before you'll be able to access.
Course code: **DL-XCM25D**

Scan to access an interactive course about the Digital X-Line. You will need to login or create an account before you'll be able to access.
Course code: **DL-XLINEDIG**

Scan to find spare parts for the X-Line Condensing unit.

Safety

Important Safety Information

Those involved in the design, manufacture, and installation of a system, system purchasers, and service personnel may need to be aware of hazards and precautions discussed in this section and throughout this document. OEMs integrating the compressor into a system should ensure that their own employees follow this bulletin and provide any necessary safety information to those involved in manufacturing, installing, purchasing, and servicing the system.

Responsibilities, Qualifications and Training

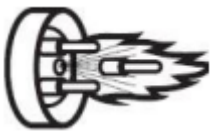
• OEMs are responsible for system design, selection of appropriate components, integration of this component into the system, and testing the system. OEMs must ensure that staff involved in these activities are competent and qualified.

• OEMs are also responsible for ensuring that all product, service, and cautionary labels remain visible or are appropriately added in a conspicuous location on the system to ensure they are clear to any personnel involved in the installation, commissioning, troubleshooting or maintenance of this equipment.

• Only qualified and authorized HVAC or refrigeration personnel are permitted to install, commission, troubleshoot and maintain this equipment. Electrical connections must be made by qualified electrical personnel.

• Observe all applicable standards and codes for installing, servicing, and maintaining electrical and refrigeration equipment.

Terminal Venting and Other Pressurized System Hazards



If a compressor's electrical terminal pin loses its seal, pressurized oil, refrigerant, and debris may spray out. This is called "terminal venting".

The ejected debris, oil, and refrigerant can injure people or damage property. The oil and refrigerant spray can be ignited by electrical arcing at the terminal or any nearby ignition source, producing flames that may project a significant distance from the compressor. The distance depends on the pressure and the amount of refrigerant and oil mixture in the system. The flames can cause serious or fatal burns and ignite nearby materials.

Each compressor has a terminal cover or molded plug that covers electrical connections. The cover or plug helps to protect against electric shock and the risks of terminal venting. If terminal venting occurs, the cover or plug helps contain the spray of refrigerant and oil and reduces the risk of ignition. If ignition occurs, the plug or cover helps contain the flames. However, neither the terminal cover nor the molded plug can completely eliminate the risk of venting, ignition, or electric shock.

See copeland.com/terminal-venting for more details about terminal venting. Additionally, a compressor's refrigerant lines keep refrigerant and oil under pressure. When removing or recharging refrigerant from this component during service, this can pose a pressurized fluid hazard.

Flammable Refrigerant Hazards

If flammable refrigerant is released from a system, an explosive concentration can be present in the air near the system. If there is an ignition source nearby, a release of flammable refrigerant can result in a fire or explosion. While systems using flammable refrigerant are designed to mitigate the risk of ignition if the refrigerant is released, fire and explosion can still occur.

See copeland.com/flammable-refrigerants for more information on flammable refrigerant safety.

Electrical Hazards

Until a system is de-energized, and capacitors have been discharged, the system presents a risk of electric shock.

Hot Surface and Fire Hazards

While the system is energized, and for some time after it is deenergized, the compressor may be hot. Touching the compressor before it has cooled can result in severe burns. When brazing system components during service, the flames can cause severe burns and ignite nearby combustible materials.

Lifting Hazards

Certain system components may be very heavy. Improperly lifting system components or the compressor can result in serious personal injury. Use proper lifting techniques when moving.

POE Oil Hazards

This equipment contains polyol ester (POE) oils. Certain polymers (e.g., PVC/CPVC and polycarbonate) can be harmed if they come into contact with POE oils. If POE oil contacts bare skin, it may cause an allergic skin reaction.

Precautions

• Always wear personal protective equipment (gloves, eye protection, etc.).

• Keep a fire extinguisher at the jobsite at all times.

• Keep clear of the compressor when power is applied.

- IMMEDIATELY GET AWAY **if you hear unusual sounds in the compressor. They can indicate that terminal pin ejection may be imminent. This may sound like electrical arcing (sizzling, sputtering or popping). However, terminal venting may still occur even if you do not hear any unusual sounds.**

• Never reset a breaker or replace a blown fuse without performing appropriate electrical testing

- **A tripped breaker or blown fuse may indicate an electrical fault in the compressor. Energizing a compressor with an electrical fault can cause terminal venting. Perform checks to rule out an electrical fault.**

• Disconnect power and use lock-out/tag-out procedures before servicing.

- Before removing the terminal cover or molded plug, check that ALL electrical power is disconnected from the unit. Make sure that all power legs are open. (Note: The system may have more than one power supply.)

- Discharge capacitors for a minimum of two minutes

- Always use control of hazardous energy (lock-out/tag-out) procedures to ensure that power is not reconnected while the unit is being serviced.

• Allow time for the compressor to cool before servicing.

- Ensure that materials and wiring do not touch high temperature areas of the compressor.

• Keep all non-essential personnel away from the compressor during service.

• For A3 refrigerants (R290) remove refrigerant from both the high and low sides of the compressor. Use a recovery machine and cylinder designed for flammable refrigerants. Do not use standard recovery machines because they contain sources of ignition such as switches, high- and low-pressure controls and relays. Only vent the R290 refrigerant into the atmosphere if the system is in a well-ventilated area.

• Never use a torch to remove the compressor. Only tubing cutters should be used for both A2L and A3 refrigerants.

• Use an appropriate lifting device to install or remove the compressor.

• Never install a system and leave it unattended when it has no charge, a holding charge, or with the service valves closed without electrically locking out the system.

• Always wear appropriate safety glasses and gloves when brazing or unbrazing system components.

• Charge the system with only approved refrigerants and refrigeration oils.

• Keep POE oils away from certain polymers (e.g., PVC/CPVC and polycarbonate) and any other surface or material that might be harmed by POE oils. Proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. Handle POE oil with care. Refer to the Safety Data Sheet (SDS) for further details.

• Before energizing the system:

1. Securely fasten the protective terminal cover or molded plug to the compressor, and

2. Check that the compressor is properly grounded per the applicable system and compressor requirements.

Signal Word Definitions

The signal word explained below are used throughout the document to indicate safety messages.

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Introduction

Copeland™ outdoor refrigeration units provide the benefits of scroll compressor technology, coupled with advanced diagnostic controls, to ensure reliable performance and operation in foodservice applications. The outdoor units are available from 0.6 to 6HP for the 208/230V and 4.5 to 6HP for the 460V configuration. The 460V units are for medium temperature application only. All units come factory equipped with a heated and insulated receiver, service valves, pressure controls, defrost control, filter drier, moisture indicator, crankcase heater, variable speed condenser fan, Copeland compressor electronics technology, and two-way communications standard.

Apart from the fixed speed condensing units, Copeland outdoor refrigeration units are also available in a medium temperature digital offering. Units are available in 3 – 6 HP. All units are 208/230 volts and are available in three phase - while there is a single-phase version of the 3 HP and 5 HP models. For further theory of operation with regards to digital compressor operation, see AE21-1319. For the latest update of this bulletin, visit the online product information (OPI) site: webapps.copeland.com/online-product-information.

An integrated electronic control module (Dixell XCM25D) provides operation, protection, and diagnostic features for the unit. The Dixell XCM25D Electronic Control Module with Copeland compressor electronics technology provides many benefits to the contractor and end-user. It is designed specifically for demanding refrigeration applications to ensure simple installation and precision operation. While the control module replaces mechanical adjustable low-pressure controls, fan cycle switches and other relays, it also has additional features. These features include bump start, data storage, communication, and short cycling protection.

1 Disabled Features (460V units only)

Certain features are disabled in the XCM25D on the 080BOM versions of the 460V models.

- o Overcurrent protection
- o Under / Over voltage protection
- o Phase imbalance
- o Incorrect phase
- o Sequence protection
- o Loss of phase

2 Inspection

Inspect unit for shipping damage. Immediately report any damage to the carrier. Check the unit nameplate to verify that the model number is correct for the application. Read all compressor and condensing unit warning labels.

3 Installation

A qualified refrigeration technician must install this system.

Table 1 - Specifications

	208/230V units	460V units
Supply Voltage	187-253 VAC	414-506 VAC
Sound Level	53-55 dBa (single fan) 58-59 dBa (Dual fan)	53-55 dBa (single fan) 58-59 dBa (Dual fan)

X	F	A	M	-	020	Z	-	TFC	-	080 / 081
X=Outdoor	F= Multi Refrigerant	A=Air Cooled	L= Low Temp M=Med Temp P=Multi		Nominal HP 008 = ¾ HP 015 = 1.5 HP 060 = 6 HP	Z = Scroll Compressor D = Digital Scroll		CFV=208/230V 1ph 60Hz TFC=208/230V 3ph 60Hz TFD=460V 3Ph 60Hz		Bill of Material
Base Model								Electrical		BOM

Table 2 Nomenclature

3.1.1 Mounting Location

This unit can mount on the ground, roof, or on a wall. For ground mounting, place the unit on a level solid concrete slab with rubber strips between the feet and concrete, or on a suitable raised support structure (PN 074-7289-00).

For wall mounting, use a wall bracket system designed for mounting condensing units (PN 074-7286-00) or universal metal framing strut and follow the manufacturer's instructions. Follow local zoning and building codes for all mounting options.

Maintain 8 inches clearance on the unit's left and rear sides for air intake. Maintain 20 inches clearance on the unit's right, top and front panels for airflow and service access (See Figure 2). Ensure that discharge air from one unit does not circulate to another unit.

3.1.2 Piping

Pipes must be sized for proper performance, and oil return. Follow ASHRAE guidelines for proper piping practices.

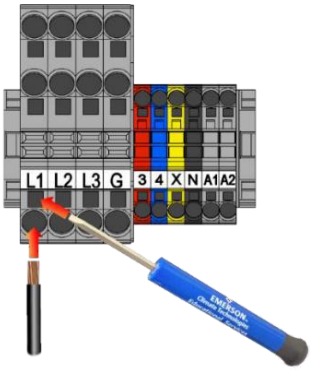
3.2 Electrical Connections

These units use spring cage type terminals for all electrical connections. Field power connections are labeled L1, L2, L3 (on three-phase only), and G (ground). Defrost connections are labeled 3, 4, X, and N to match labeling on most unit coolers. Terminals will accept up to #8 AWG wire for main power and #10 AWG for defrost connections. Wire sizes must be suitable for the Minimum Circuit Ampacity (MCA) of the unit. See Table 3 for MCA values of each unit.

Strip wire insulation back to expose ½ inch bare wire. Firmly insert a small screwdriver into the square opening to open the spring cage. Insert the wire into the round opening and remove the screwdriver (see Figure 1 - Electrical Connections).

The 460V units has a two 3 ampere slow blow fuses (PN 071-0435-14) in line with the step-down transformer. If fuse(s) opens, the unit will not run and the XCM25D controller will be off.

Figure 1 Field Electrical connection



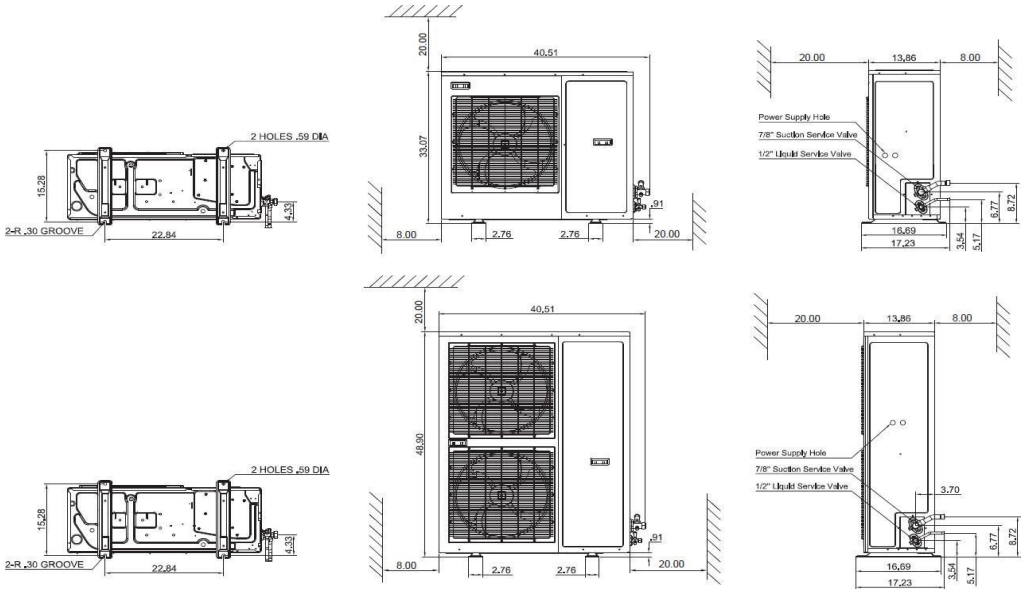


Figure 2 Unit dimensions and clearance Requirement

Table 3 Electrical Data and Receiver Volume

Unit Model	Compressor Electrical	Chassis Size	Length (in)	Width (in)	Height (in)	Refrigerant Connections		Receiver Capacity (lbs @ 90% Volume)							DLT Protection	MCA	Max. Over Current	Defrost Relay Rating†	Ship Weight
						Liquid	Suction	R-134a	R-22	R-404A	R-407A	R-407C	R-448A	R-449A					
XFAM-030D-TFC	ZBD21KCE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	LI	16.8	25	30	240
XFAM-030D-CFV	ZBD21KCE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	LI	24.7	40	30	240
XFAM-040D-TFC	ZBD30KCE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	LI	21.7	35	30	285
XFAM-050D-TFC	ZBD38KCE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	LI	31.7	50	30	285
XFAM-050D-CFV	ZBD38KCE-PFV	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	LI	45	70	30	295
XFAM-060D-TFC	ZBD45KCE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	LI	30.2	50	30	300
XFAL-008Z-CFV	ZF03KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	9.1	15	30	246
XFAL-008Z-TFC	ZF03KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	6.2	15	30	246
XFAL-009Z-CFV	ZF04KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	10.3	15	30	246
XFAL-009Z-TFC	ZF04KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	9.3	15	30	246
XFAL-010Z-CFV	ZF05KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	11.9	15	30	246
XFAL-010Z-TFC	ZF05KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	10.4	15	30	246
XFAL-012Z-CFV	ZF07KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	18.4	30	30	246
XFAL-012Z-TFC	ZF07KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	DTC	11.8	15	30	246
XFAL-020Z-CFV	ZXI06KCE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	EVI	21.55	35	30	246
XFAL-020Z-TFC	ZXI06KCE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	EVI	16.18	25	30	246
XFAL-030Z-TFC	ZXI09KCE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	EVI	17.18	25	30	246
XFAL-035Z-CFV	ZXI11KCE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	EVI	34.05	50	30	272
XFAL-035Z-TFC	ZXI11KCE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	N/A	N/A	9.1	10	10	9.7	9.7	EVI	34.05	50	30	272
XFAL-040Z-CFV	ZXI14KCE-PFV	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	EVI	40.1	60	30	274
XFAL-040Z-TFC	ZXI14KCE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	EVI	27.1	45	30	312
XFAL-050Z-TFC	ZXI15KCE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	EVI	28.85	45	30	323
XFAL-051Z-CFV	ZXI16KCE-PFV	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	EVI	44.73	70	30	343
XFAL-060Z-TFC	ZXI18KCE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	N/A	N/A	13.4	14.8	14.7	14.2	14.3	EVI	33.98	50	30	341
XFAM-008Z-CFV	ZB06KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	9.3	15	30	218
XFAM-008Z-TFC	ZB06KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	8.05	15	30	218
XFAM-010Z-CFV	ZB07KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	9.3	15	30	218
XFAM-010Z-TFC	ZB07KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	8.1	15	30	218
XFAM-012Z-CFV	ZB08KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	11.1	15	30	218
XFAM-012Z-TFC	ZB08KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	8.1	15	30	218
XFAM-015Z-CFV	ZS09KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	13.55	20	30	218
XFAM-015Z-TFC	ZS09KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	11.05	15	30	219
XFAM-017Z-CFV	ZS11KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	16.8	25	30	219
XFAM-017Z-TFC	ZS11KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	14.05	20	30	219
XFAM-020Z-CFV	ZS13KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	16.1	25	30	219
XFAM-020Z-TFC	ZS13KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	13.2	20	30	219
XFAM-022Z-CFV	ZS15KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	20.68	35	30	220
XFAM-022Z-TFC	ZS15KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	14.3	20	30	219
XFAM-025Z-CFV	ZS19KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	23.6	40	30	219
XFAM-025Z-TFC	ZS19KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	18.2	30	30	219
XFAM-030Z-CFV	ZS21KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	30.05	50	30	236
XFAM-030Z-TFC	ZS21KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	20.05	30	30	236
XFAM-033Z-CFV	ZS26KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	30.6	50	30	236
XFAM-033Z-TFC	ZS26KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	20.4	30	30	236
XFAM-037Z-CFV	ZS29KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	33.7	50	30	236
XFAM-037Z-TFC	ZS29KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	26.7	45	30	236
XFAM-045Z-CFV	ZS33KAE-PFV	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	37.35	60	30	285
XFAM-045Z-TFC	ZS33KAE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	29.98	50	30	280
XFAM-050Z-CFV	ZS38K4E-PFV	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	41.85	70	30	292
XFAM-050Z-TFC	ZS38K4E-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	28.85	45	30	292
XFAM-060Z-TFC	ZS45K4E-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	31.98	50	30	299
XFAP-015Z-CFV	ZS09KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	13.55	20	30	233
XFAP-015Z-TFC	ZS09KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	11.05	15	30	234
XFAP-017Z-CFV	ZS11KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	16.8	25	30	234
XFAP-017Z-TFC	ZS11KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	14.05	20	30	234
XFAP-020Z-CFV	ZS13KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	16.1	25	30	234
XFAP-020Z-TFC	ZS13KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	13.2	20	30	234
XFAP-022Z-CFV	ZS15KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	20.68	35	30	235
XFAP-022Z-TFC	ZS15KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	14.3	20	30	234
XFAP-025Z-CFV	ZS19KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	23.6	40	30	234
XFAP-025Z-TFC	ZS19KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	18.2	30	30	234
XFAP-030Z-CFV	ZS21KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	30.05	50	30	251
XFAP-030Z-TFC	ZS21KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	20.05	30	30	251
XFAP-033Z-CFV	ZS26KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	30.6	50	30	251
XFAP-033Z-TFC	ZS26KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	20.4	30	30	251
XFAP-037Z-CFV	ZS29KAE-PFV	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	33.7	50	30	251
XFAP-037Z-TFC	ZS29KAE-TF5	1 FAN	16.7	40.5	33.1	1/2 S	7/8 S	10.7	10.5	9.1	10	10	9.7	9.7	LI	26.7	45	30	251
XFAP-045Z-CFV	ZS33KAE-PFV	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	37.35	60	30	300
XFAP-045Z-TFC	ZS33KAE-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	29.98	50	30	295
XFAP-050Z-CFV	ZS38K4E-PFV	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	41.85	70	30	307
XFAP-050Z-TFC	ZS38K4E-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	28.85	45	30	307
XFAP-060Z-TFC	ZS45K4E-TF5	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	31.98	50	30	314
XFAM-045Z-TFD	ZS33KAE-TFD	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	14.6	20	10	320
XFAM-050Z-TFD	ZS38K4E-TFD	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	14.1	20	10	345
XFAM-060Z-TFD	ZS45K4E-TFD	2 FAN	16.7	40.5	48.9	1/2 S	7/8 S	15.7	15.5	13.4	14.8	14.7	14.2	14.3	LI	13.7	20	10	353

** Max Over-current rating applies to the condensing unit only. Additional evaporator fan or defrost heater loads must be considered. See evaporator manufacturer literature for additional load requirements.

*** Defrost relay rated to 40 amps (normally open) for the 208/230V units and 10 amps for the 460V units. Terminal block capable of handling defrost heaters up to 30 Amps

† Defrost relay for single phase heaters only. For three-phase heaters, additional contactors are required.

3.3 Evaporator Connections and Considerations

The X-Line unit can connect with any electric defrost or air defrost evaporator. Most evaporators will connect to the X-Line unit using the typical wiring of any other unit. Some newer evaporators with built in electronic controls may require some adjustments to parameter settings to avoid conflicts or false alarms. Evaporators with stand- alone power and controls do not need any connection to the X-Line unit. The unit will cycle based on suction pressure cut-in/cut-out.

If a situation occurs non-standard of a typical evaporator installation that could possibly require a communication link to the X-line unit, contact the evaporator manufacturer for additional information in order to disable that requirement.

3.3.1 Evaporators with Built-in Time Delay

Evaporators with a built-in time delay may conflict with the time-delay setting of the X-Line unit. To avoid conflicts, adjust parameter 2oF on the X-Line to a time that is less than the time delay setting in the evaporator. Check with the evaporator manufacturer for information on the evaporator time delay setting.

3.3.2 Evaporators with Built-in Defrost Controls

The connected evaporator has built-in defrost control, or if a third party defrost control is used, set the defrost mode on the X-Line unit (Parameter EdF) to nV (off).

3.3.3 Evaporators with Electronic Expansion Valves (EXV)

If the evaporator has an electronic expansion valve and control, additional energy savings are possible by adjusting the minimum condensing temperature (Parameter MC5) of the X-Line unit. See Section 4.2.7 Low condensing operation on pg. 18.

3.3.4 Superheat Requirements

In order to assure that liquid refrigerant does not return to the compressor during the running cycle, attention must be given to maintaining proper superheat at the compressor suction inlet. Copeland recommends a minimum of 20°F (11°C) superheat, measured on the suction line 6 inches (152mm) from the suction valve, to prevent liquid refrigerant floodback.

