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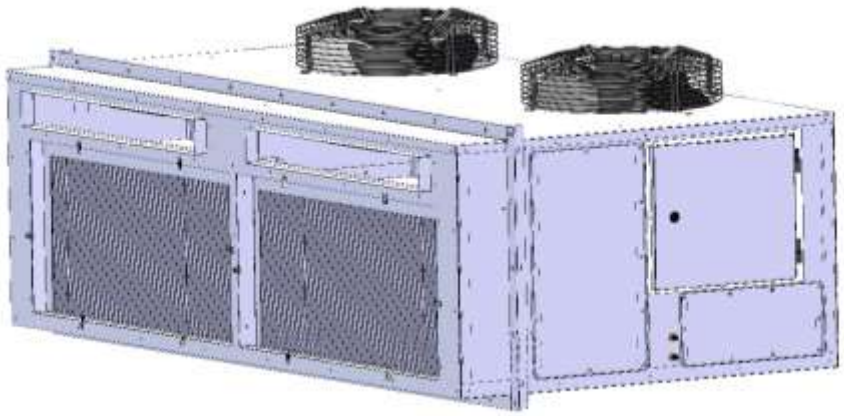
D120FMCGA2DDA01



REV A DATE 03/17/15

TABLE OF CONTENTS

System Specifications

Capacity: 120,000 BTU/hr @ 80F db/67F wb return air, 95F ambient air temperature

Supply Airflow: **3500 CFM @ 0.5”**
Heat Capacity: **9 kW Per Side**
Condenser Airflow: **6000 CFM**
Refrigerant: **17 lbs. R407C Per Side**

POWER:

230 VAC 1 PHASE 60 Hz

Per Side:

1 - .75 kW	Cond. Fan Motor	3.4 FLA
1 - 5.7 kW	Compressor	28.8 FLA
1 - .50 kW	Evap. Fan Motor	2.8 FLA
2 - 4.5 kW	Electric Heater	20.0 FLA ea.

MAX OVERCURRENT PROTECTION (MOP): 110
MINIMUM CIRCUIT AMPACITY (MCA): 90
COOLING FLA: 36
HEATING FLA: 45
COMBINED FLA: 81

Sequence of Operations

- System is turned on by the PGD display interface or selector switch
- System reads temperatures, humidity (optional) and system refrigerant pressures, as well as checks all alarm circuits for faults
- If unit is turned on and no faults are present, the evaporator fan contactor will be activated. The evaporator fan and condenser fans will run for 30 seconds as a purge cycle. The condenser fans will be deactivated; the evaporator fan will stay activated.
- Digital Compressor starts and runs modulating to maintain suction pressure set point.
- Based on cooling demand the system provides 0 – 10v output to digital compressor
- The condenser fans speed up and down based on pressure using a 0 – 10 volt analog signal to the drive.
- Heating is activated when the temperature drops below set point by 2° and turns off when temperature is satisfied.(Can be configured through factory)
- If there is a need for heating, the system stops cooling by bringing compressor demand to 0% and shut off when in cycling mode (optional)
- In the case of high humidity, the system will run cooling and heat at the same time to dehumidify and maintain temperature set points.(optional)
- When humidification is required, the system enables the humidifier contactor and sends a 0-10 volt signal to the CP4 board. (optional)
- In the event of an alarm, the system will display each one with a time and date stamp. This will be displayed until the problem is solved and alarm is reset by the control pad display.