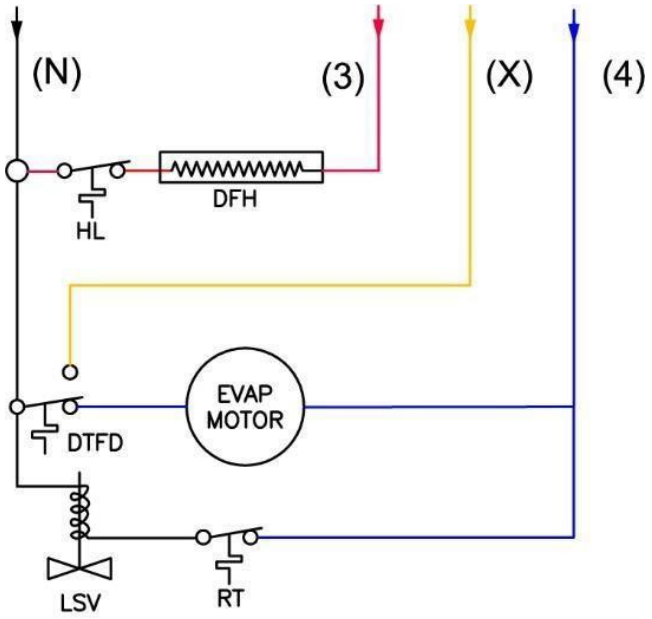


Figure 3 Typical Unit Cooler

Table 4 Refrigerant Liquid Temperature Valve Capacity Multiplier Correction Factors

	Refrigerant Liquid Temperature Entering TXV														
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
R-22	1.56	1.51	1.45	1.40	1.34	1.29	1.23	1.17	1.12	1.06	1.00	0.94	0.88	0.82	0.76
R-404A	2.00	1.90	1.80	1.70	1.60	1.50	1.40	1.30	1.20	1.10	1.00	0.90	0.80	0.70	0.50
R-507	2.00	1.90	1.80	1.70	1.60	1.50	1.40	1.30	1.20	1.10	1.00	0.90	0.80	0.70	0.50
R-134a	1.70	1.63	1.56	1.49	1.42	1.36	1.29	1.21	1.14	1.07	1.00	0.93	0.85	0.78	0.71
R-407A	1.75	1.68	1.61	1.53	1.46	1.39	1.31	1.24	1.16	1.08	1.00	0.92	0.84	0.76	0.68
R-407C	1.69	1.62	1.55	1.49	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.93	0.86	0.79	0.72

These factors include corrections for liquid refrigerant density and net refrigerating effect and are based on an average evaporator temperature of 0°F. However, they may be used for any evaporator temperature from - 40°F to + 40°F since the variation in the actual factors across this range is insignificant.

3.4 Leak Check and Refrigerant Charging

Units are shipped with a dry air holding charge (11 lb.). Open the service valves to release the charge. Make sure the inside of copper tubes are clean before brazing line connections. Use a dry nitrogen bleed during brazing. Charging ports are provided on the liquid and suction service valves. Service valves should not be open to atmosphere longer than 15 minutes. Compressors with POE (polyolester) oil will quickly become contaminated when opened to atmosphere.

Pressurize the system to 185 PSIG with an approved pressure source to leak check. Use a leak detection solution or electronic leak detector following the manufacturer's directions.

Evacuate system, then charge with the desired refrigerant.

3.5 Initial Startup

Copeland outdoor refrigeration units are equipped with the latest in unit control and protection technology. When power is first applied, the unit will perform a series of diagnostic checks and protective actions.

3.5.1 Incorrect Phase Sequence Protection

On three-phase units, if an incorrect phase (L1, L2, L3) is detected, the control will prevent the compressor from starting and will display code L21. To correct, disconnect power and swap the L1 and L2 wires. The unit will start when power is reapplied.

3.5.2 Flooded start protection (Bump Start)

On initial startup, the compressor will cycle through a series of 3 short start and stops. The compressor will cycle on for 2 seconds, then off for 15 seconds. This process protects against flooded starts, and occurs any time power is lost and reapplied to the unit, or any time the unit is off for more than 4 hours and the ambient temperature is below 95°F.

3.5.3 Default Settings

The built-in control module comes factory set with default settings that allow the unit to run with commonly used settings (see Table 5 - Default Settings). No adjustments are needed during the initial startup and charging of the system. Adjustments can be made after the system is fully charged and operating.

Table 5 Default Settings

Variable	Default Setting
Refrigerant	Fixed Capacity: R-404A
	Digital: R-404A
Med. Temp. Suction Cut-In Pressure	25 psi
Digital Suction Pressure	31 psi
Med. Temp. Suction Cut-Out Pressure	15 psi
Low Temp. Suction Cut-In Pressure	20 psi
Low Temp. Suction Cut-Out Pressure	7 psi
Defrost Settings	Every 8 hours, 45-minute maximum duration

3.6 Main Settings

The default settings will allow the system to operate at a basic level. If R-404A refrigerant is used in the system, the unit can continue to operate with no additional settings adjustments. However, to take advantage of the on-board diagnostics, to optimize operation, or if a refrigerant other than R-404A is used, additional settings must be adjusted.

See **Appendix C** for a Quick Setup Guide.

3.6.1 How to Adjust Settings

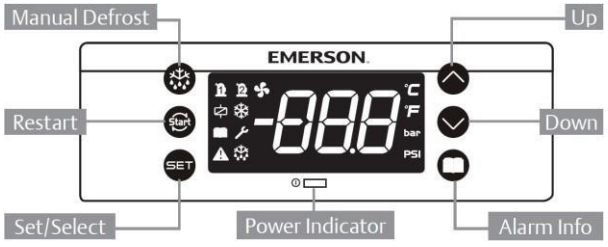


Figure 4 Buttons Functions

1. Hold “SET” and “Down” for 3 seconds to enter programing mode.
2. Use “Up” and “Down” to cycle through settings and adjust values.
3. Use “Set” to select and accept settings.
4. Hold “SET” and “Up” to exit programing mode or wait 60 seconds for programing mode to time out.

3.6.2 Real Time Clock

The real-time clock is used to time and date stamp all errors and alarms in the on-board data log. It also allows a time-of-day based defrost schedule and a holiday defrost schedule.

Figure 5 Real Time Clock

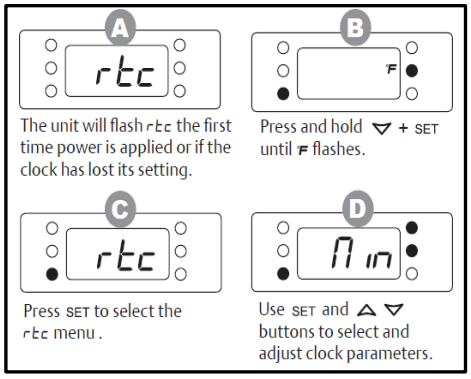


Table 6 Clock Parameters

Par.	Description	Value Range
Min	Minute	0 – 59
Hr	Hour	0 – 23
MdY	Day	1 –31
Mon	Month	1 –21
YEr	Year	0 –99

Scan to watch a video on how to set the clock.

3.6.3 Low Ambient, Low Pressure Control Operations

In the event if extreme low ambient conditions are present, there is an adjustment which is available in the advanced options menu to adjust the low-pressure control minimum on time as well as initiation temperature. See Parameter menu in Section 4.2.6, Pg. 18

3.6.4 Refrigerant and Pressure Control Settings

The correct refrigerant must be set to match what is installed in the system. This setting adjusts the values the control uses to decide if the unit is operating correctly and within set limits. Failure to set the refrigerant to match the refrigerant used can result in inefficient operation, and false alarms. The pressure control cut-in and cut-out set points should also be set for the specific application.

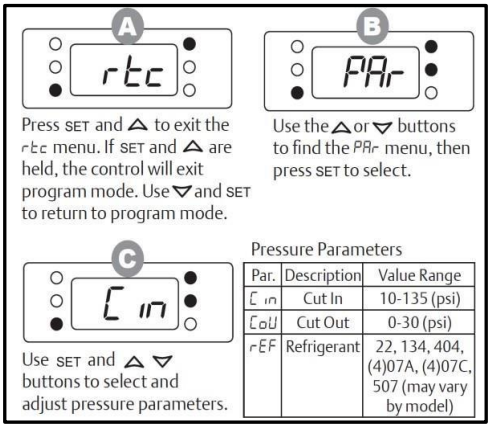


Figure 6 Pressure Controls Settings

Table 7 Refrigerant List

Refrigerant	rEF Display
R-404A	404
R-507	507
R-134A	134
R-22	r22
R-407C	07C
R-407A	07A
R-407F	07F
R-448A	48A
R-449A	49A

Scan to watch a video on how to set the setpoints. Minute 8:40.

3.6.5 Defrost Mode Selection

The control module is capable of direct control of air defrost or electric defrost on single phase evaporators with up to 10-amp heaters for the 460V units and 30- amp heaters for the 230V units. An additional contactor is required for use with three phase heaters. If the connected evaporator has built-in defrost control, or if a third party defrost control is used, set the defrost mode (EdF) to nv (off).

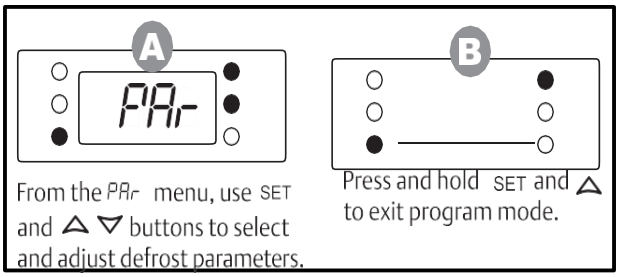


Figure 7 Defrost Setting

Table 8 Defrost Parameters

Par.	Description	Value Range
idF	Interval between defrost	0-120 (hours)
MdF	Max duration	0-255 (minutes)
EdF	Defrost mode	nv(off), in(interval), rtc (clock)
Id1	1st start time	nv (not used), 0-23:50
Id2	2nd start time	
Id3	3rd start time	
Id4	4th start time	
Id5	5th start time	
Id6	6th start time	

Scan to watch a video on how to set the defrost mode.

3.7 Advance Settings

Several optional settings are provided to allow customization for specific application needs.

To access the advanced settings, select the PA5 (password) parameter from the PAr menu. Enter code “321” using the “Up” and “Down” buttons to adjust the value, and the “Set” button to accept the value.

3.7.1 Auto / Manual Restart

Compressor lockouts activate when conditions cause repeated compressor shutdowns. Default settings allow either 4 or 5 auto restarts (depending on cause). These settings can be changed to disable auto restarts, disable lockouts, or change the number of shutdowns allowed before a lockout occurs. The compressor safety and compressor protection sections of Table 15 shows the lockout parameters that can be adjusted.

3.7.2 Anti-short cycle control

A minimum compressor off time is set to 120 seconds to prevent short-cycling and protect against compressor reverse rotation that can result from brief power interruptions on single phase systems. Some newer evaporator controls also include short-cycle protection. To avoid potential conflicts between two controls, the minimum compressor off time can be adjusted by changing parameter 2oF. Changing the value to 20 seconds will avoid conflicts with evaporator controls.

4.Use and Operation

4.1 User Interface

The controller display is shown below along with the function of each light. The controller displays the current suction pressure to three digits in pounds per square inch gage (psig). The controller uses a 7-segment display for digits and the following alpha characters:

The 7-segment alphabet and Roman equivalent:

A	B	C	D	E	F	H	I	L	M	N	O	P	Q	R	S	T	U	y	0	1	2	3	4	5	6	7	8	9
A	B	C	D	E	F	H	I	L	M	n	o	P	q	r	S	T	U	Y	0	1	2	3	4	5	6	7	8	9

Figure 8 Unit Display

Table 9 LED Functions

LED	MODE	FUNCTION
	ON	Compressor enabled
	Flashing	Anti-short cycle delay enabled
	ON	Condensing fans enabled
	ON	Display temperature value in degrees F
	Flashing	Programming mode
	ON	Display pressure value in PSI
	ON	Browsing service menu
	Flashing	Fast access menu (Viewing set points and measured values)
	ON	Browsing the alarm menu
	Flashing	New alarm occurred
	ON	An alarm is occurring
	ON	In defrost or evap fan drip time when ON
	ON	Evaporator fans enabled

4.1.1 Button Descriptions

	(SET) Select a parameter or confirm an operation when in programming mode.
	(RESTART) Hold for 5 seconds to reset any lockouts if the current state of the controller allows for reset. Allows a manual restart and a “dead band reset”.
	(UP) View current measured values (Fast Access Menu); in programming mode or any menu to browse the parameter codes or increase the displayed value.
	(DOWN) in programming mode or any menu to browse the parameter codes or decrease the displayed value.
	(SERVICE) To enter the service and alarm menu.
	**Hold for 3 seconds to start a manual defrost**
	Press and hold for about 3 sec to lock (PoF) or unlock (pon) the keyboard.
	Press together to exit from programming mode or from menu; on submenus to return to previous level.
	Press together for 3 sec to access to first level of programming mode.

4.1.2 Changing a Parameter Value

To change a parameter value:

1. Hold down SET + ▽ keys for 3 seconds or until the 'F' LED starts blinking to enter the module’s programming menu.
2. Use △ or ▽ to select the rtC or PAr menu
3. Press SET to enter the menu.
4. Use △ or ▽ to select the required parameter.
5. Press the SET key to display its value.
6. Use △ or ▽ to change its value.
7. Press SET to store the new value.

TO EXIT: Press SET + △ or wait 60 seconds without pressing a key.

NOTE: The set value is stored even when the procedure is exited by waiting for the time-out to expire.

NOTE: If a menu does not have any parameters available, noP will be displayed.

4.1.3 Entering the Advanced Options Menu

1. Hold down SET + ▽ keys for 3 seconds or until the F LED starts blinking to enter the module’s programming menu.
2. Use △ or ▽ to select the PAr menu
3. Press SET to enter the menu
4. Use △ or ▽ to select the PA5 parameter
5. Press SET to select PA5
6. The blinking PA5 label will be showed for a few seconds
7. Will be showed 0 — — with blinking 0: insert the password [321] using the keys UP and DOWN and confirming with SET key.

4.1.4 Moving Parameters Between the Programming Menu and the Advanced Options Menu

While in the advanced options menu, certain parameters will have a (. period) in between the 2nd and 3rd character, for example Ci.n. These parameters are in the Programming Menu as well as the Advanced Options Menu.

To add or remove a parameter from the programming menu, press the SET + ▽ keys together while the parameter name is on the display in the advanced options menu. The (. period) between the 2nd and 3rd parameter will either be added or removed.

TO EXIT: Press SET + △ or wait 60 seconds without pressing the keys.

4.1.5 Locking the Keypad

Press the △ + ▽ keys for 3 seconds.

The POF message will be displayed and the keyboard will be locked. The Fast Access Menu will remain accessible while the keyboard is locked.

If a key is pressed more than 3 seconds the POF message will be displayed.

4.1.6 Unlocking the Keypad

Press the △ + ▽ keys for 3 seconds until the POn message is displayed.

4.1.7 Fast Access Menu

This menu allows viewing measured values from various probes and view some outputs resulting from these measurements. The values nP or noP stand for probe not present or value not evaluated. E rr means the value is out of range, probe is damaged, not connected, or incorrectly configured.

Press the △ to enter the Fast Access Menu.

Use up or down arrows to select an entry, then press set to see the value or to go on with other value.

TO EXIT: Press or wait 60 seconds without pressing the keys.

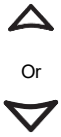
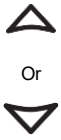
Table 10 List of Fast Access Parameters

P1P	P1P	Suction pressure
P2t	P2t	Condenser temperature
P2P	P2P	Discharge Line Pressure
P3t	P3t	Discharge line temperature
P4t	P4t	EVI heat exchanger vapor inlet temperature (XFAL 2HP-6HP only)
P5t	PSt	EVI heat exchanger vapor outlet temperature (XFAL 2HP-6HP only)
P5t	P6t	Ambient temperature
P7t	P7t	Liquid line temperature (XFAL 2HP-6HP only)
5H	5H	Not used
oPP	oPP	Percentage of liquid injection (XFAP/XFAM) or vapor injection (XFAL 2HP-6HP) valve opening.
LL5	LLS	Not used
5td	Std	Current condenser temperature target for fan speed control
A00	A00	Fan speed percent
d5o	d5o	Not used
Lt	L t	Not used
Ht	H t	Not used
tU1	tU1	Line voltage (1-phase)
tU2	tU2	Line voltage (3-phase)
tU3	tU3	Line voltage (3-phase)
tA1	tA1	Current (1-phase)
tA2	tA2	Current (3-phase)
tA3	tA3	Current (3-phase)
Hm	HM	Menu

4.1.8 Alarm Menu

The controller time-stamps and stores the last 50 alarms. See Section 11 for alarm codes.

Table 11 Alarm Button Functions

Action	Button	Notes
Enter alarm menu		Push and release alarm key (Displays SEC when alarm menu is active)
Enter alarm list	SET	Press SET to confirm
Scroll through active and recorded alarm list		Scroll the list of alarms and see the list of active alarms with the number of the alarm (Letter + Number, A01- A50). Push Down key and see the alarm Name or Code. Push Down key and see the next active alarm
Select the alarm to see the date and time	SET	Enter the sub menu with alarm time details
Scroll through alarm information data		Successive presses of the down arrow button will display the clock data label (hour, minute, day, month, year) followed by the value of the preceding label. The up arrow will reverse this order and show the value followed by the label. The displayed values record the start time of an alarm.
Exit menu	SET + 	Press SET and UP together or wait about 10 seconds.

4.1.9 How to Program a HOT-KEY from the Controller (UPLOAD TO OVERWRITE HOT-KEY)

Caution: Overwrites hot key. When the controller is ON, insert the HOT-KEY into the 5-PIN receptacle (labeled H-K) and push the  button; the UPL message appears followed a by a flashing End label.

Push SET button and the End will stop flashing.

Turn OFF the controller, remove the HOT-KEY and then turn the controller ON again.

NOTE: the Err message appears in case of a failed programming operation. In this case push the  again if you want to restart the upload again or remove the HOT-KEY to abort the operation.

4.1.10 How to Program a Controller Using a HOT-KEY (Download)

A hot key is included with each unit for factory reset and replacement control programming. Remove power from the unit.

Insert a pre-programmed HOT-KEY into the 5-PIN receptacle (labeled H-K) and reapply power to the unit.

The parameter list of the HOT-KEY will be automatically downloaded into the controller memory. The doL message will blink followed by a flashing End label.

After 10 seconds the controller will restart and begin working with the new parameters.

Remove the HOT-KEY

NOTE: The message Err is displayed for failed programming. In this case turn the unit off and then on if you want to restart the download again or remove the HOT-KEY to abort the operation

4.2 Condensing Unit Operational Control

4.2.1 System Operation

4.2.1.1 Liquid Line Solenoid Control

By default, the unit assumes that a liquid line solenoid is used to pump down the system during a defrost. When the unit enters a defrost, the evaporator power (Connection 3 on the terminal strip) will turn off, turning off the liquid line solenoid as well. The unit will then run until the suction pressure drops below the cut- out value, then turn off the compressor. When the defrost is complete, the unit will apply power to the evaporator, opening the solenoid and the compressor will start running once the suction pressure is above the cut in.

If a pump down solenoid is not present or the unit should not pump down when entering a defrost, parameter tl5 should be set to no. tl5 is set to YE5 by default.

4.2.1.2 Door Switch/Thermostat Control

Kit Number 929-0220-16 can be used to connect to the device. Digital Input 3 (DI3 on the XCM25D) can be used as a door switch or a thermostatic On-Off control. In order to use DI3 for this purpose, technician must enter the Advanced Options Menu and adjust parameter i3P to OP. For instructions on adjusting this parameter, please see the sections on "**Entering the Advanced Options Menu**" and "**Changing a Parameter Value**" in this bulletin. After this occurs, condensing Unit will run when Switch/Thermostat is in the closed position and will be Off when the switch/Thermostat is open.

Please, note there is a warning (E66) programed into the XCM25D if the door is open or thermostat does not call for cooling for longer than 255 consecutive minutes

4.2.2 Unit Functions

The X-Line control module operates the condensing unit and ensures the system remains in correct operating conditions. It controls the follow items:

- Compressor
- Condenser Fan Motor(s)
- Crank Case Heater
- Receiver Heater
- Defrost Heater (If connected)

The X-line Unit will protect the system from the following fault conditions (See Sections 6.23 through 6.31 for further details):

Discharge Line Temperature Protection

Over-Current Protection

Incorrect Phase Sequence Protection (3 Phase Only)

Loss of Phase Protection - Current (3 Phase Only) Open

Run Circuit (Single Phase Only)

Open Start Circuit (Single Phase Only)

Over/ Under Voltage Protection

Phase Imbalance (3 Phase Only)

Compressor Internal Thermal Protection

Fixed High Pressure Control

In addition, the X-Line unit has protection features that will prevent it from reaching a fault condition. For example, when the low temperature unit experiences an extremely hot day, the control module decides to switch from vapor-injection-optimization to discharge gas temperature control to allow the compressor to run safely and pass the extreme weather hours.

4.2.3 Controller Startup

At initial power up, the controller display will display the following information:

- All LEDs will light up for approximately 2 seconds.
- For 3 seconds, the controller will display the firmware version (EX: 1.0, 1.1, etc.)
- For three seconds the controller will display the program number (EX: 100, 101, 200, etc.)

The controller will then wait 6 seconds before turning on the compressor or any other device.

Once the controller calls for the compressor to run and there are no active alarms, the controller will then turn on the compressor utilizing bump start (if needed per Section 6.15) and control the fans and compressor.

4.2.4 Bump Start Control Operation

If the ambient temperature sensor reads less than 95°F when the controller is first turned on or after the compressor has been off for 4 hours and now is being turned on, the compressor will initiate a bump start. If the ambient temperature sensor is not functioning, the mid-coil temperature sensor will determine if the unit will initiate a bump start or not.

The compressor and fans will run for 2 seconds then turn off for 15 seconds three times. Once this sequence is completed, the unit resumes normal operation.

The crank case heater will remain off during the bump start sequence.

If liquid injection, vapor injection, or a system EXV is present, the stepper valve will remain closed until the bump start has finished.

In the event of a power loss, the controller can be programmed to enter a defrost at power up if dPo is set to YE5. It is turned off by default but is adjustable from the advanced options menu.

4.2.5 Compressor Stop Program

When the compressor needs to turn off, either based on an error or loss of demand, the following items will occur:

- Liquid or Vapor Injection Only: If a non-error shutdown occurs, compressor runs for 5 seconds before turning off to allow the liquid of vapor injection valves to fully close.
- Compressor turns off
- Condenser fans turn off

Crankcase heater turned on (See **Section 4.3.2**)

NOTE: During the pump down process with the 5 second delay the compressor may run down into a vacuum. There are no reliability issues in this application.

4.2.6 Low Ambient Operation

X-Line Outdoor Condensing Units include features designed for operation at low ambient temperatures as standard equipment. The units come factory supplied with components such as heated and insulated receivers, a check valve installed between the outlet of the condenser and the inlet of the receiver, a pressure relief valve installed on the unit receiver, as well as an adjustable low-pressure control time delay. However, proper overall system design is required to ensure proper starting and operation at low ambient temperatures. Different approaches for proper low- ambient, cold weather control may be acceptable if properly applied. Factors such as system size, type of application, severity of expected weather conditions and unit location must be taken into consideration.

The unit will automatically adjust condenser fan speed to maintain head pressure. At extremely low ambient temperature the condenser fan might not run, but the condenser coil is still discharging heat. Parameter LA5 sets the ambient temperature required to initiate low pressure control bypass time delay. The default value is

-20°F. Parameter LM0 sets the low ambient minimum on time. The default value is 6 seconds. Below -20°F ambient, when the condensing unit starts it will run for a minimum of 6 seconds even if the suction pressure drops below the cut-out set point.

4.2.7 Low Condensing Operation

NOTICE

To fully utilize low condensing options below 70°F condensing, an electronic expansion valve (EXV) is normally required to handle the larger variation in mass flows. As a result, the unit is shipped with a default minimum condensing override value of 70°F (80°F for XFAL). The fans will still follow the map of the selected refrigerant, but the map will not be allowed to run below the override value. If a system EXV is installed, the minimum condensing value can be adjusted by changing the parameter MCS/MC5 in the advanced options menu.

4.3 Component Controls

4.3.1 Suction Pressure Control

The compressor is operated based on the suction pressure cut-in (C in) and cut-out (CoV). If the suction pressure rises above the cut-in, the compressor is turned on using the startup procedure (See Section 4.2.3). If the suction pressure then falls below the cut- out, it turns the

compressor off using the shutdown procedure (See Section 4.2.5).

The compressor remains off for a minimum 120 seconds (2oF) after shutdown, which is adjustable in the advanced options menu (See Section 3.7).

If the suction pressure transducer fails, the compressor will run in limp along mode. The compressor will stay off for 3 minutes (Cof) then run for 3 minutes (Con). These values are adjustable from the advanced options menu (See Section 3.7).

The cut-in and cut-out settings are adjustable between 0 PSIG and 135 PSIG.

IMPORTANT: At initial power up, depending on the suction pressure transducer, the suction pressure could be higher than the rating of the transducer. For 15 minutes after power up, any over pressure errors generated by the suction pressure transducer should be ignored, and the display will flash 135. If the transducer is still in an error state after the time has expired, the control will alarm that the suction pressure transducer signal is lost and go into limp along mode.

4.3.2 Crankcase Heater

The crankcase heater is energized when the ambient temperature is below 50°F and the compressor is off. If an ambient sensor fails, the crankcase heater is energized when the compressor is off.

4.3.3 Fan Control

The X-Line uses variable speed PSC condenser fan motors to maintain the head pressure values that allow the system to operate within the compressor operating envelope and maintain the minimum pressure differential across the expansion device to allow it to operate properly.

The controller uses a Proportional-Integral (PI) control algorithm to determine the fan speed. The fans will not run any slower than 40% before turning off. When a fan first turns on it will run for 3 seconds at full speed before it begins modulating. Fans will run for at least 10 seconds before turning off and stay off for at least 10 seconds before being turned back on.

Since the X-Line controller knows the current suction pressure, the controller can determine the minimum condensing point for the condition the unit is actually running and will adjust the fan control set point to maintain that temperature or higher.

The XFAP/XFAM and XFAL models have different compressors and different refrigerant options. Therefore, during commissioning, it is important to identify the selected refrigerant, so the controller will operate the fans properly

4.3.4 Fan Overrides and Error Handling

If the discharge line temperature is above 205°F the fans will run at full speed.

If the condenser mid-coil temperature sensor fails, the fan speed is determined by outdoor ambient. If both the outdoor ambient sensor and the condenser mid-coil temperature sensor fail, all fans will run at full speed.

4.3.5 Defrost Functionality

The control module is capable of direct control of air defrost or electric defrost on single phase evaporators with up to 10-amp heaters for the 460V units and 30- amp heaters for the 230V units. An additional contactor is required for use with three phase heaters. Default settings are set to initiate a defrost every 8 hours with a maximum duration of 45 minutes. During a defrost the controller will display `dEF`.

To manually initiate a defrost, press and hold the defrost button for 3 seconds. The controller will terminate defrost after 45 minutes `MdF` (`Pr1` parameter) or after the defrost termination input (Terminal 'X') is closed.

The defrost control can also operate on a time-of-day schedule (rtc) or disabled if needed (`nV`). Parameters `Ld1` through `Ld6` control the times when defrosts will initiate when using the `rtc` mode.

Defrost Parameter are depicted in **Table 8 - Defrost Parameters.**

Figure 9 Defrost Button Position

4.3.5.1 Holiday Defrosts

If you are using real time clock mode (rtc), holiday defrosts can be set in the advanced options menu. To set a holiday, change Hd1 from nV to whatever day of the week you would like to have a different defrost schedule. (An example would be if a store is closed on Sundays and needs less defrosts). You can set a second holiday by changing Hd2. The defrosts for the set holidays are controlled by parameters 5d1 through 5d6.

4.3.6 Enhanced Vapor Injection (EVI) For Low Temperature Units (2HP-6HP)

The injection valve is a key part of the EVI system. It regulates vapor injection flow to optimize the performance of system and cool the scroll set. When the compressor first calls for power, the injection valve opens a preset amount before the compressor turns on. After startup, the EVI injection valve is controlled using a proportional-integral (PI) algorithm to control the differential between the vapor inlet temperature and the vapor outlet temperature. The differential is 18°F for all approved refrigerants. The PI algorithm for the EVI injection valve control is auto-adaptive, so it does not need to be adjusted.

4.3.6.1 Low Temp EVI Discharge Line. Temperature Protection Mode (2HP-6HP)

If during normal operation the DLT temperature reaches 225°F the control changes to act as a liquid injection valve to control the DLT temperature. Once the DLT temperature falls below 200°F, normal vapor injection control resumes.

If the discharge temperature goes above 250°F, the compressor trips off and the control displays an E44 error. The compressor cannot turn back on until the temperature drops below 170°F and has been off for 3 minutes.

If the compressor trips more than 4 times per hour (dLn), the controller will lock out the compressor, requiring a manual reset or the controller power to be reset. The controller will display L44 showing the compressor has tripped on high DLT and locked out. If parameter dLn, which is available in the advanced options menu, is set to 0, the unit will always automatically reset.

4.3.6.2 Low Temp EVI (2HP-6HP) Discharge Line Temperature Protection Error Handling

In case of DLT failure, the injection valve operates based on the mid coil and ambient sensor.

If the DLT sensor fails and a mid-coil temperature sensor is available, the injection valve will be opened based on the mid coil temperature. If the mid coil sensor fails in addition to the DLT sensor, the injection valve is controlled by the ambient temperature.

4.3.6.3 EVI System Checks (XFAL 2HP-6 HP units only)

An E47 warning code means that the injection valve has been fully open longer than 3 minutes. An E48 warning code means that the temperature difference across the EVI heat exchanger is higher than expected for 3 minutes. These are only warnings but are likely due to loss of refrigerant charge or undercharge.

4.3.6.4 Constant Liquid Temperature Mode. For Low Ambient EVI Injection (2HP-6HP)

Subcooling is generally good, but liquid refrigerant that is too cold can create sizing problems for TXVs. If the ambient is below 30°F, discharge temperature is generally well under control and so the controller disables vapor injection to operate in constant liquid temperature mode. The low ambient temperature will generate enough subcooling for the system without the need for injection. Copeland recommends a balanced port TXV (or EXV) for low ambient operation.

4.3.6.5 Low Temperature Units with EVI TXV Selection

For use with 2HP-6HP XFAL models, Copeland recommends a balanced port TXV because it offers a wider operating range for floating liquid temperatures. In addition, the unit liquid line should be insulated since the liquid line temperature will be lower than the ambient temperature.

See Table 4 on page 10 for specifics regarding balanced port sizing recommendations. Applied with the low temp units it is recommended that a balanced port expansion valve be used along with a complete review of the distributor and nozzle (orifice) that is supplied with the evaporator coil being matched with the applicable condensing unit. Typically, nozzles are selected for

standard TXV sizing using 100°F liquid, with the low temperature X-Line units those typical selections could be grossly oversized. See Table 4 on page 10 for the liquid correction safety factors when selecting those components.

4.3.6.6 Low Temperature Units with DTC Protection

XFAL-008Z/009Z/010Z/012Z units apply the ZF**KAE low temperature compressor which are provided with an injection port that is used for liquid injection protection. The purpose of the DTC valve is to provide protection when required during approved operation of the units noted above.

For the liquid injection system to be effective, a minimum of 5°f subcooled liquid at the DTC inlet is required.

A discharge line thermostat is included in the system which is applied with in the XCM25D control circuit. In the event an issue occurs with the injection circuit, the thermostat attached to the compressor discharge line will signal the controller to shut down the system.

If the discharge temperature goes above 250°F, the compressor trips off and the control displays an E44 error. The compressor cannot turn back on until the temperature drops below 170°F and has been off for 3 minutes.

If the compressor trips more than 4 times per hour (dLn), the controller will lock out the compressor, requiring a manual reset or the controller power to be reset. The controller will display L44 showing the compressor has tripped on high DLT and locked out.

Insulating the liquid line is not necessary. Also, selection of a balanced port valve is not required, but be sure to follow manufacturers guidelines for proper valve selection.

4.3.7 Medium Temperature DLT Protection

Medium Temperature units have liquid injection through the suction line to prevent compressor overheat during extreme ambient operations. The liquid injection will keep discharge temperatures below 235°F.

If the discharge temperature goes above 255°F, the compressor trips and then the controller shows an E44 error. The compressor cannot turn back on until the discharge line temperature drops below 170°F and has been off for at least 3 minutes.

If the compressor trips more than 4 times in an hour (dLn) on DLT, the controller will lock out the compressor, requiring a manual reset or the controller power to be reset. The controller will display L44

showing the compressor has tripped on high DLT and is locked out. If parameter dLn, which is available in the advanced options menu, is set to 0, the unit will always automatically reset.

See Section 12 for 86k Thermistor probe resistance values. Discharge line sensor is 86k, all other temperature sensors on this unit are 10k.

4.3.7.1 Medium Temperature DLT Protection Error Handling

In case of DLT sensor failure, injection is determinedby the mid coil and ambient sensor.

If the DLT sensor fails and a mid-coil temperature sensor is available, the injection valve will be opened based on the mid coil temperature. If the mid coil sensor fails in addition to the DLT sensor, the injection is determined by the ambient temperature.

4.3.8 Low Temperature Small Scroll DLT Protection

The low temperature small scroll models are provided with an injection port that can be used for liquid injection.

Liquid injection is required when using the ZF*KAE scrolls for liquid injection operation, a discharge temperature control (DTC) valve must be applied.

The purpose of the DTC valve is to maintain safe internal operating temperatures.

If during normal operation the DLT temperature reaches 250°F +/- 5 degrees, the DTC valve will begin injection.

If the discharge temperature goes above 255°F, the compressor trips off and the control displays an E44 error. The compressor cannot turn back on until the temperature drops below 170°F and has been off for 3 minutes.

If the compressor trips more than 4 times per hour (dLn), the controller will lock out the compressor, requiring a manual reset or the controller power to be reset. The controller will display L44 showing the compressor has tripped on high DLT and locked out. If parameter dLn, which is available in the advanced options menu, is set to 0, the unit will always automatically reset.

4.3.9 Over-Current Protection

Current is measured using the two current transducers installed on the controller. If the current exceeds the compressor MCC, the controller will stop the compressor for 3 minutes and signal error E23. A separate parameter MC2 is available to allow adjust the maximum current value down, but not up, in the advanced options menu.To avoid any fault triggering during the compressor startup period caused by the high inrush current, current sensing in not processed by the controller until 6 seconds after compressor startup.

If the compressor trips more than 5 times in an hour (default) on high current, the controller will lock out the compressor and display an L23 lockout, requiring a manual reset or the controller power to be reset. If the parameter oCn, which is available in the advanced options menu, is set to 0, then the unit will always reset.

4.3.10 Incorrect Phase Sequence Protection (3 Phase Only)

The controller determines whether the sequence of three phase supply lines is proper or not. The voltage sensing terminals are connected to the 3-phase supply of the compressors. If an incorrect phase (L1, L2, and L3) is detected, the controller will trip compressor immediately and display an L21 lockout code. The compressor will not restart until the power to the unit is turned off and L1 and L2 are switched. The reset button will not work with this error.

4.3.11 Loss of Phase Protection - Current (3 Phase Only)

The unit controller detects whether all the three phase supplies are available. If a phase is missing, the controller will shut down the compressor and display an E20 error code and prevent the compressor from restarting for 3 minutes. If the unit is shut down more than 5 times in an hour (default), then unit will lock out and display an L20 lockout code. If the parameter (PEn) is set to 0, the unit will always automatically reset.

4.3.12 Open Run Circuit (Single Phase Only)

After the compressor is started and runs for 6 seconds, if the there is no run circuit current and the start current is still greater than 1 amp, the controller will display an E24 error for open run circuit and shut down the compressor. The compressor will not restart for 3 minutes in the event of a trip.

If the unit is shut down more than 5 times in an hour (oCn), then the unit locks out and display a L24 lockout code. If the parameter (oCn) is set to 0, the unit will always automatically reset.

4.3.13 Open Start Circuit (Single Phase Only)

Immediately after startup, if there is no start current for the first 500ms and the run current is greater than 1 amp, the controller will display an E25 error for open start circuit and shut down the compressor. The compressor will not restart for 3 minutes in the event of a trip. If the unit is shut down more than 5 times in an hour (oCn), then the units locks out and display an L25 lockout code. If the parameter (oCn) is set to 0, the unit will always automatically reset.

4.3.14 Over/ Under Voltage Protection

If the voltage drops below 10% of the minimum rated voltage or above 10% of the maximum rated voltage for 1 second, the controller will shut off the compressor and display an E26 (under voltage) or E27 (over voltage) error code until the voltage is back within acceptable range and the compressor has been off for 3 minutes (oCn).

If the compressor trips more than 5 times per hour (Default), the controller will lock out the compressor, requiring a manual reset or the controller power to be reset. If the parameter (PEn) is set to 0, then the unit will always reset. The controller will display an L26 (lockout, under voltage) or L27 (lockout over voltage).

Phase Imbalance (3 Phase Only)

If the voltage in a given leg drops below 5% of the average voltage of the 3 legs for 1 second, the controller will display E22 and shut the unit down (based on a parameter PiC) for 5 minutes and until the phase imbalance is corrected.

4.3.15 Compressor Internal Thermal Protection

If the compressor's internal thermal protector trips, the contactor fails, or the contactor is miswired, the controller will detect the loss of current and display an E28 warning code. This happens if both of the current transducers do not sense current for 1 second when the controller sends a compressor run signal. To avoid any fault triggering during the compressor startup period caused by the high inrush current, current sensing is not processed by the controller until 6 seconds after compressor startup.

4.3.16 Fixed High-Pressure Control

The high-pressure control is a nonadjustable pressure switch that opens at 440 +/- 10 psig and resets at 348psig in the event of high discharge pressure. If the high-pressure switch is open, the compressor shuts off immediately, ignoring any overrides. As long as the high-pressure switch is open, the compressor will not run. The compressor will stay off for 3 minutes regardless of when the pressure switch resets. ---E40 will be displayed while the unit is shut down.

If the compressor trips more than 5 times per hour, the controller will lock out the compressor, requiring a manual reset or the unit power to be reset. Error code

L40 means the compressor tripped on high pressure and is locked out. If the parameter HPn is set to 0, the unit will always automatically reset.

4.3.17 Alarm Contact

The alarm contact (A1 and A2 on terminal block) is a dry contact that can be wired to an external warning device such as a buzzer or light. This relay has a 5 Amp limit, up to 250V. The alarm contact will close in the event of an alarm or lockout.

4.3.18 Anti-Flood Back Warning

System Liquid Flood Back Warning Logic:

High-side superheat is the discharge line temperature minus the mid-coil temperature. If high-side superheat is less than 18°F for longer than 30 minutes during the last 45 minutes, the controller will display E50, but continue running the system. When the high-side superheat climbs above 18°F for 30 minutes, then the warning signal stops.

4.3.19 High Condensing Temperature Warning

An E46 warning means the condensing temperature exceeded 150°F. The fans will run at full speed, but the compressor does not shut down. The warning clears when the temperature drops below 140°F.

4.4 Local and Remote Displays and Communication

The controller can communicate with Modbus RTU RS485 supervisory controllers

4.4.1 Remote Display

An optional remote display (943-0058-00) is available. The display can be mounted up to 30 feet from the unit. To connect and configure the remote display, follow the instructions included with the remote display.

4.4.2 PC Connection

PC software is available to enable control of the unit from a computer. The software can be found in the software section of the online product information (OPI) site: copeland.com/online-product-informationl

A USB to RS485 adapter is also required. Copeland recommends FTDI USB-RS485-WE-1800-BT CABLE, USB TO RS485 SERIAL, 1.8M, WIRE END it is available on Amazon here: http://a.co/d/0gJliFZ See AE-1439 for detailed information

4.4.3 Supervisory Controls

The X-Line unit can connect with most supervisory controls that use the RS485 ModBus communication Protocol. See AE-1439 for E2 and E3 connection information.

For connection to non-Copeland supervisory controls, contact your local Copeland sales representative for support

4.5 Control Module Overview

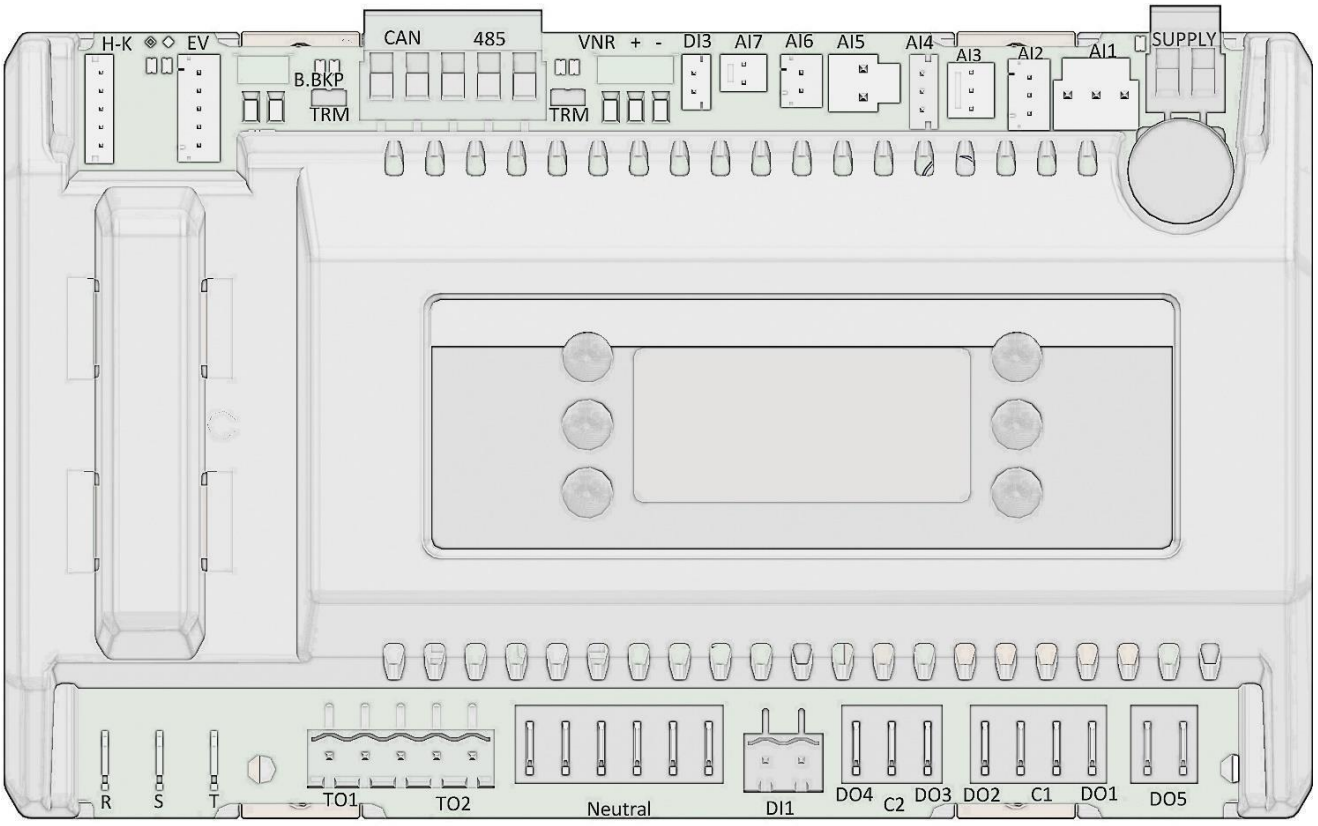


Figure 10 Controller

NOTE: There is no field wiring to this controller except for communications. The transformer wired in the unit is for the controller only. Do not tap off the transformer to power any other devices. When removing a connector, do not pull on the wire.