WALL MOUNT, 2.8V PCO3 SMALL

		Analog Input	NTC Probe (max.5)	PT 1000 (max.2)	ON/OFF (max.2)	0-1V (max.3)	0-10V (max.3)	0-20 mA (max.3)	0-5V Ratiometric (max.3)	4-20 mA (max.3)	Digital Input	24 Vac/Vdc (max.8)	110/230 Vac (max.N/A)	Anolog Output	0-10 V (max.4)	Digital Output	Relay (max.8, 250Vac 8A res.)	Switching (max.1, 24Vac/dc 10W)
	Analog Inputs																	
AI-1	Low pressure sensor								X									
AI-2	High pressure sensor								X									
AI-3	Humidity Sensor (optional)					X												
AI-4	Room temperature		X															
AI-5	Suction temperature (optional)		X															
		Total	2			1			2									
	Digital Inputs																	
DI-1	Phase monitor											X						
DI-2	Evaporator fan fault											X						
DI-3	Condenser fan fault											X						
DI-4	Low air flow switch or Generator status											X						
DI-5	Heater fault											X						
DI-6	Compressor 1 fault											X						
DI-7	Humidifier fault or Compressor #2 Fault (optional)											X						
DI-8	On/Off switch											X						
											Total	8						
	Analog Output																	
AO-1	Condenser fan VFD 0-10vdc													X				
AO-2	Evaporator fan VFD 0-10 vdc													X				
AO-3	Digital compressor demand													X				
AO-4	Humidifier demand (optional)													X				
														Total	4			
	Digital Outputs																	
DO-1	Heater #1 contactor															X		
DO-2	Heater #2 contactor															X		
DO-3	Heater #3 contactor (optional)															X		
DO-4	Evaporator fan contactor															X		
DO-5	Standard compressor or #2 compressor contactor (optional)															X		
DO-6	Remote Alarm Contact															X		
DO-7	Condenser fan VFD enable															X		
DO-8	Humidifier enable (optional)															X		
															Total	8		