Table 12 High Voltage Connections

Label	Connector(s)	Electrical Limit (250VAC Max)	Function
C1	¼" Spade Connectors (2)	25A Max Current (16A Max Each Spade)	Provides Power for Defrost Heater and Evaporator Fan Relays
D01	¼" Spade Connector	16A Relay	Operates 40A Evaporator Fan Relay
D02	¼" Spade Connector	16A Relay	Operates 40A Defrost Heater Relay
C2	¼" Spade Connector	16A Max Current	Provides Power to Compressor Relay and CCH/RH Relays
D03	¼" Spade Connector	5A Relay	Operates Compressor Contactor
D04	¼" Spade Connector	8A Relay	Powers Crankcase Heater and Receiver Heater
D05	¼" Spade Connectors (2)	5A Relay	Dry (Switch Only) Alarm Contact
DI1		250VAC Max	Left Terminal – Defrost Termination Input Right Terminal – L2
Neutral	¼" Spade Connectors (6)	25A Max Current (16A Max Each Spade)	L1 Common Terminal Strip
R	¼" Spade Connector	460V Max	L1 Voltage Sensing
S	¼" Spade Connector	460V Max	L2 Voltage Sensing
T	¼" Spade Connector	460V Max	L3 Voltage Sensing (3 Phase Only)
SUPPLY		24VAC, 40VA	Controller Power Supply
T01		2A Wave Form Chopping Triac	Variable Speed PSC Fan Motor Control
T02		Not Used	For Future Use

Table 13 Sensor Connections

Label	Function	Type
AI1	Suction Pressure Transducer	0.5 to 4.5 VDC Ratio metric
AI2	Condenser Temperature Sensor	10k NTC (See Section 5.3 for values)
AI3	Discharge Line Temperature Sensor	86k NTC (See Section 5.3 for values)
AI4	er Inlet Vapor Temperature Sensor (Low Temp Only)	10k NTC (See Section 5.3 for values)
AI5	xchanger Outlet Vapor Temperature Sensor (Low Temp Only)	10k NTC (See Section 5.3 for values)
AI6	Ambient Temperature Sensor	10k NTC (See Section 5.3 for values)
AI7	Liquid Line Temperature Sensor (Low Temp Only)	10k NTC (See Section 5.3 for values)
DI3	Door Switch / ON-OFF Thermostat Dry Switch	NC Switch, 929-0220-16 Cable
EV	Liquid or Vapor Injection Valve	12VDC Stepper

Table 14 Other Connections

Label	Functions
VNR	Remote Display Connection
Connect + to + and – to -	
RS485	RS-485 Communications
CANBUS	Future Use
B.BKP	Future Use
H-K	Hotkey programming (use with part # 043-0171-01 to reset control)

Table 15 Parameter List

Label	Description	Default	Range
Default Display Value			
	Current Suction Pressure (PSIG)		
Adjustable in Programming Menu			
Compressor			
Cin / Cin	Compressor cut in pressure set point (PSIG)	25.0	Cou - 135
CoU / Cov	Compressor cut out pressure set point (PSIG)	15.0	0 - Cin
rEF / rEF	Refrigerant Selection for Regulation	R404A	All unit Refs
StC / 5tC	Digital Compressor set point (PSIG)	31.0	0 - 135
Low Side Control			
idF / idF	interval between defrost cycles (hour)	8	0 - 120
MdF / MdF	Maximum length for defrost (min)	45	0 - 255
EdF / EdF	Defrost interval mode	in	nu, in, RTC
Ld1 / Ld1	Workday defrost start 1 (hour)	6:00	nu, 0:00 - 23:50
Ld2 / Ld2	Workday defrost start 2 (hour)	13:00	nu, 0:00 - 23:50
Ld3 / Ld3	Workday defrost start 3 (hour)	21:00	nu, 0:00 - 23:50
Ld4 / Ld4	Workday defrost start 4 (hour)	nu	nu, 0:00 - 23:50
Ld5 / Ld5	Workday defrost start 5 (hour)	nu	nu, 0:00 - 23:50
Ld6 / Ld6	Workday defrost start 6 (hour)	nu	nu, 0:00 - 23:50

Parameter List, continued

Label	Description	Default	Range
Real Time Clock			
Min / Min	Current minute		0 - 59
Hr / Hr	Current hour		0 - 23
MdY / MdY	day of month		1 - 31
Mon / Mon	month		1 - 12
YEr / YEr	year		0 - 99
Password			
PAS / PA5	Enter into PR2 level	321	(blank)
Adjustable from Advanced Options Menu			
Probe Configuration			
P1F / P1F	Probe P1 calibration (PSIG)	0.0	-12.0 - 12.0
Display			
Lod / Lod	Remote Display visualization	P1	P1 - P7
Compressor			
LAS / LA5	Ambient temperature required to initiate low ambient on time (°F)	-20	-40 - 230
LMO / LMO	Low ambient minimum on time (sec)	6	0 - 255
Compressor Safety			
odS / od5	Output delay at start up (sec)	6	0 - 255
Con / Con	Compressor On time with faulty probe (min)	3	0 - 255
CoF / CoF	Compressor OFF time with faulty probe (min)	3	0 - 255
2oF / 2oF	Compressor Minimum Off Time (sec)	120	1 - 900
HPn / HPn	Number of high pressure switch activation before compressor lock	5	0 - 15
bMP / bMP	Bump start enable	YES	no, yes
dLn / dLn	Number of activation of DLT in a hour to lock compressor	4	0 - 15
Condenser Fan			
MCS / MC5	Minimum Condenser set point (°F)	70 - XFAP 80 - XFAL	-40 - 230
Low Side Control			
dFd /dFd	Display during defrost	dEF	DEF, Setpoint, Initial Pressure, End Pressure

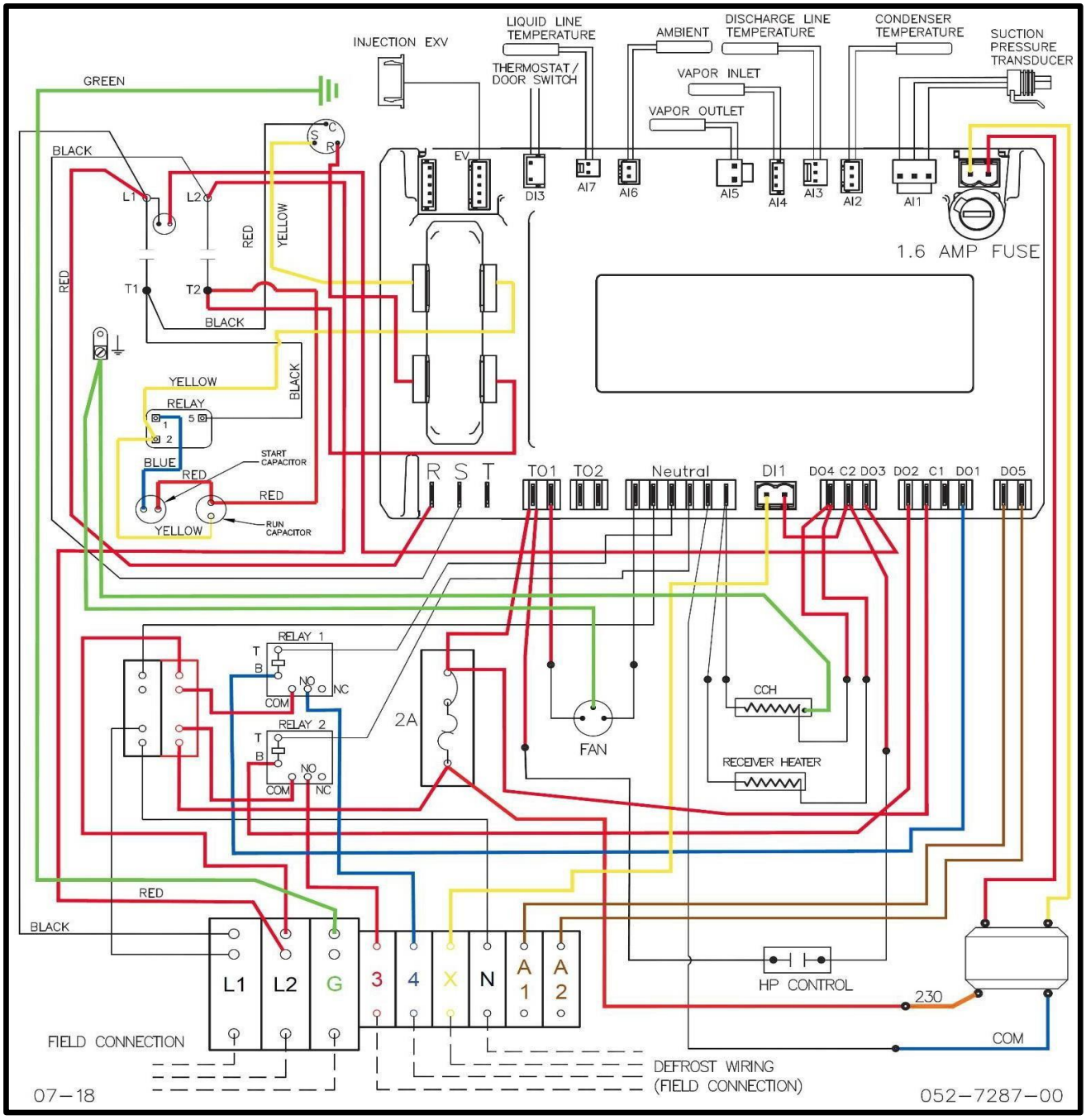
Parameter List, continued

Label	Description	Default	Range
Fdt / Fdt	Drip time (min)	0	0 - 120
dPo / dPo	Defrost at power-on	NO	no, yes
Sd1 / 5d1	Holiday defrost start 1 (hour)	6:00	nu, 0:00 - 23:50
Sd2 / 5d2	Holiday defrost start 2 (hour)	13:00	nu, 0:00 - 23:50
Sd3 / 5d3	Holiday defrost start 3 (hour)	21:00	nu, 0:00 - 23:50
Sd4 / 5d4	Holiday defrost start 4 (hour)	nu	nu, 0:00 - 23:50
Sd5 / 5d5	Holiday defrost start 5 (hour)	nu	nu, 0:00 - 23:50
Sd6 / 5d6	Holiday defrost start 6 (hour)	nu	nu, 0:00 - 23:50
Hd1 / Hd1	First Weekly holiday	nu	Sun - Sat
Hd2 / Hd2	second weekly holiday	nu	Sun - Sat
FnC / FnC	Fans operating mode	on	cn, on, cy, oy
Fon / Fon	Fan ON time	0	0 - 255
FoF / FoF	Fan OFF time	0	0 - 255
dSA / d5A	Maximum door open time before alarm	255	0 - 255
tLS / tL5	Use the liquid line solenoid	YES	no, yes
Compressor Protection			
MC2 / MC2	Adjustable current limit before trip (Amps)	MCA	0 - MCA
oCn / oCn	Over Current Trips before lockout	5	0 - 15; 0 = always automatic restart
PEn / PEn	loss of phase trips number before lockout	5	0 - 15; 0 = always automatic restart
Utn / Vtn	compressor trips before lockout	5	0 - 15; 0 = always automatic restart
PiC / PiC	Generate warning or shut the regulation when phase imbalance	Trip	Warning, Trip
Digital Input			
i3F / i3F	Digital input 3 function	Door Switch	Door Switch
i3P / i3P	Digital input 3 polarity	CL	CL , oP
Serial Address			
Adr / Adr	Serial address	1	1- 247

Parameter List, continued

Digital Compressor Regulation			
Pbd / Pbd	Proportional band for compressor regulation	30	0.1 - 99.9
r5 / r5	Band offset for compressor regulation	0	0.0 - 99.9
inC / inC	Integral time	250	0 - 999
SUt / 5Ut	Start up time: interval time with digital valve energized before start of regulation	10	0 - 10
tdG / tdG	Cycle time for digital compressor	20	10 - 40
PMi / PMi	Minimum capacity for digital compressor	20	0 - 100
PMA / PMA	Maximum capacity for digital compressor	100	20 - 100
ton / ton	Time with DGS at PMA before starting another load	0	255
toF / toF	Time with DGS at PMA before switching off another load	0	255

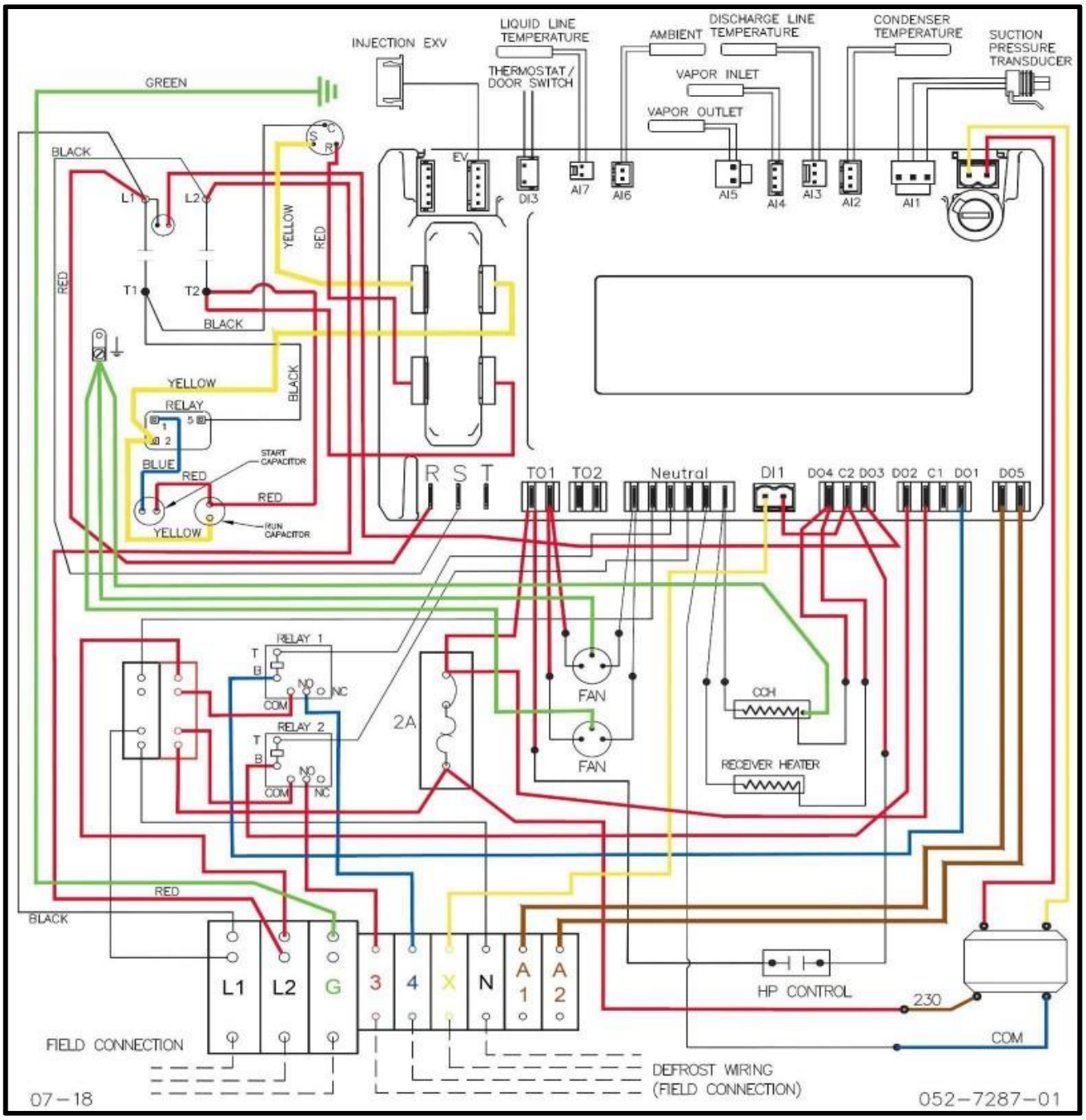
4.6 Wiring diagrams



052-7287-00

230V Low Temp 1-Phase 2.0-3.5 HP

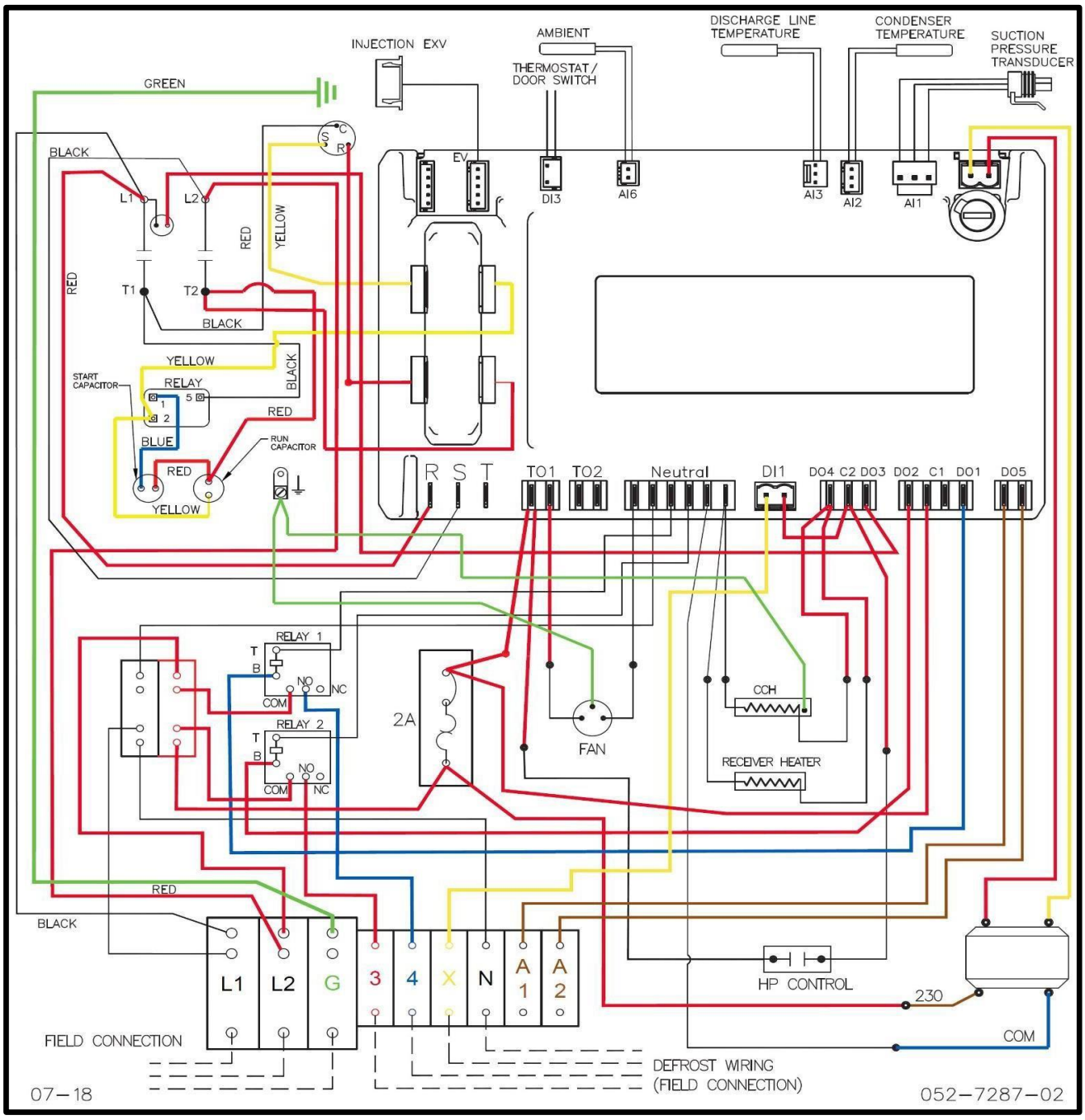
1 Condenser Fan



052-7287-01

230V Low Temp 1-Phase 4-5.1 HP

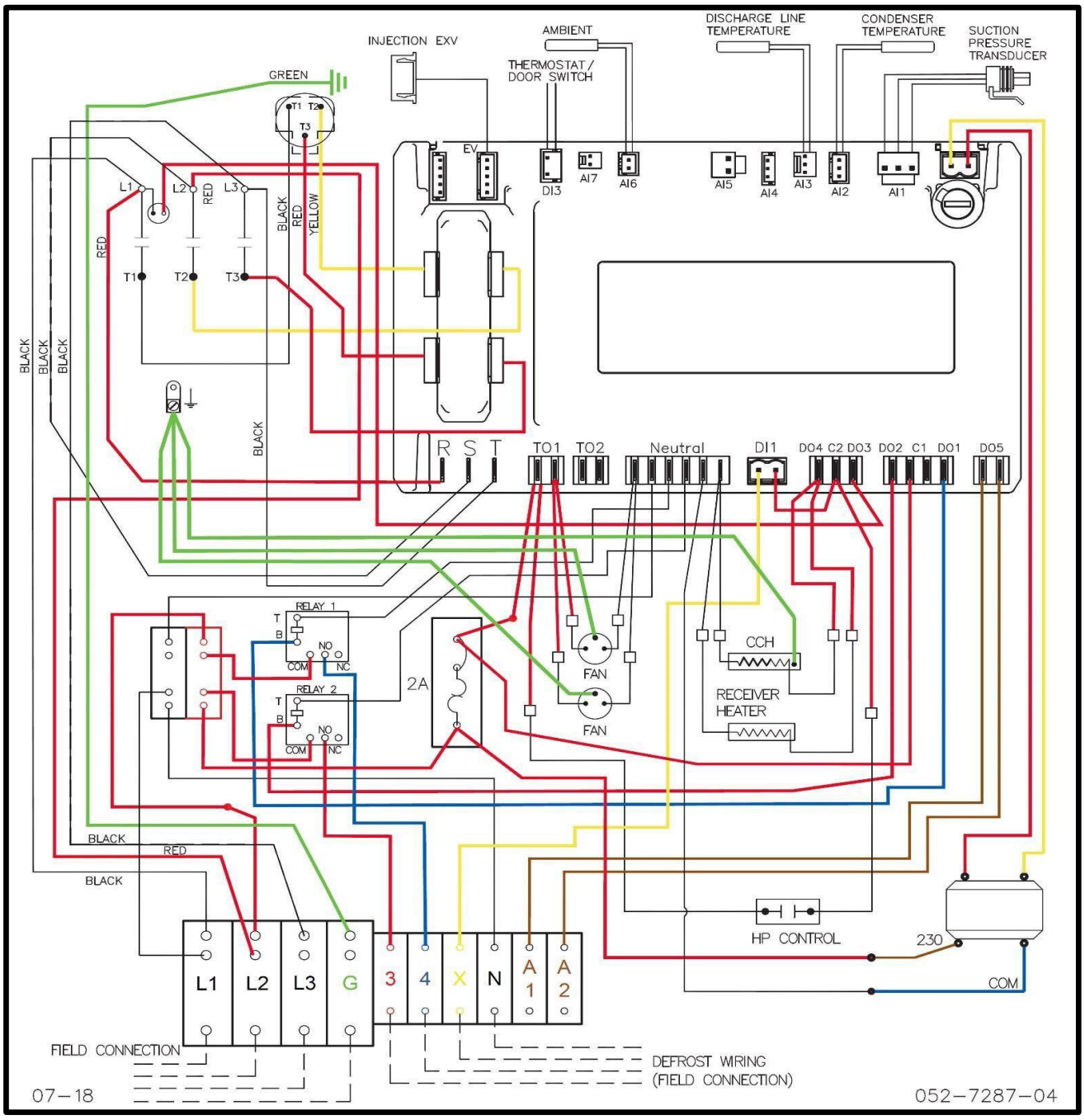
2 Condenser Fans



052-7287-02

230V Medium Temp 1-Phase 0.75-3.7 HP

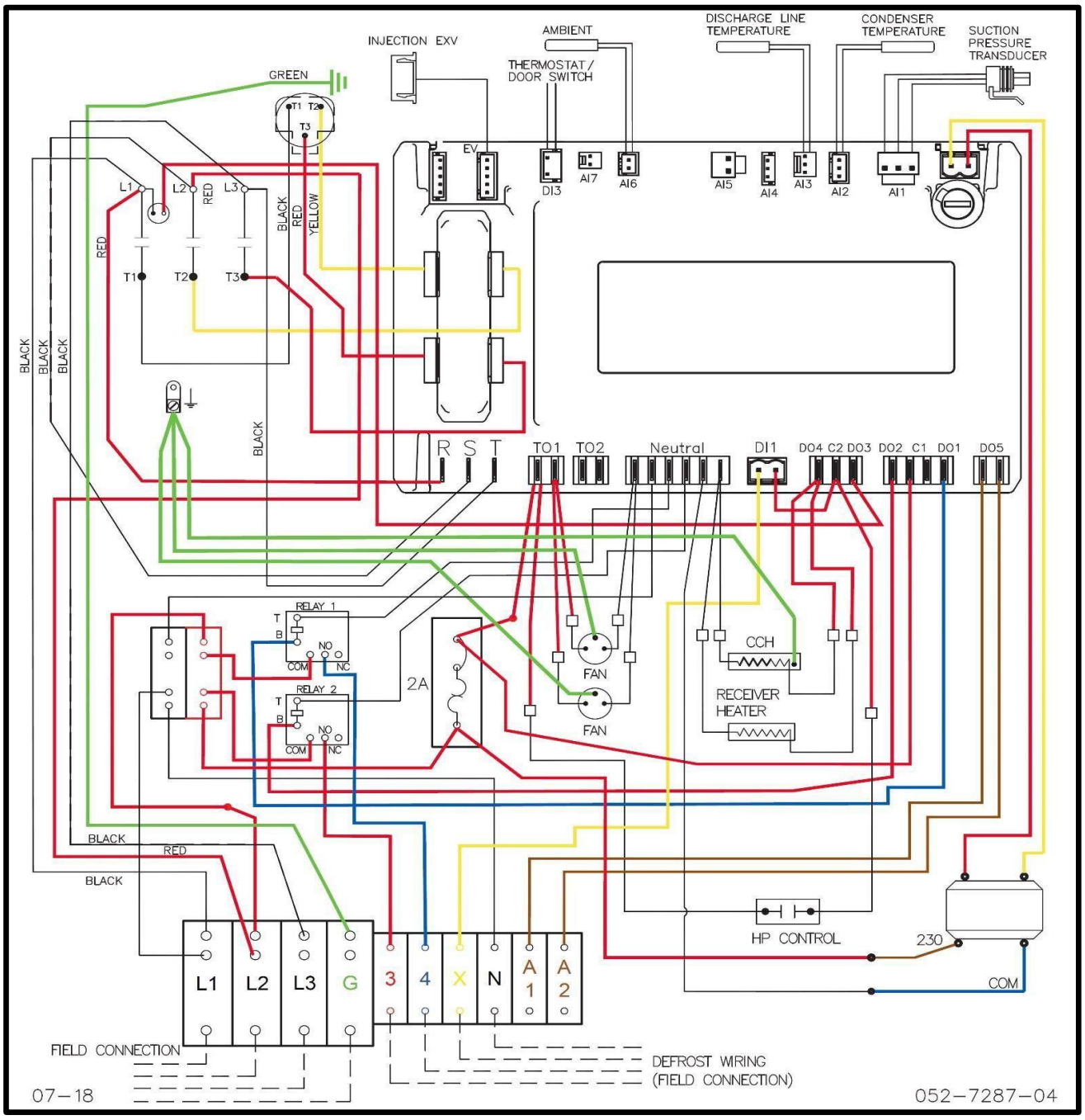
1 Condenser Fan



052-7287-04

230V Medium Temp 3-Phase 4.5-6 HP

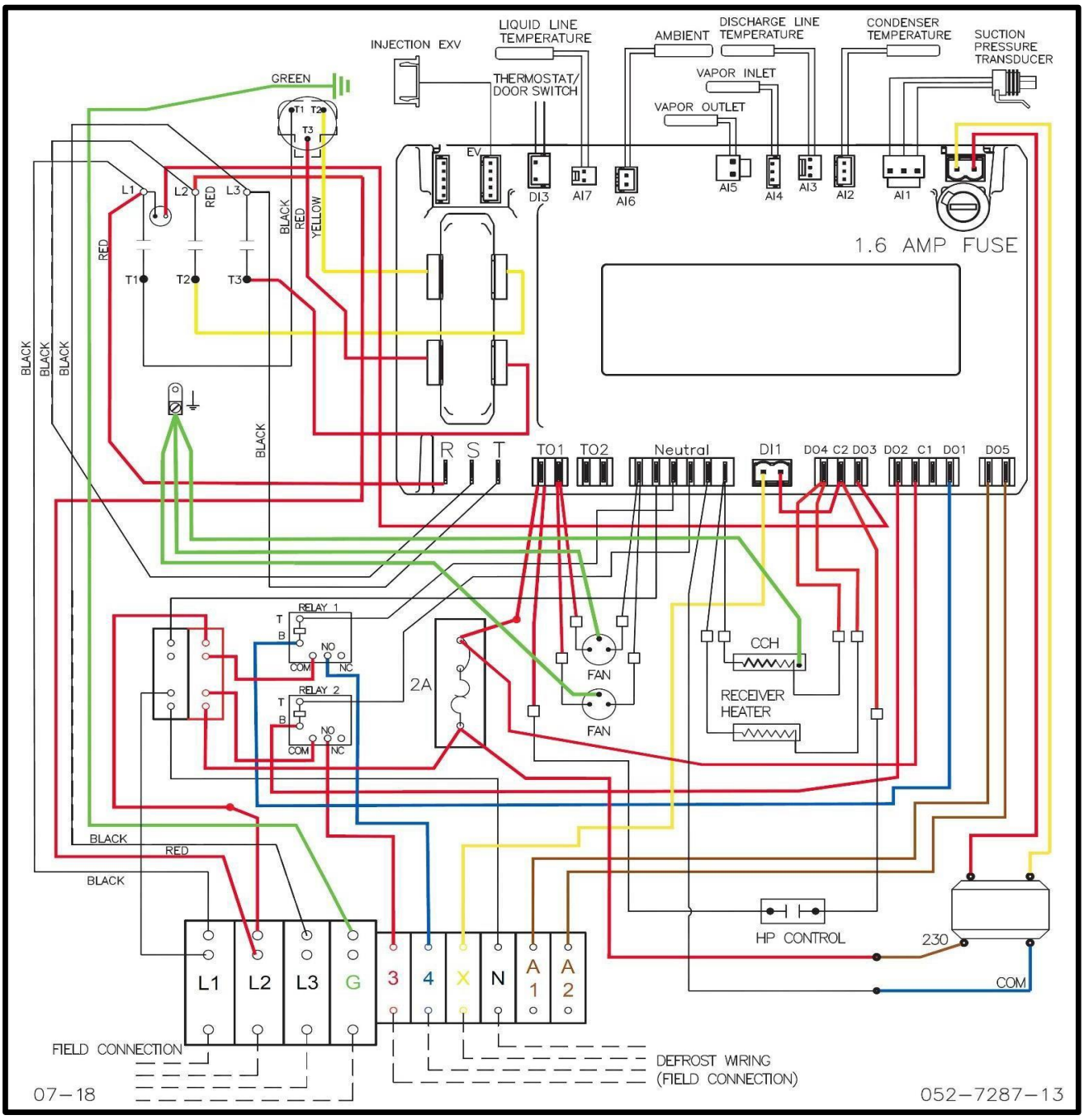
2 Condenser Fans



052-7287-05

230V Low Temp 3-Phase 2-3.5 HP

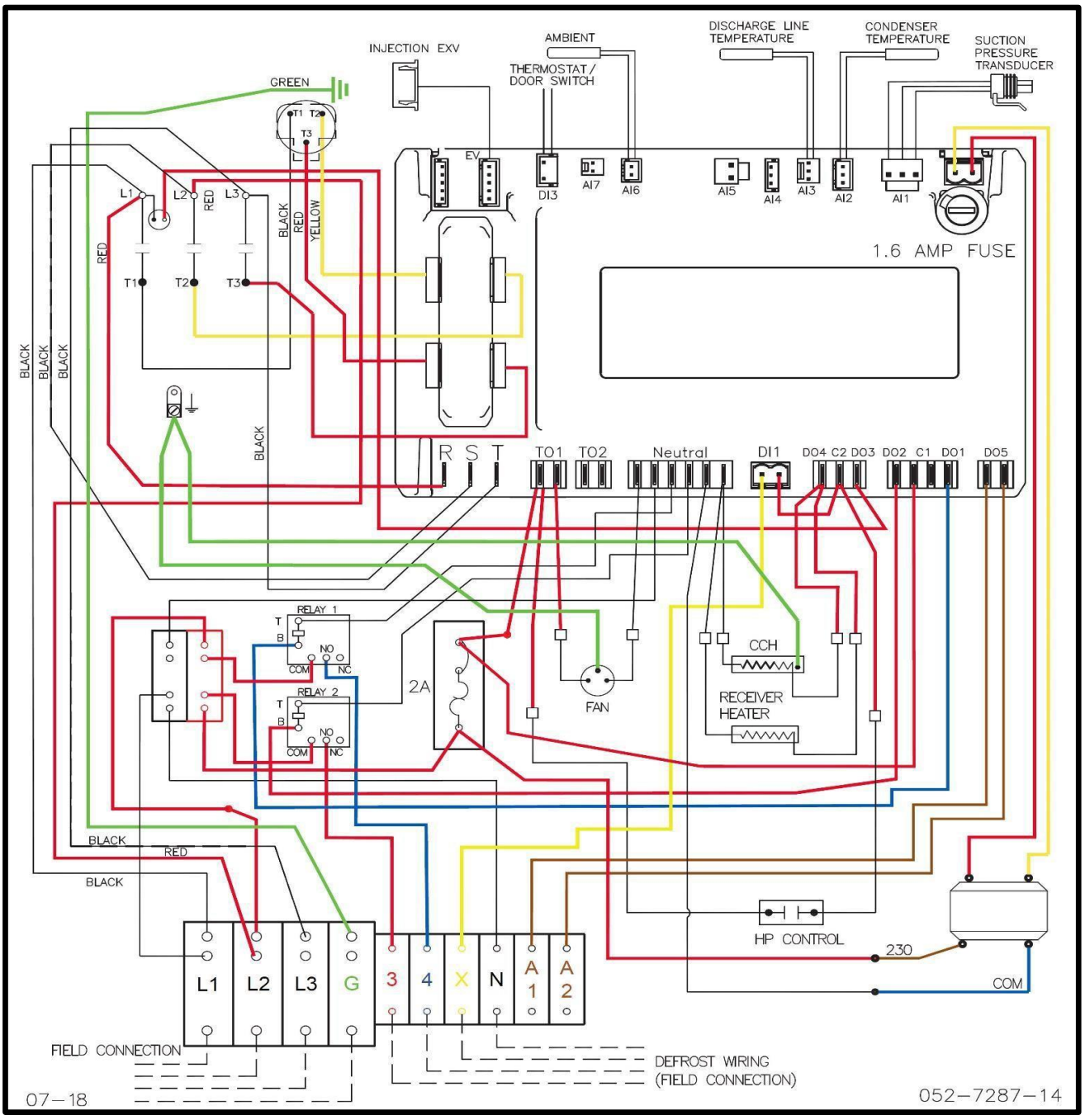
1 Condenser Fan



052-7287-13

230V Low Temp 3-Phase 4-6 HP

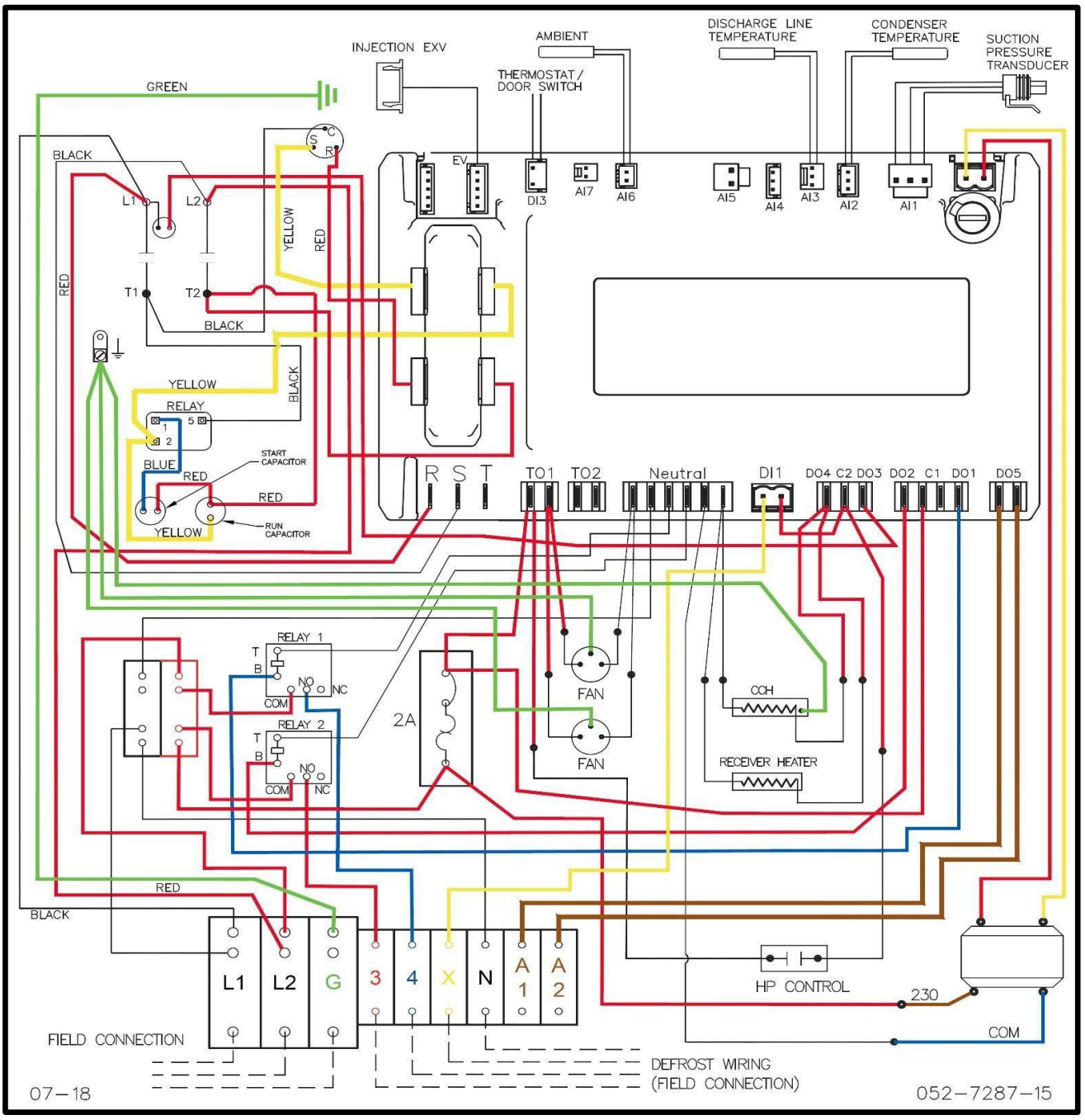
2 Condenser Fans



052-7287-14

230V Medium Temp 3-Phase 0.75-3.7 HP

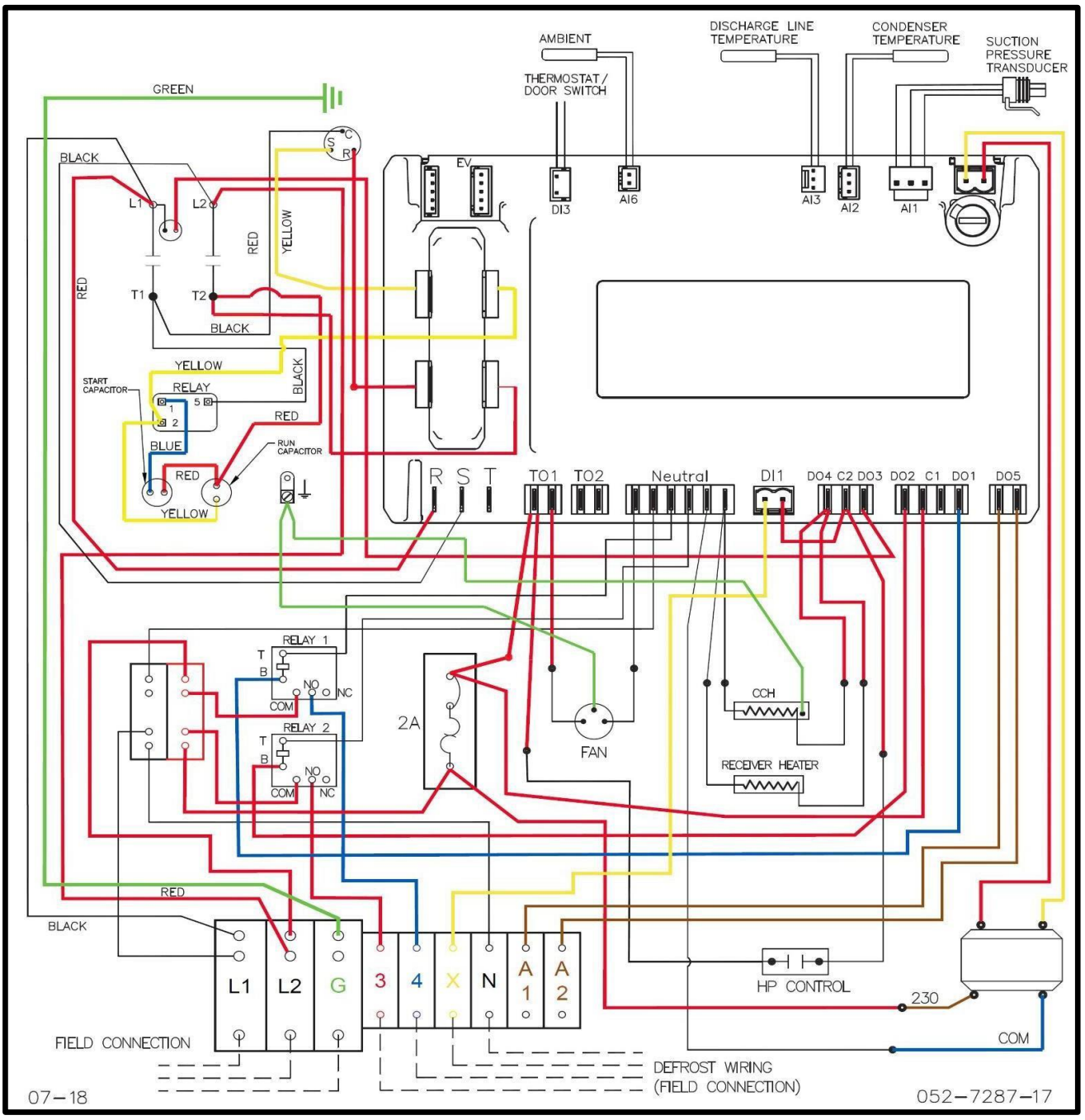
1 Condenser Fan



052-7287-15

230V Medium Temp 1-Phase 4.5-5 HP

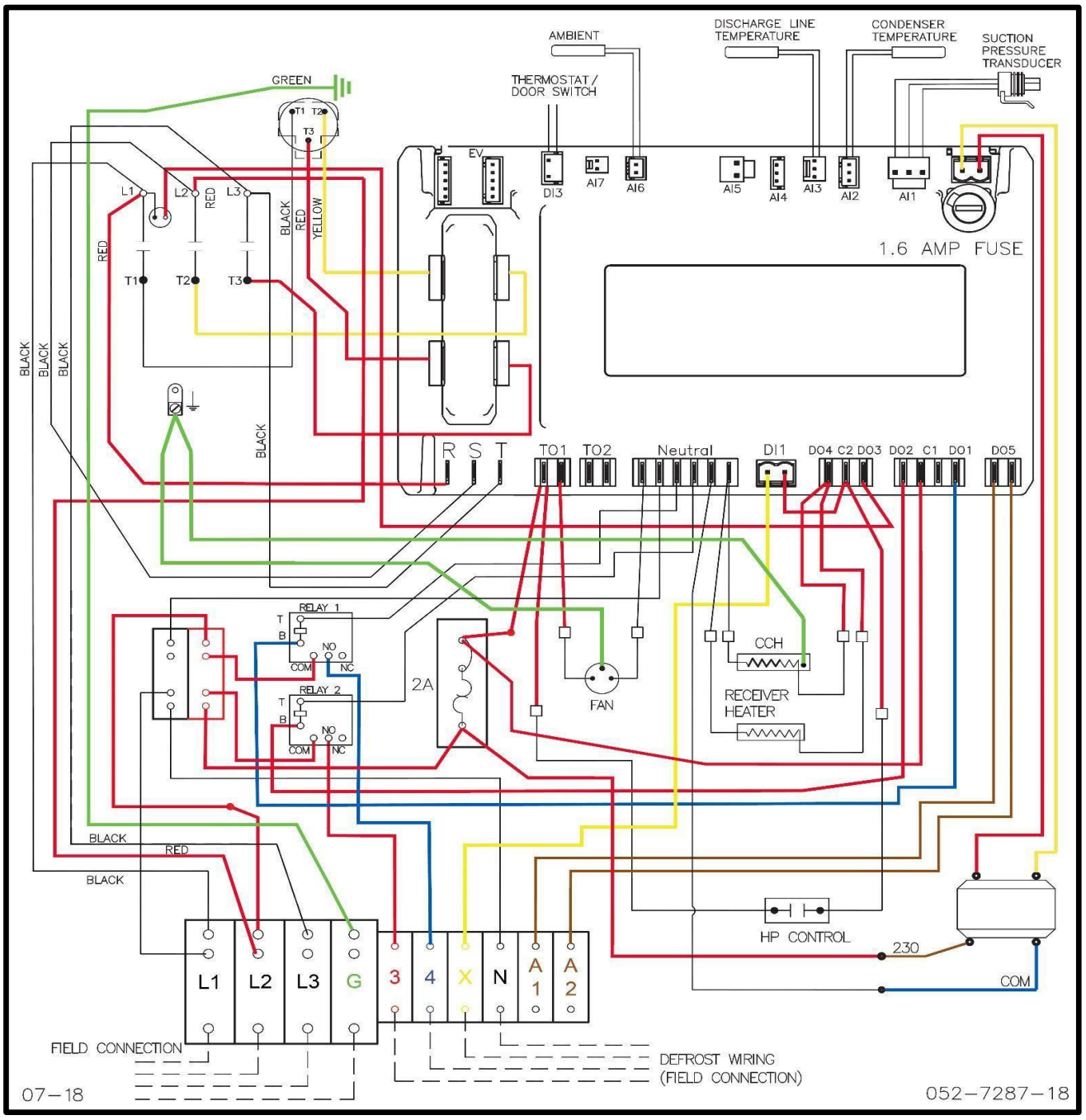
2 Condenser Fans



052-7287-17

230V Low Temp Single Phase .75 to 1.25 HP

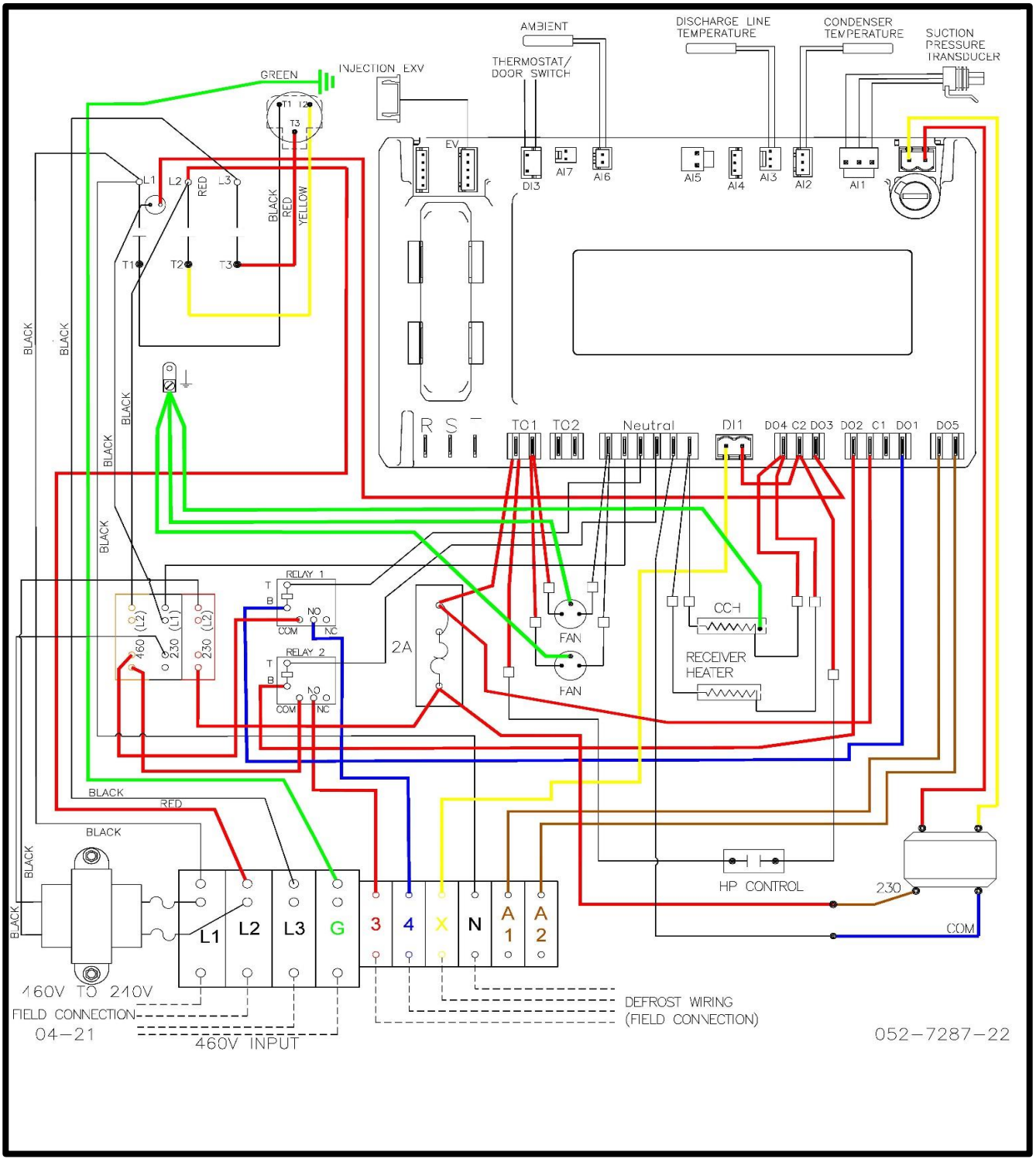
1 Condenser Fan



052-7287-18

230V Low Temp Three Phase Single Fan .75 to 1.25 HP

1 Condenser Fan



052-7287-22

460V Medium Temp (No Voltage Sensing) Three Phase Dual Fan 4.5 to 6 HP

2 Condenser Fans

5 Troubleshooting

5.1 Manual Stepper Control Mode for Vapor Injection (Low Temp) or Liquid Injection (Medium Temp)

For troubleshooting purposes, the stepper setting can be temporarily adjusted manually.

From the standard display screen, pressing SET and SERVICE/ALARM key for 3 seconds will enter a manual stepper control mode.

In the manual stepper control mode, the display shows the current step count of the valve.

In manual stepper control mode, all algorithms controlling the stepper valve are suspended, but the rest of the functions operate normally.

The up and down arrows on the keypad open and close the valve, with the display showing the updated step count.

If the controller is left untouched for 60 seconds or the set and up button are pressed together to exit, the controller will resume normal operation.

5.2 Alarm Codes

Code	Description	Alarm Level	Diagnostic Resolution	Possible Fix
E01	Suction pressure transducer error	Alarm	Check wire connection to the top of the controller (A1) Check to ensure suction pressure is below 135 PSIG	Replace faulty suction pressure transducer Verify DC voltage output of the controller.
E02	Condenser temperature sensor error	Alarm	Check wire connection to the top of the controller (A2)	Replace faulty temperature sensor
E03	Discharge line temperature sensor error	Alarm	Check wire connection to the top of the controller (A3)	Replace faulty temperature sensor
E04	EVI heat exchanger vapor inlet temperature error (XFALs only)	Alarm	Check wire connection to the top of the controller (A4)	Replace faulty temperature sensor
E05	EVI heat exchanger vapor outlet temperature error (XFALs only)	Alarm	Check wire connection to the top of the controller (A5)	Replace faulty temperature sensor
E06	Ambient temperature sensor error	Alarm	Check wire connection to the top of the controller (A6)	Replace faulty temperature sensor
E07	Liquid line temperature sensor error (XFALs only)	Alarm	Check wire connection to the top of the controller (A7)	Replace faulty temperature sensor

E09-E10	Current sensor error	Alarm	Check wires are properly routed through controller current transducers per wiring diagram	Replace faulty controller
E11-E13	Voltage sensor error	Alarm	Check wires are connected to voltage sensing connections (R, S, T) per wiring diagram	Replace faulty controller
E20 L20	Lost phase error/ lockout (Three phase only)	Alarm Lockout	Check power to unit	Check wires are connected to voltage sensing connections (R, S, T) per wiring diagram
E21 L21	Phase sequence error / lockout (Three phase only)	Alarm Lockout	Reverse two phases incoming power to unit	Check wires are connected to voltage sensing connections (R, S, T) per wiring diagram
E22	Phase imbalance (Three phase only)	Alarm	Check incoming electrical power	Correct incoming voltage supply
E23 L23	Over current error/ lockout	Alarm Lockout	Confirm system operation to find out what is causing the compressor to pull excessive current	
E24 L24	Open run circuit error/ lockout	Alarm Lockout	Check run capacitor	Check start component wiring per diagram Check wires are properly routed through controller current transducers per wiring diagram
E25 L25	Open start circuit error/ lockout	Alarm Lockout	Check start capacitor	Check start component wiring per diagram Check wires are properly routed through controller current transducers per wiring diagram
E26 L26	Under voltage alarm/lockout	Alarm Lockout	Check incoming power	
E27 L27	Over voltage alarm/lockout	Alarm Lockout	Check incoming power	
E28	Compressor protector trip	Warning	Check to see if compressor is tripped on protector	Check to see if contactor is functioning properly Check contractor control circuit wiring per wiring diagram
E29	Power Frequency	Alarm	Check incoming Power	
E40 L40	High pressure switch trip/ lockout	Alarm Lockout	Check system cause of high pressure trip Check if circuit breaker is tripped (It provides power to the high pressure switch)	Ensure wiring to terminal C2 of the controller is correct per the wiring diagram and C2 is receiving power.Verify high pressure switch is working properly or needs replaced

E41	Low Pressure Switch	Alarm	Check Suction Pressure Transducer	Replace Suction Pressure Transducer
E42	High Pressure	Alarm	Check system cause of High Pressure Trip	Replace Discharge Pressure Transducer
E43	Low Pressure Alarm	Alarm	Check Suction Pressure Transducer	Replace Suction Pressure Transducer
E44 L44	Discharge line temperature alarm/ lockout	Alarm Lockout	Check system cause of high DLT	Faulty temperature sensor. Check sensor values versus section 12.
E45	High Condenser Pressure Alarm	Alarm	Check system cause of High Pressure Trip	Replace Discharge Pressure Transducer