Pco Address 1

***When using lead lag option the second unit Pco address will be 2

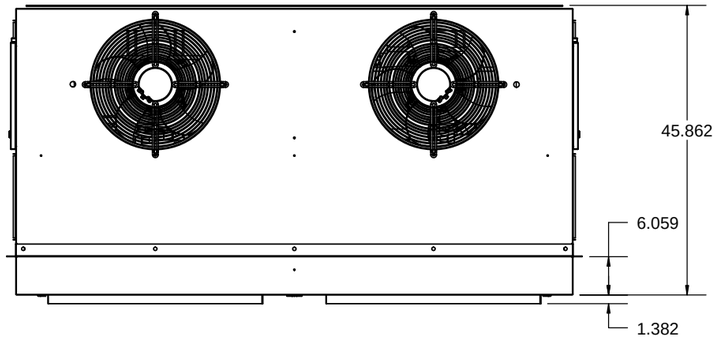
First Unit Hot Gas EVD Address 3

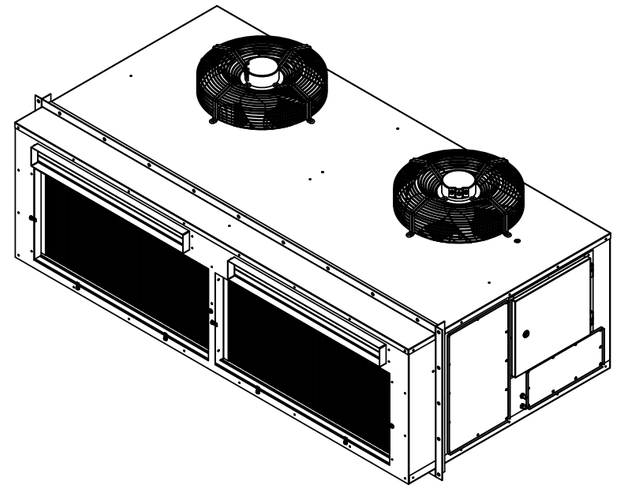
Second Unit Hot Gas EVD Address 4

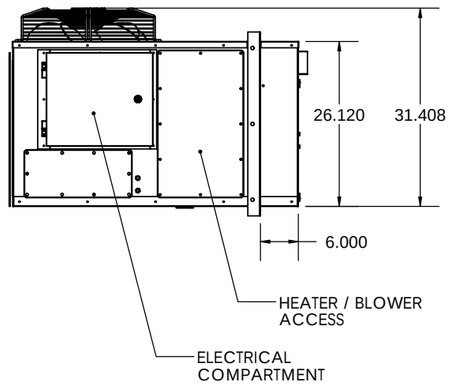
05/11/10

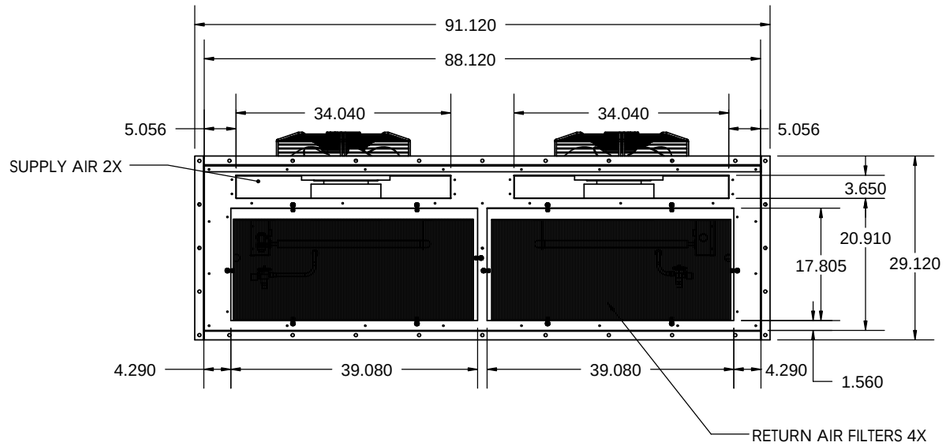
- o 120,000 BTU / hour total cooling capacity at 95°F
- o 60,000 BTU / hour per zone
- o Copeland digital scroll compressor that provides modulating cooling capacity
- o Ambient operation from -30°F to 120°F
- o 18 kW resistive heat capacity (9 kW per zone)
- o 230 VAC, Single-phase, 60 Hz power
- o Programmable Logic Controller (PLC)
- o High quality German-designed axial condenser fan & motorized impeller evaporator blower
- o Two remote programmable displays (P/N 20EPGD1)
- o Tubular frame construction with 12-18ga sheet metal exterior
- o Standard white polyester powder coat finish
  {Contact us for quote and lead time for non-standard color and/or spray paint}
- o Hinged access doors with tool-access latches
- o R-407C EPA-compliant refrigerant
- o One (1) year parts warranty

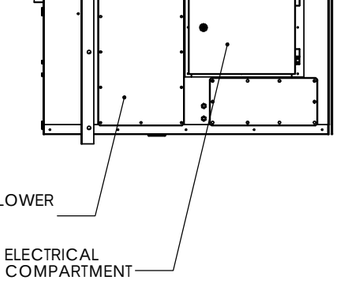
REVISIONS			
REV.	DESCRIPTION	DATE	ECN
000	DRAWING RELEASE	2/7/15	

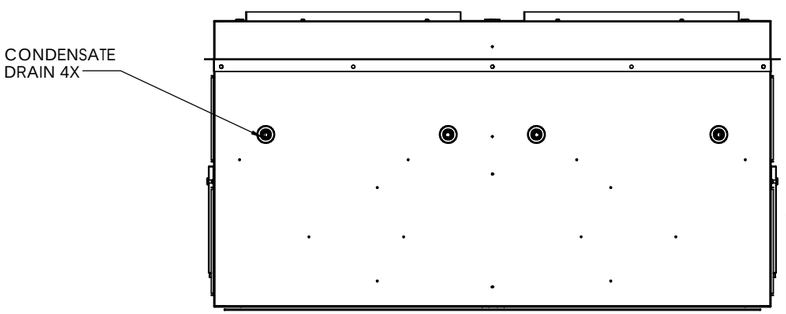












UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/16"
BEND ± 4°
TWO PLACE DECIMAL ± 0.07"
THREE PLACE DECIMAL ± 0.063"

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN BY	WDR	2/7/15
APPROVED BY	*WDR 3/20/2015*	

Northern-Air

TITLE:
D120FMCGA2DDA01

SIZE	DWG. NO.	
B	D120FMCGA2DDA01	
SCALE: 1:24		SHEET 1 OF 1

208 VAC 1PH 60Hz
HEAT FLA = 45A
COOLING FLA = 36A
MCA = 90A MOP = 110 A

L1
L2
PDB-1
16 AWG Red
16 AWG Black
GRY - 480VAC
BRN - 240VAC
ORG - 208VAC
WHT - 120VAC
BLK - COM
20E694M2A
TX-1
100 VA
RED - COM
RED - 24VAC
INTERNAL 6A CB1
-24VAC 16 AWG Black
+24VAC 16 AWG Red
-24VAC1.1
+24VAC1.1
20G54901
24VAC2.1
+24VAC2.1
5.0-4