E46	High condenser temperature alarm	Alarm	Check to see what is causing the system to run at a higher condensing temperature	Faulty temperature sensor. Check sensor values versus section 12.
E47	Over injection (XFALs only)	Warning		
E48	Refrigerant shortage (XFALs only)	Warning	Check refrigerant charge	EVI injection valve may not be clogged or blocked
E49	Pump Down Alarm	Alarm	Check Liquid Line Solenoid	Replace Solenoid or set tLS to off if not present
E50	High side flood back alarm	Warning	Check to see if proper superheat is being maintained	
E53	Digital Compressor Safety Chain Is Open	Warning		
E66	Door Open Alarm	Warning	Review application restrictions	Review Pg.17, Section 4.2.1.2 to eliminate the error.
E80	Rtc warning, date not correct	Warning	Set the real time clock	
E81	Rtf warning, communication error	Warning	Reload factory settings with the hotkey and reset the real time clock	Replace faulty controller
E82- E85	Configuration Errors	Alarm	Reload factory settings with the hotkey	Replace faulty controller
L86	EEPROM Memory Error	Lockout	Reload factory settings with the hotkey	Replace faulty controller

5.3 Sensor and Transducer Values

Resistance Values for 86k NTC Temperature Sensor (DLT)

°F	Resistance (kOhms)	°F	Resistance (kOhms)
-40	2889.60	**167**	12.73
-31	2087.22	**176**	10.79
-22	1522.20	**185**	9.20
-13	1121.44	**194**	7.87
-4	834.72	**203**	6.77
5	627.28	**212**	5.85
14	475.74	**221**	5.09
23	363.99	**230**	4.45
32	280.82	**239**	3.87
41	218.41	**248**	3.35
50	171.17	**257**	2.92
59	135.14	**266**	2.58
68	107.44	**275**	2.28
77	86.00	**284**	2.02
86	69.28	**293**	1.80
95	56.16	**302**	1.59
104	45.81	**311**	1.39
113	37.58	**320**	1.25
122	30.99	**329**	1.12
131	25.68	**338**	1.01
140	21.40	**347**	0.92
149	17.91	**356**	0.83
158	15.07		

Resistance Values for 10k NTC Temperature Sensors

(Condenser Temperature, Ambient Sensor, Liquid Line Temperature Sensor, EVI Heat Exchanger Temperature Sensors)

F	Resistance (kOhms)	F	Resistance (kOhms)	F	Resistance (kOhms)
-55	302.2	**45**	20.3	**140**	3.02
-50	254.9	**50**	18.0	**145**	2.75
-45	221.7	**55**	15.9	**150**	2.55
-40	188.5	**60**	14.4	**155**	2.33
-35	160.2	**65**	12.8	**160**	2.16
-30	140.4	**70**	11.6	**165**	1.98
-25	120.2	**75**	10.4	**170**	1.84
-20	105.7	**80**	9.46	**175**	1.69
-15	90.8	**85**	8.47	**180**	1.58
-10	80.3	**90**	7.73	**185**	1.45
-5	69.4	**95**	6.94	**190**	1.34
0	61.5	**100**	6.25	**195**	1.25

5	53.4	**105**	5.73	**200**	1.15
10	46.5	**110**	5.17	**205**	1.08
15	41.5	**115**	4.75	**210**	0.998
20	36.3	**120**	4.30	**215**	0.937
25	32.4	**125**	3.96	**220**	0.868
30	28.5	**130**	3.59	**225**	0.816
35	25.6	**135**	3.32	**230**	0.758
40	22.5				

Transducer Voltage to Pressure Values

High Pressure

DC Voltage	PSI
0.5	0
0.6	12.5
0.7	25
0.8	37.5
0.9	50
1	62.5
1.1	75
1.2	87.5
1.3	100
1.4	112.5
1.5	125
1.6	137.5
1.7	150
1.8	162.5
1.9	175
2	187.5
2.1	200
2.2	212.5
2.3	225
2.4	237.5
2.5	250
2.6	262.5
2.7	275
2.8	287.5
2.9	300
3	312.5
3.1	325
3.2	337.5
3.3	350
3.4	362.5
3.5	375
3.6	387.8
3.7	400
3.8	412.5
3.9	425
4	437.5
4.1	450
4.2	462.5
4.3	475
4.4	487.5
4.5	500

Low Pressure

DC Voltage	PSI
0.5	-15
0.6	-11.3
0.7	-7.5
0.8	-3.8
0.9	0
1	3.8
1.1	7.5
1.2	11.3
1.3	15
1.4	19
1.5	23
1.6	26
1.7	30
1.8	34
1.9	38
2	41
2.1	45
2.2	49
2.3	53
2.4	56
2.5	60
2.6	64
2.7	68
2.8	71
2.9	75
3	78.8
3.1	82.5
3.2	86.3
3.3	90
3.4	93.8
3.5	97.5
3.6	101.3
3.7	105
3.8	108.8
3.9	112.5
4	116.3
4.1	120
4.2	123.8
4.3	127.5
4.4	131.1
4.5	135

Measuring Pressure/Voltage for Suction Pressure Transducer (X-Line)

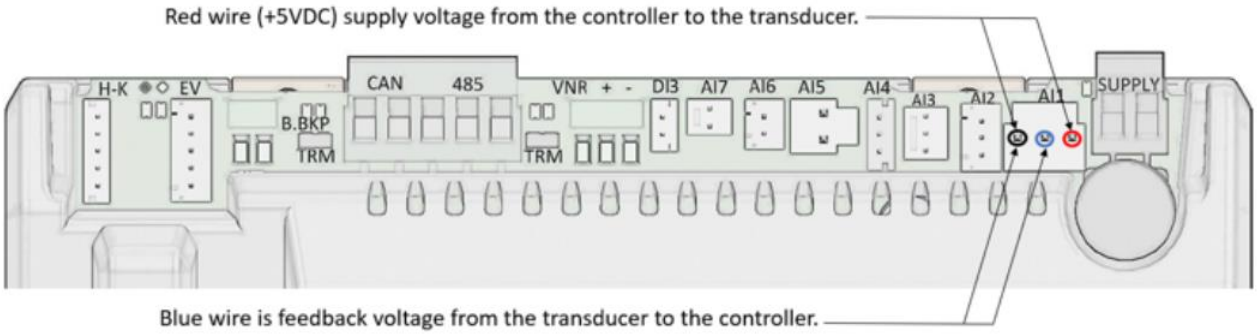
To Measure voltage to the suction pressure transducer manually, do the following:

1. Tur controller ON
2. Monitor current suction pressure on controller display and record reading
3. Using a voltmeter, measure the voltage on the AI1 terminals on top right corner of controller.

Red Wire (5VDC) supply voltage from the controller to the transducer

Black wire (ground)

Blue wire. Feedback voltage from transducer to the controller.



Revision Tracking R7

The document format has been updated to the new Copeland format

All occurrences of "Emerson" have been removed

A note regarding A3 and R290 venting has been updated

Appendices

Appendix A: DTC Valve Instructions

ZF03/04/05/07KAE R404A, R448A, R449A, R407A/C/F Applications

Please see all the parts before assembly in Figure 1

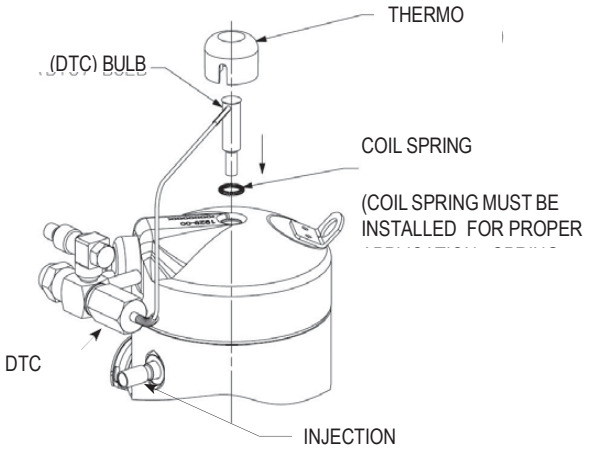


Figure 1 Explosion View

DTC Valve Assembly

1. Connect the Discharge Temperature Control (DTC) valve to the injection fitting.

a. The DTC valve should bottom out in the injection fitting and should be installed in a horizontal orientation.

Please see the assembly in Figure 2.

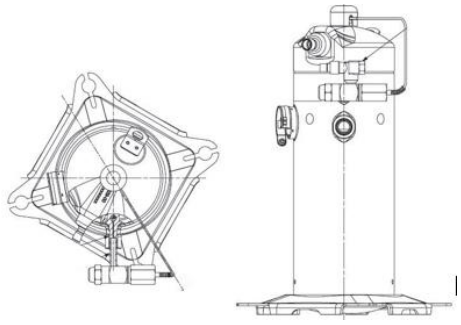


Figure 2. DTC valve installation

Compressor Brazing Procedure

IMPORTANT

Possible blockage! Compressor overheating!

It is recommended to maintain the flow of oxygen-free nitrogen through the system at a very low pressure during brazing. Nitrogen displaces the air and prevents the formation of copper oxides in the system. If allowed to form, the copper oxide material can later be swept through the system and block screens such as those protecting capillary tubes, thermal expansion valves, and accumulator oil return holes.

Contamination or moisture! Bearing failure!

Do not remove the plugs until the compressor is set into the unit. This minimizes any entry of contaminants and moisture. Copeland™ scroll compressors have copper-plated steel suction, discharge, and injection tubes. These tubes are far more robust and less prone to leaks than copper tubes. Due to the different thermal properties of steel and copper, brazing procedures may have to be changed from those commonly used.

Figure 3 shows the proper procedure for brazing the DTC valve to a scroll compressor.