20ED32B7
32A
5/L3
3/L2
1/L1
6/T3
4/T2
2/T1
CC-1
10 AWG Red
10 AWG Black
133 10 AWG Red

L4 - CONDENSER SECTION
20E918-0043-00
0.3A
800 Ohms
70W
CH-1
16 AWG Red
10 AWG Orange
CC-1 21
20E03287
22
137 10 AWG Orange CA-C1ORG
10 AWG Brown
CA-C1BRN

SSM-1
R - RUN WINDING
RC - RUN CAP
T2
SECURE START MODULE
S - START WINDING
X - NOT USED
C - COMP COMMON
20E543012000
RC-1
20E014006427
Emerson Climate Tech
80uF
135 10 AWG Red
134 12 AWG Red
074 12 AWG Black

10 AWG Red CA-C1RED
10 AWG Blue CA-C1BLU
10 AWG Black CA-C1BLK
134
077
074
DCC-1
20ETT72A10
T2/S
T3/R
T1/C
CA-C1YEL
10 AWG Yellow CA-C1YEL
GND
S
R
C
20RZRD612301
ZRD61KCE-PFV-250
5,700 Watts
RLA: 28.8A MCC:45.0A
3~ M
C-1

20G55801
25A
HC-1
12 AWG Red
12 AWG Black
087 12 AWG Red
089 12 AWG Black

L2 - HEATER JUNCTION BOX
12 AWG Green
20EL300F
TOS-1
088 12 AWG Red
20E45KW208
20A
10 Ohms
4.5 kW
H-1

20G55801
25A
HC-2
094 12 AWG Red
096 12 AWG Black
20EL300F
TOS-2
095 12 AWG Red
20E45KW208
20A
10 Ohms
4.5 kW
H-2

L3 - EVAP SECTION
16 AWG Red CA-EB1RED
16 AWG Black CA-EB1BLK
16 AWG Yellow | Green CA-EB1YEL
N-BLU
L1-BLK
PE-GRN/YEL
20MR3G280AF35
R3G280-AF35-71
0.5 kW
2.8A
~ M
EB-1

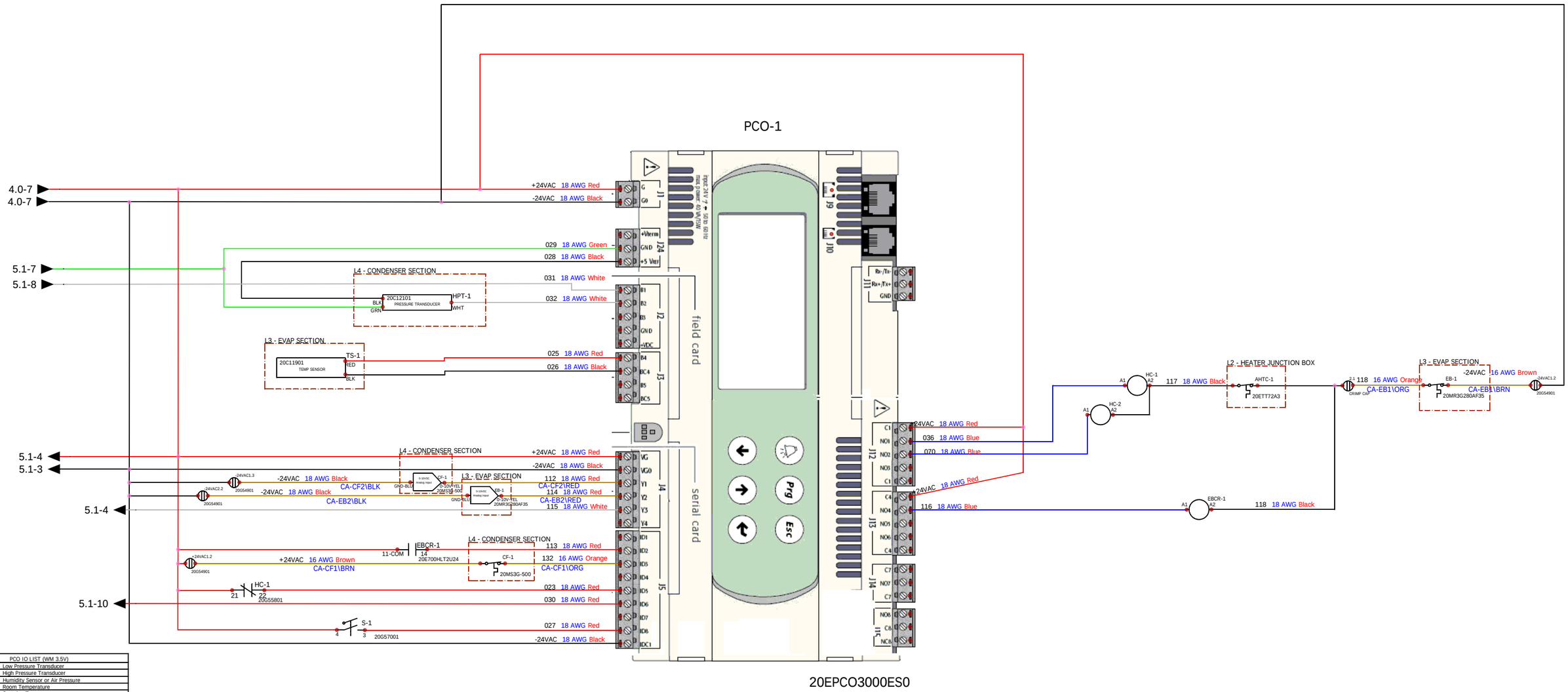
L4 - CONDENSER SECTION
16 AWG Red CA-CF1RED
16 AWG Black CA-CF1BLK
16 AWG Yellow | Green CA-CF1YEL
N-BLU
L1-BLK
PE-GRN/YEL
20MS3G-500
S3G500-AM56-21
0.75 kW
3.4A
~ M
CF-1