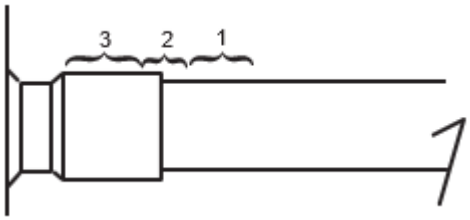


Figure 3 Tube brazing

- The copper-coated steel tubes on scroll compressors can be brazed in approximately the same manner as any copper tube.
- Recommended brazing materials include any silfos material, preferably with a minimum of 5% silver, however, 0% silver is acceptable.
- Be sure tube fitting inner diameter and tube outer diameter are clean prior to assembly.
- Prior to brazing, apply a wet rag or any other suitable heat protection to the valve body. Overheating of the valve body may cause damage to the valve.
- Using a double-tipped torch, apply heat in area 1.
- As the tube approaches brazing temperature, move the torch flame to area 2.
- Heat area 2 until braze temperature is attained, moving the torch up and down and rotating around the tube as necessary to heat the tube evenly. Add braze material to the joint while moving the torch around the joint to flow braze material around the circumference.
- After the braze material flows around the joint, move the torch to heat area 3. This will draw the braze material
- down into the joint. The time spent heating area 3 should be minimal.
- As with any brazed joint, overheating may be detrimental to the final result.

NOTE: Since the injection tubing design of the ZF*KA compressors includes some O-rings, a wet rag or any other suitable heat protection must be used when brazing the injection line to the compressor.

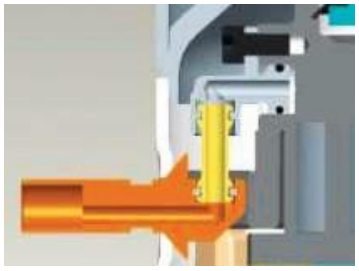


Figure 4. O-rings composing the injection inside compressor models ZF*KA

b. Verify the coil spring is seated in the thermostat tube groove area (see Figure 5) on the top of the compressor. The spring is required for proper DTC valve installation.

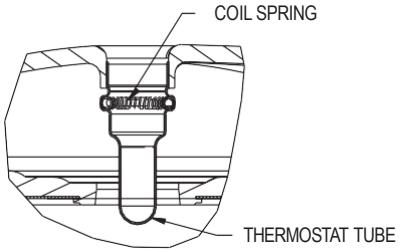


Figure 5 Coil Spring Location

c. Spread a thin film of thermal grease around the DTC bulb. Press the DTC bulb into the thermostat tube on top of the compressor until the bulb bottoms out in the thermostat tube. Please install by hand without using excessive force. Copper tube from the DTC bulb should be approximately [1/8”] off the top of the compressor. Take care and avoid damaging or scratching the bulb. Please see Figure 6.

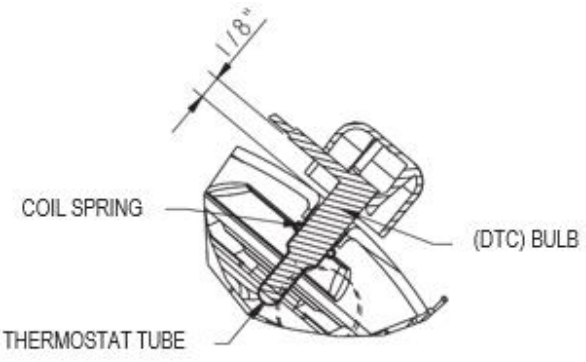


Figure 6. Bulb installation on top of the compressor

d. Snap the thermal cap onto the DTC bulb on top of the compressor. If there is a need to remove the thermal cap due to height limitations, thermal insulation for the bulb is strongly recommended. Please see Figure 6.

2. Maximum operating temperature for the valve bulb is limited to [293°F].

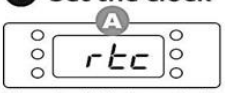
3. Ensure liquid refrigerant is available in the line feeding theDTC valve prior to starting the compressor. Failure to do this will result in damage to the DTC valve and compress

DTC Valve Removal

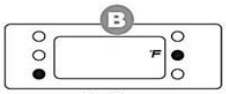
1. Close the valves to isolate the compressor from the system.
2. Evacuate the compressor and ensure no pressure remains.
   To disconnect:
3. Heat joint areas 2 and 3 slowly and uniformly until the braze material softens and the tube can be pulled out of the fitting to reconnect:
4. See Compressor Brazing Procedure. Recommended brazing materials include silfos with minimum 5% silver or silver braze used on other compressors. Due to the different thermal properties of steel and copper, brazing procedures may have to be changed from those commonly used.

Appendix B: Fixed Speed Quick Start Guide

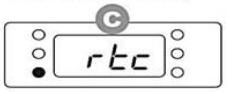
1 Set the clock



The unit will flash rtc the first time power is applied or if the clock has lost its setting.



Press and hold ▽ + SET until F flashes.



Press SET to select the rtc menu.

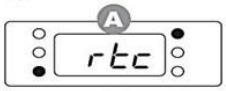
Use SET and △ ▽ buttons to select and adjust clock parameters.

Clock Parameters

Par.	Description	Value Range
Min	Minute	0-59
Hr	Hour	0-23
ndy	Day	1-31
Mon	Month	1-12
YEr	Year	0-99

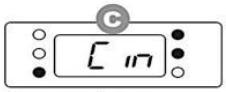
Scan to watch a video on how to set the clock

2 Set pressure controls



Press SET and △ to exit the rtc menu. If SET and △ are held, the control will exit program mode. Use ▽ and SET to return to program mode.

Use the △ or ▽ buttons to find the PAr menu, then press SET to select.



Use SET and △ ▽ buttons to select and adjust pressure parameters.

Pressure Parameters

Par.	Description	Value Range
Cin	Cut In	10-135 (psi)
CoU	Cut Out	0-30 (psi)
rEF	Refrigerant	22, 134, 404, (4)07A, (4)07C, 507 (may vary by model)

3 Set defrost parameters and schedule

From the PAr menu, use SET and △ ▽ buttons to select and adjust defrost parameters.

Scan to watch a video on how to set the defrost mode

Defrost Parameters

Par.	Description	Value Range
idF	Interval between defrost	0- 120 (hours)
MdF	Max duration	0-255 (minutes)
EdF	Defrost mode	nU (off), in (interval), rtc (clock)
Ld1	1st start time	nU (not used), 0-23:50
Ld2	2nd start time	
Ld3	3rd start time	
Ld4	4th start time	
Ld5	5th start time	
Ld6	6th start time	

IMPORTANT BEFORE PROGRAMMING – DETERMINE DESIRED DEFROST MODE

1. Press and Hold SET + DOWN for 3 seconds
2. Using arrows scroll to RTC and select by pressing SET
3. Press UP or DOWN and select EdF
4. Press SET and select interval mode (in), real time clock mode (rtc), or not used (nU)
5. Press SET to confirm section then proceed to step 6 if (in) selected, or step 8 if (rtc) selected

Interval Mode (in) - Interval between defrost cycles
RTC Mode (rtc) - Real time clock based defrost schedule
Not Used Mode (nU) – Defrost not used

IF USING INTERVAL DEFROST MODE (in)

6. Scroll through options and select (idF) by pressing SET. Scroll to desired defrost interval (hours) and confirm by pressing SET.
7. Scroll through options and select (NdF) by pressing SET. Scroll to desired defrost duration (minutes) and confirm by pressing SET.

IF USING TIME OF DAY DEFROST MODE (rtc)

8. Scroll to Ld1 and confirm by pressing SET. Set desired defrost time(0.1 = 12:10AM, 13.5 = 1:50PM) and confirm by pressing SET
9. Scroll to Ld2-Ld6 and repeat step 8 for each desired time of day. Set all unneeded options to (nU)

Navigation

Enter program mode* ▽ + SET 3 seconds (F flash)
Cycle through options/adjust values △ ▽
Select funtion/store function SET
Exit program mode △ + SET
*Program mode will terminate after 60 seconds of inactivity.

Scan to watch a video on how to set the setpoints. Starts at 8:00

View Values and Set Points

From main screen, press and release	△
Cycle through parameters	△ ▽
Select value	SET
Go to next parameter	SET
Exit menu	△ + SET

*Program mode will terminate after 60 seconds of inactivity.

Values and Set Points

Par	Description	Par	Description
P IP	Suction Pressure	oPP	EXV %
P2t	Cond. Temp.	LLS	NA
P2P	NA	Foo	Fan Speed %
P3t	DLT	dSo	NA
P4t	Vapor Inlet	Lt	NA
P5t	Vapor Outlet	Ht	NA
P6t	Ambient Temp	Hn	RTC Menu
P7t	Liquid Line Temp	Std	Dynamic Fan Set Point
SH	NA		

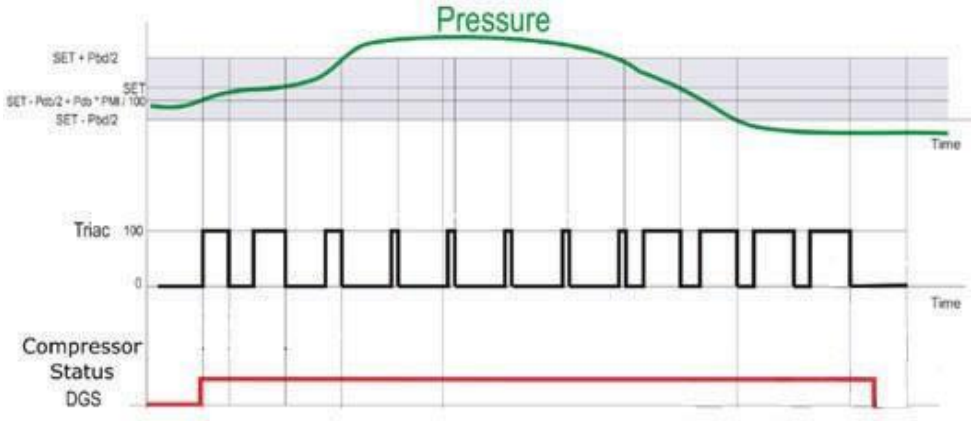
Code	Description
01	AI1
02	AI2
03	AI3
04	AI4
05	AI5
06	AI6
07	AI7
08	Battery
09	Current sensor 1
10	Current sensor 2
11	Voltage sensor 1
12	Voltage sensor 2
13	Voltage sensor 3
20	Lost phase
21	Phase sequence
22	Phase Imbalance
23	Over current
24	Open run circuit
25	Open start circuit
26	Under voltage

Code	Description
27	Over voltage
28	Compressor Build-in protector trip
29	Power frequency (manual)
40	High pressure switch
41	Low pressure switch
42	High pressure
43	Low pressure
44	Discharge line temperature
46	High condenser temperature
47	EXV full open in EVI
48	Refrigerant shortage error in EVI
49	Pump down alarm
50	High side flood back
80	RTC warning, date not correct
81	RTF warning, communication with clock
82	Probe configuration
83	DI configuration
84	Compressor configuration
85	Injection probe configuration
86	EEPROM R/W (manual)

E-Error L= Lockout

Appendix C: X-Line Digital Outdoor Refrigeration Unit

The Copeland digital outdoor refrigeration unit operates slightly unique from the fixed speed models. While fixed speed units operate based on a user set cut-in and cut-out value, the digital models will operate based on suction pressure setpoint (5tC). The compressor will run via a built-in algorithm in the XCM25D controller between the window of the 5tC setpoint plus ½ of the proportional band (Pbd) and minus ½ of the proportional band.



X-Line Digital units will seamlessly modulate capacity from 20% to 100%. A normally closed (de-energized) solenoid valve is one of the key components for modulation. When the solenoid valve is in its normally closed position, the compressor operates at full capacity, or loaded state. When the solenoid valve is energized, the two scroll elements move apart axially, or into the unloaded state. The solenoid coil is controlled through the XCM25D controller onboard the condensing unit.

During the unloaded state, the compressor motor continues running, but since the scrolls are separated, there is no compression. During a loaded state, the compressor delivers 100% capacity and during the unloaded state, the compressor delivers 0% capacity. A duty cycle consists of one loaded state and one unloaded state. By varying the time of the loaded state and the unloaded state, an average capacity is obtained. The lowest achievable capacity is 20% by default (PMi), which is 4 seconds of pumping during one 20 second duty cycle (tdG).

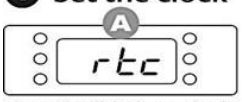
In applications that use digital compressors, the set point is controlled using the saturated evaporating pressure for the refrigerant being used. For the setpoint pressure, there is a tolerance pressure band, Pbd which has a factory default setting of 30 PSIG. In order to help avoid pressure trips at start up, the Pbd value can be changed in the advanced settings menu to a larger value such as 50 PSIG. Changing this parameter allows the electronic expansion valve more time to open and increase refrigerant flow when the compressor is started. Also, in the advanced settings, the default duty cycle for the digital modulation is 20 seconds. Reducing the duty cycle to 15 seconds will help reduce the system pressure swings due to unloading/loading of the compressor.

** Copeland does not recommend decreasing the minimum capacity to lower than 10%. Duty cycles from 20 seconds to 15 seconds can be implemented to minimize pressure swings from unloading operation of the digital compressor's operation. Parameter tdG = 20 can be adjusted to tdG = 15 to help address pressure swings during digital operation. (**AE21-1319**)**

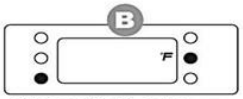
Please refer to **AE21-1319** for further information regarding digital capacity control for Copeland scroll refrigeration compressors.

Digital Quick Start Guide

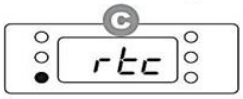
1 Set the clock



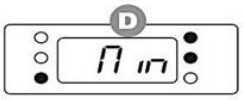
The unit will flash rtc the first time power is applied or if the clock has lost its setting.



Press and hold ▽ + SET until F flashes.



Press SET to select the rtc menu.



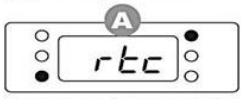
Use SET and △ ▽ buttons to select and adjust clock parameters.

Clock Parameters

Par.	Description	Value Range
Min	Minute	0-59
Hr	Hour	0-23
Ndy	Day	1-31
Mon	Month	1-12
YEr	Year	0-99

Scan to watch a video on how to set the clock

2 Set pressure controls



Press SET and △ to exit the rtc menu. If SET and △ are held, the control will exit program mode. Use ▽ and SET to return to program mode.

Use the △ or ▽ buttons to find the PAr menu, then press SET to select.

Use SET and △ ▽ buttons to select and adjust pressure parameters.

Pressure Parameters

Par.	Description	Value Range
StC	Pressure	0-135 (psi)
rEF	Refrigerant	22, 134, 404, (4)07A, (4)07C, 507 (may vary by model)

3 Set defrost parameters and schedule

From the PAr menu, use SET and △ ▽ buttons to select and adjust defrost parameters.

Scan to watch a video on how to set the defrost mode

Defrost Parameters

Par.	Description	Value Range
idF	Interval between defrost	0- 120 (hours)
MdF	Max duration	0-255 (minutes)
EdF	Defrost mode	nU (off), in (interval), rtc (clock)
Ld1	1st start time	nU (not used), 0-23:50
Ld2	2nd start time	
Ld3	3rd start time	
Ld4	4th start time	
Ld5	5th start time	
Ld6	6th start time	

IMPORTANT BEFORE PROGRAMMING – DETERMINE DESIRED DEFROST MODE

1. Press and Hold SET + DOWN for 3 seconds
2. Using arrows scroll to RTC and select by pressing SET
3. Press UP or DOWN and select EdF
4. Press SET and select interval mode (in), real time clock mode (rtc), or not used (nU)
5. Press SET to confirm section then proceed to step 6 if (in) selected, or step 8 if (rtc) selected

Interval Mode (in) - Interval between defrost cycles
RTC Mode (rtc) - Real time clock based defrost schedule
Not Used Mode (nU) – Defrost not used

IF USING INTERVAL DEFROST MODE (in)

6. Scroll through options and select (idF) by pressing SET. Scroll to desired defrost interval (hours) and confirm by pressing SET.
7. Scroll through options and select (NdF) by pressing SET. Scroll to desired defrost duration (minutes) and confirm by pressing SET.

IF USING TIME OF DAY DEFROST MODE (rtc)

8. Scroll to Ld1 and confirm by pressing SET. Set desired defrost time(0.1 = 12:10AM, 13.5 = 1:50PM) and confirm by pressing SET
9. Scroll to Ld2-Ld6 and repeat step 8 for each desired time of day. Set all unneeded options to (nU)

Navigation

Enter program mode* ▽ + SET 3 seconds (F flash)
Cycle through options/adjust values △ ▽
Select funtion/store function SET
Exit program mode △ + SET
*Program mode will terminate after 60 seconds of inactivity.

Scan to watch a video on how to set the setpoints. Starts at 8:00

View Values and Set Points

From main screen, press and release	△
Cycle through parameters	△ ▽
Select value	SET
Go to next parameter	SET
Exit menu	△ + SET

*Program mode will terminate after 60 seconds of inactivity.

Values and Set Points

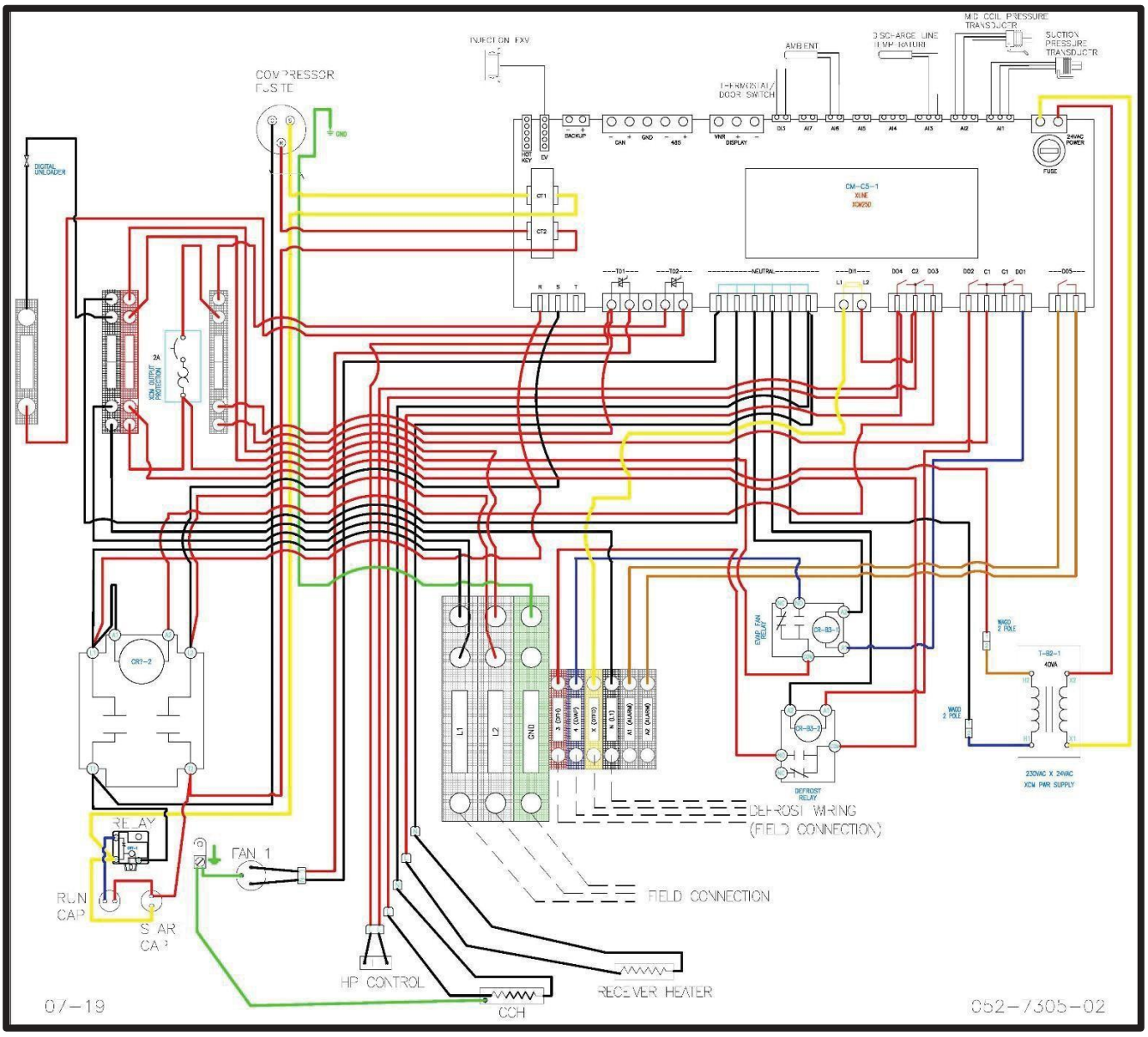
Par	Description	Par	Description
P IP	Suction Pressure	oPP	EXV %
P2t	Cond. Temp.	LLS	NA
P2P	Disc. Pressure	Foo	Fan Speed %
P3t	DLT	dSo	NA
P4t	Vapor Inlet	Lt	NA
P5t	Vapor Outlet	Ht	NA
P6t	Ambient Temp	Hn	RTC Menu
P7t	Liquid Line Temp	Std	Dynamic Fan Set Point
SH	NA		

Code	Description
01	AI1
02	AI2
03	AI3
04	AI4
05	AI5
06	AI6
07	AI7
08	Battery
09	Current sensor 1
10	Current sensor 2
11	Voltage sensor 1
12	Voltage sensor 2
13	Voltage sensor 3
20	Lost phase
21	Phase sequence
22	Phase imbalance
23	Over current
24	Open run circuit
25	Open start circuit
26	Under voltage
27	Over voltage