Northern-Air

	NAME	DATE	REV.	DATE	NAME	CHANGES
DRAWN BY:	TJF	2/5/2015	A	2/5/2015	t.frieday	
APPROVED BY:						

D120FMCGA2DDA01
POWER

REVISION A
SCHEME 4.0



20EPCO3000ES0

PCO IO LIST (WM 3.5V)	
J2:B1	Low Pressure Transducer
J2:B2	High Pressure Transducer
J2:B3	Humidity Sensor or Air Pressure
J3:B4	Room Temperature
J3:B5	Sunction Temperature
J4:Y1	Condenser Fan 0-10VDC
J4:Y2	Evaporator Fan 0-10VDC
J4:Y3	Digital Compressor Demand
J4:Y4	Humidifier Demand
J5:ID1	Phase Monitor
J5:ID2	Evaporator Fan Fault
J5:ID3	Condenser Fan Fault
J5:ID4	Low Air Flow/Generator Status
J5:ID5	Heater Fault
J5:ID6	Compressor #1 Fault
J5:ID7	Humidifier Fault/Compressor #2 Fault
J5:ID8	On/Off
J12:NO1	Heater #1 Demand
J12:NO2	Heater #2 Demand
J12:NO3	Heater #3 Demand/Std Comp #2 Demand
J13:NO4	Evaporator Fan Demand
J13:NO5	Std Comp #1 Demand/Digital Comp #2 Demand
J13:NO6	Remote Alarm
J14:NO7	Condenser Fan VFD Enable
J15:NO8	Humidifier Enable
J15:NC8	