E-Error L= Lockout

Code	Description
28	Compressor build-in protector trip
29	Power frequency (manual)
40	High pressure switch
41	Low pressure switch
42	High pressure
43	Low pressure
44	Discharge line temperature
45	High condenser pressure alarm
46	High condenser temperature
47	EXV full open in EVI
48	Refrigerant shortage error in EVI
49	Pump down alarm
50	High side flood back
53	Open digital compressor safety chain
66	Door open alarm
80	RTC warning, date not correct
81	RTF warning, communication with clock
82	Probe configuration
83	DI configuration
84	Compressor configuration
85	Injection probe configuration
86	EEPROM R/W (manual)

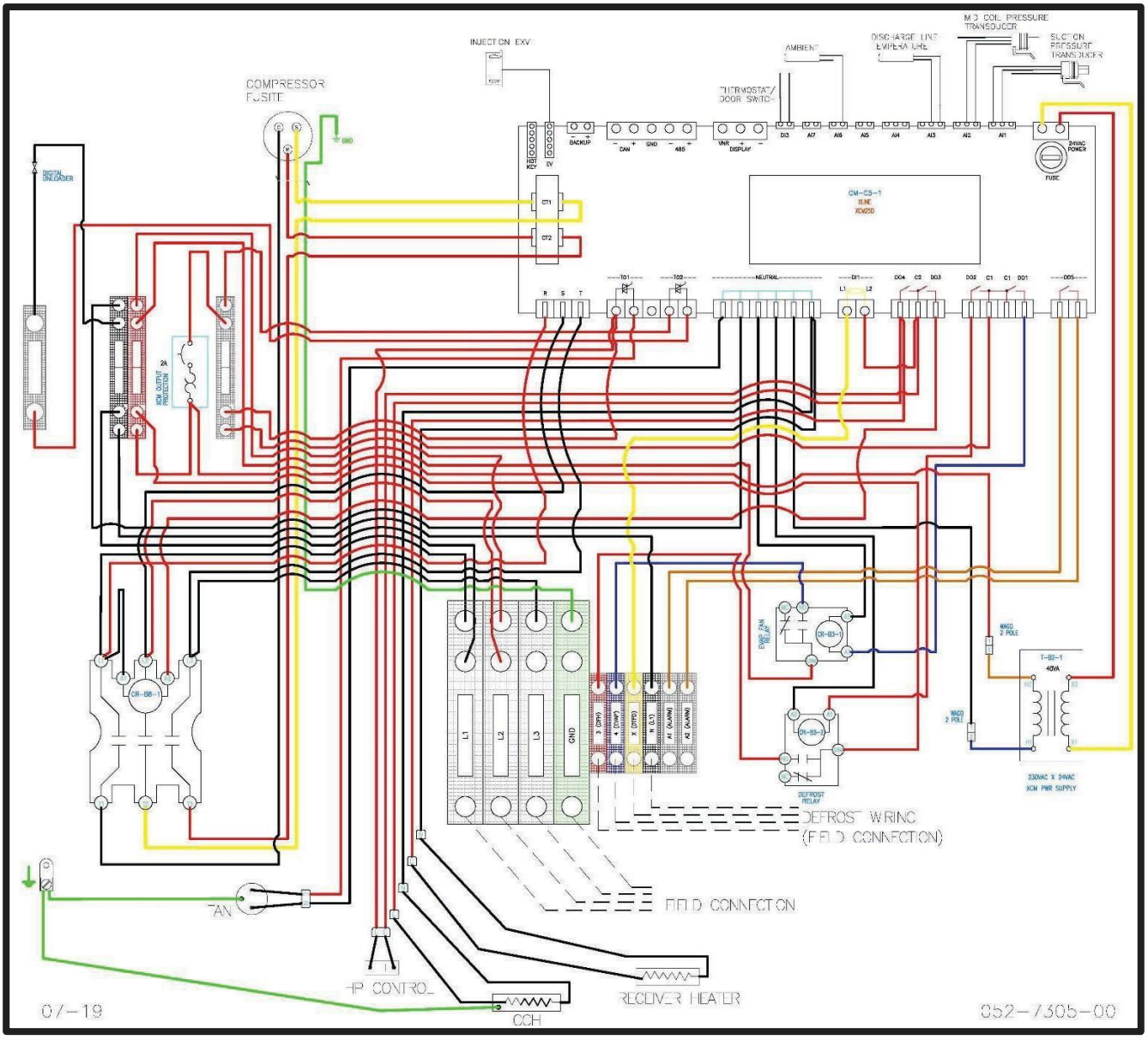
Wiring Diagrams



052-7305-02

230V Medium Temp Digital Single Phase 3 HP

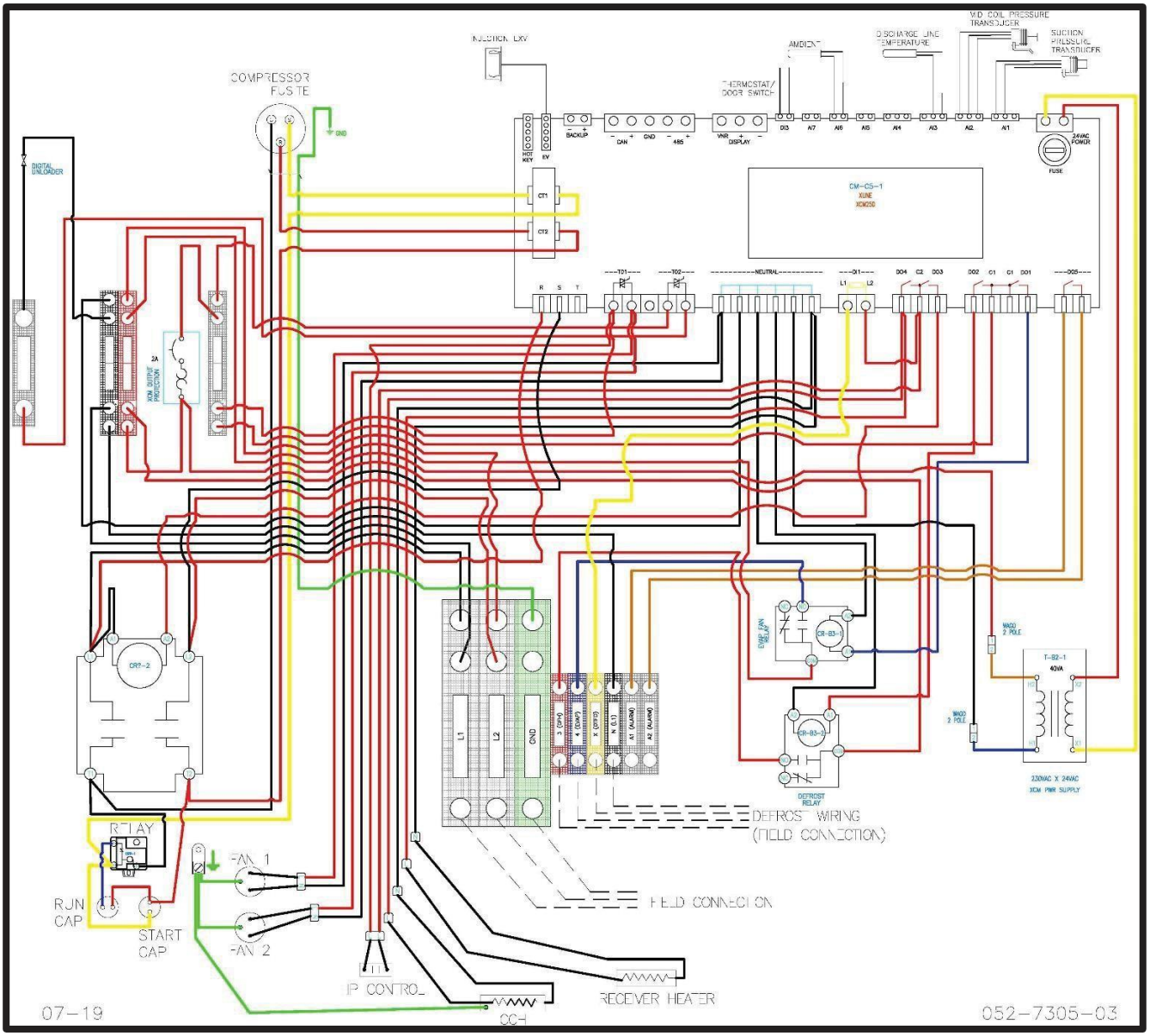
1 Condenser Fan



052-7305-00

230V Medium Temp Digital Three Phase 3 HP

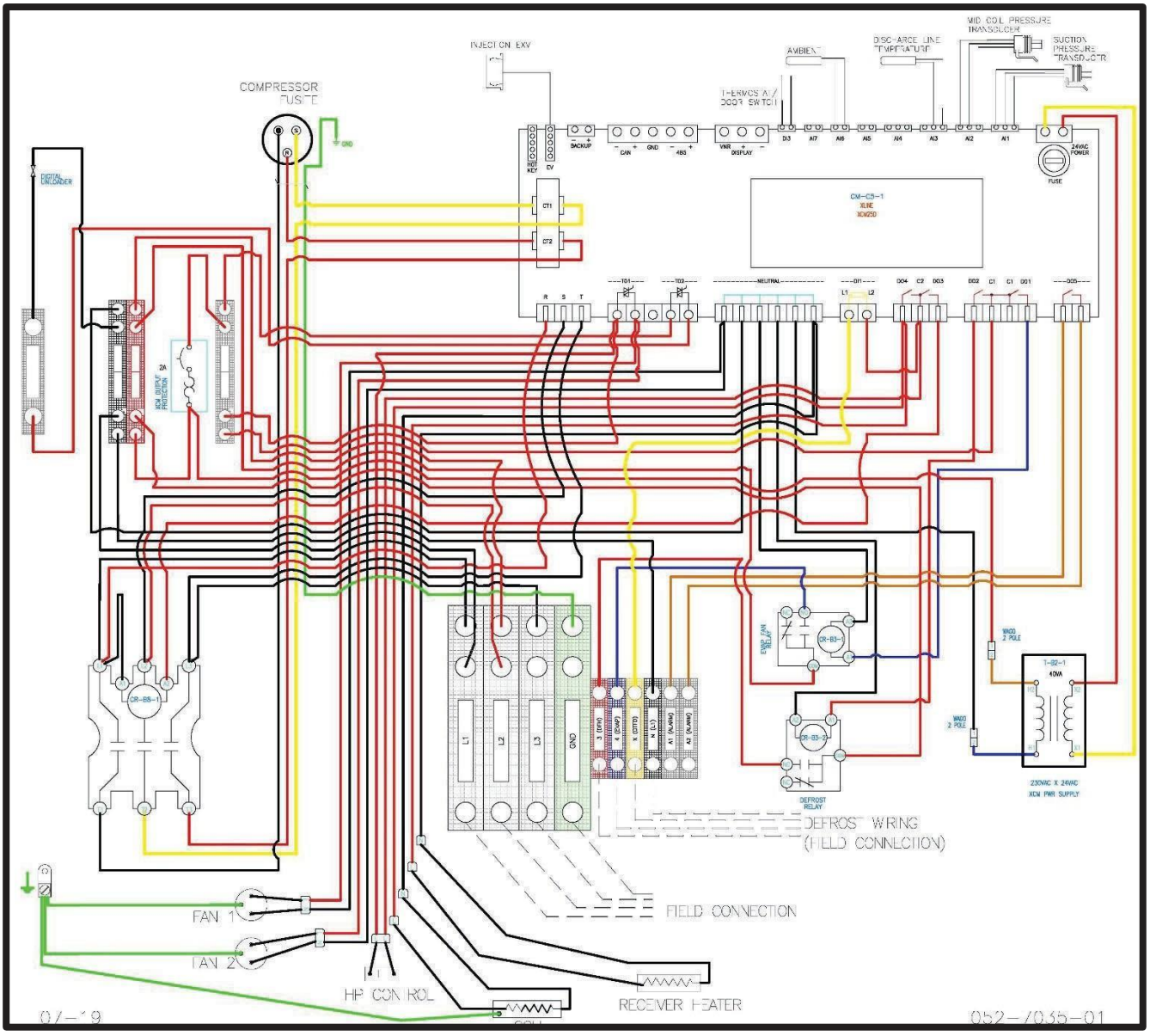
1 Condenser Fan



052-7305-03

230V Medium Temp Digital Single Phase 4 to 6 HP

2 Condenser Fans



052-7305-01

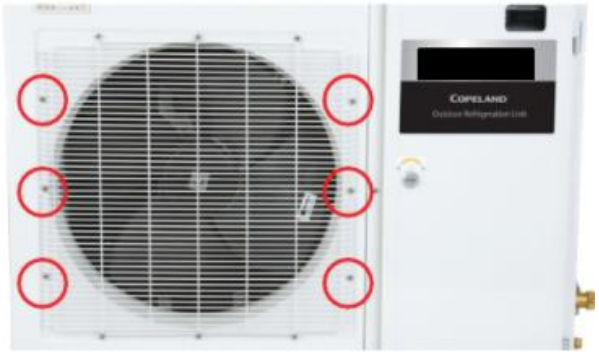
230V Medium Temp Digital Three Phase 4 to 6 HP

2 Condenser Fans

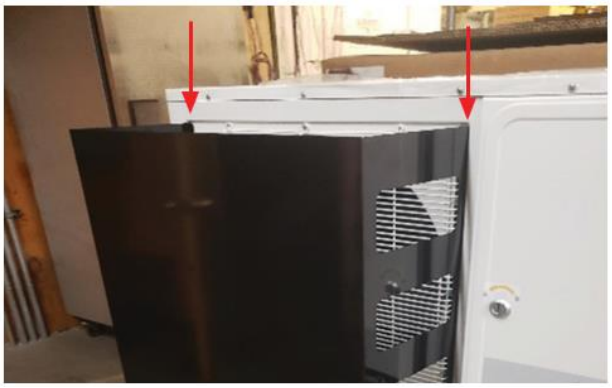
Appendix D: Wind Baffle Attachment Instructions

Copeland Outdoor Refrigeration Unit X-Line Series

1.Ensure the unit is powered off; then remove the side screws (circled in the photo shown below).

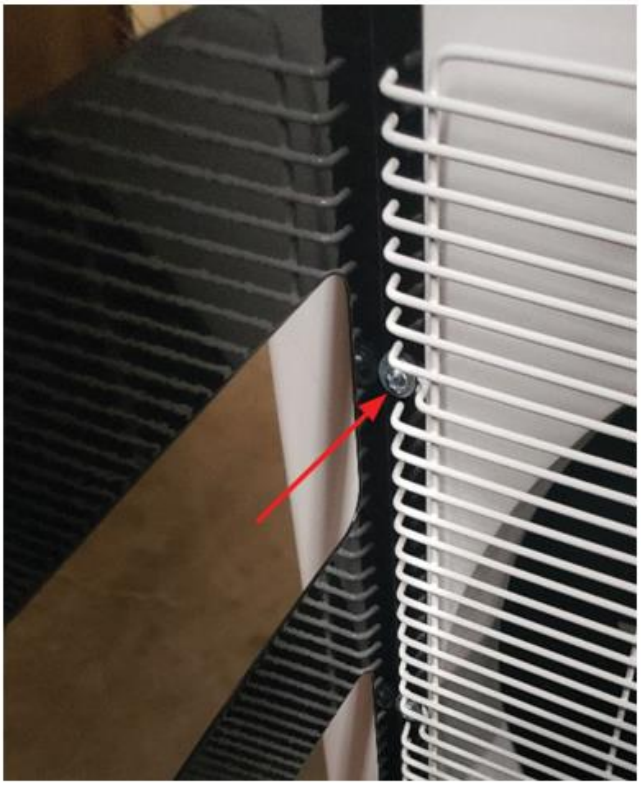


2.Set the wind baffle in the indentation between the fanguard and the unit by sliding from the top to the bottom.



3.Begin screwing in the provided screws/washers. Start at the upper corners with the washer between the screw head and fan guard. It is recommended using an attachement on a screw driver to increase reach/ ease of use

4. Screw in the final four screws into the sides, attaching the wind baffle to the unit (example in the photo below)



Appendix E: Remote receiver installation instructions

Copeland™ Outdoor Refrigeration Unit, X-Line Series
Additional Remote Receiver Installation Instructions

Purpose of the additional remote receiver:

The additional remote receiver provides a reservoir for refrigerant during normal operation of a refrigeration system, ensures availability of a reserve quantity of refrigerant during periods of high load demands and provides a place to store the refrigerant charge during either automatic or service pump downs.

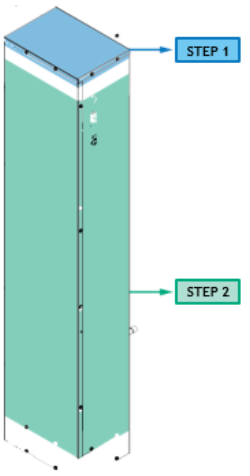
Please refer to Table 3 of AE5-1412 which gives the receiver capacity of the unit you are working on. If the total system charge exceeds the amount of the receiver in the unit this remote receiver will allow for additional refrigerant storage.

Safety Statements

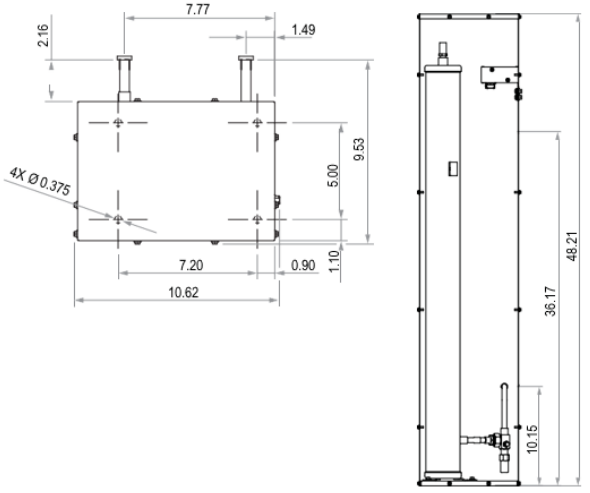
- Only qualified and authorized HVAC or refrigeration personnel are permitted to install commission and maintain this equipment.
- Electrical connections must be made by qualified electrical personnel.
- All valid standards and codes for installing, servicing, and maintaining electrical and refrigeration equipment must be observed.
- Refrigerant must be removed from the system prior to starting this procedure.
- During installation or maintenance procedure of a system never leave it unattended when it has no charge. A servicing tag must be used for advising to other technician about servicing procedure running. This
- will prevent unauthorized personnel from accidentally starting the equipment and potentially ruining the compressor by operating with no refrigerant.

Step 1
Remove the top cover by unfastening the six screws around the top of the receiver assembly

Step 2
Remove the front cover by unfastening the ten screws around the sides and bottom of the of the receiver assembly.



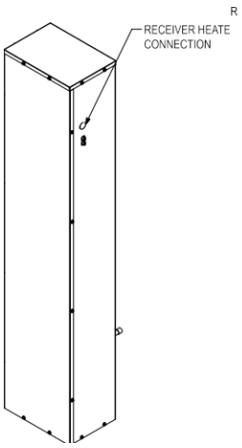
Step 3
Once inside, find the four mounting holes on the bottom plate of the assembly. Use these mounting holes to remotely secure the receiver assembly down within a few feet of the condensing unit to prevent tipping.

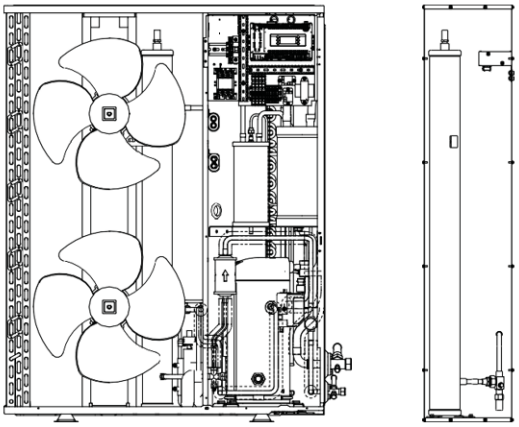


Auxiliary Tank Additional Volume Capacity

R-22	R-134a	R-404A	R-407A	R-407C	R-448A	R-449A
15.5	15.7	13.4	14.8	14.8	14.2	14.3

Step 4
Install the electrical cable from the X-Line unit to the receiver assembly. Do this by connecting into the receiver heater the connections between Neutral and D4 on XCM25D in the X-Line unit. Then, run a 18 to 14 gauge watertight cable from the X-Line unit to the receiver assembly.

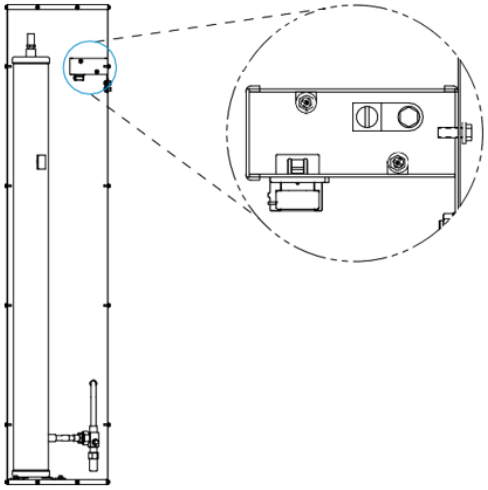




Step 5
Remove the two screws to remove the cover of the electrical box within the receiver assembly.

Step 6
Wire the receiver heater to the wires just ran from the X- Line unit in step #4.

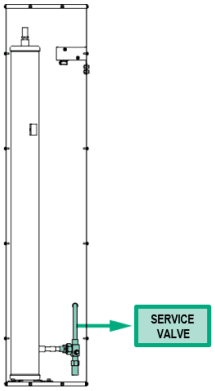
Step 7
Reinstall the electrical box cover after wiring is complete.



Step 8
Install line set using inlet and outlet stub tubes to connect into the system.

Step 9
Open the receiver service valve and vacuum system.

Step 10
Once the system has been checked for leaks, add refrigerant, open all service valves and start unit.



Step 11
Reinstall the front cover by fastening the ten screws around the side and the bottom of the assembly.

Step 12
Reinstall the top cover by fastening the six screws around the top of assembly.