Northern-Air

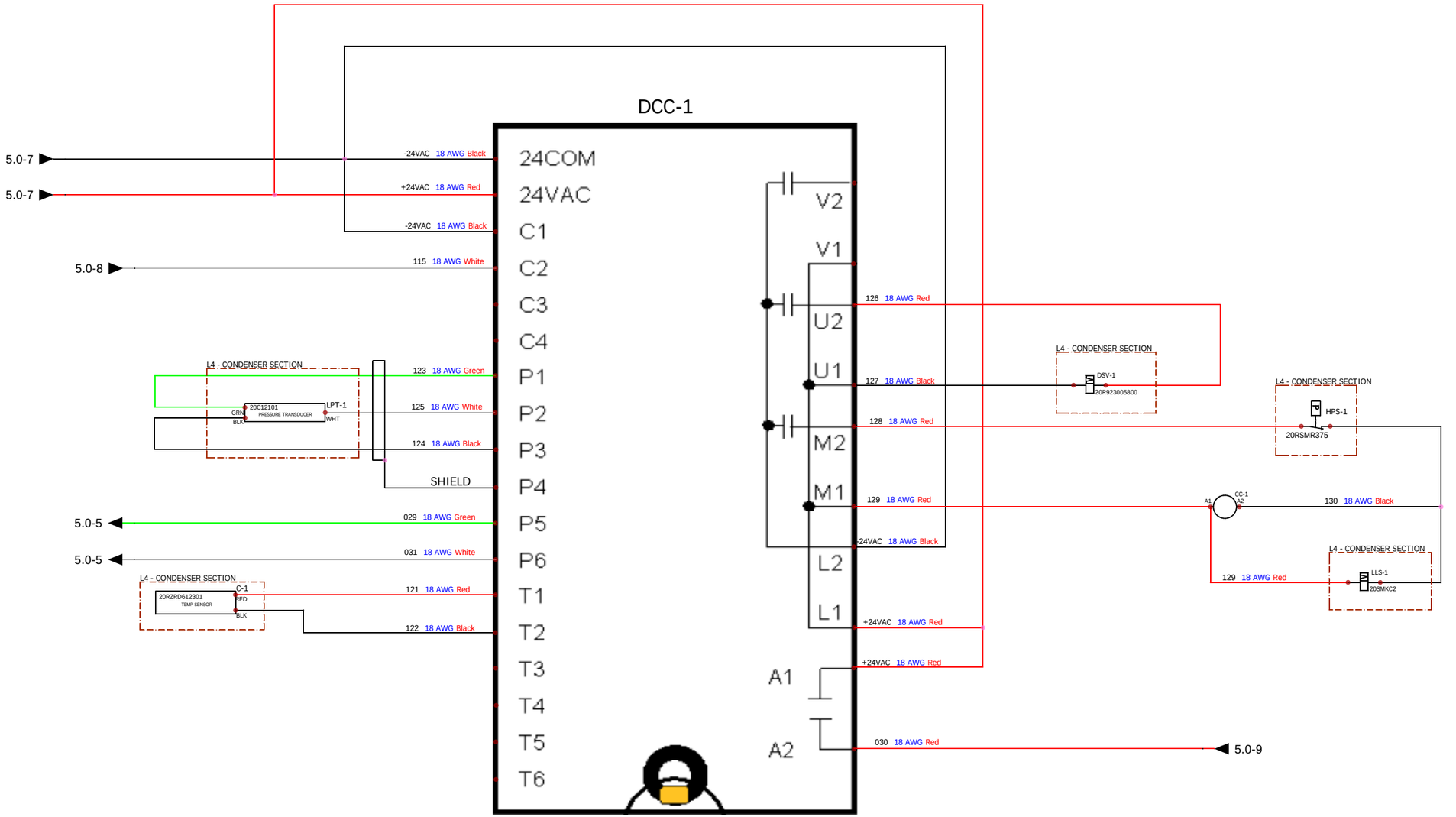
	NAME	DATE	REV.	DATE	NAME	CHANGES
DRAWN BY:	TJF	2/5/2015	A	2/5/2015	t.frieday	
APPROVED BY:						

D120FMCGA2DDA01

PLC CONTROL

REVISION A

SCHEME 5.0



20ETT72A10

DCC TERMINALS

24COM Module Common
24VAC Module Power
C1 Demand Common
C2 Demand Input +5VDC
P1 Pressure Common
P2 Pressure Signal
P3 Pressure Power +5VDC
P4 Pressure Shield
P5 Pressure Output Common
P6 Pressure Output +5VDC
T1 Discharge Temp Sensor
T2 Discharge Temp Sensor

A1 Alarm Relay Out
A2 Alarm Relay Out
M1 Contactor Coil
M2 Contactor Coil
L1 Control Voltage N
L2 Control Voltage L
U1 Digital Unloader Solenoid
U2 Digital Unloader Solenoid
V1 Vapor Injection Solenoid
V2 Vapor Injection Solenoid

Northern-Air

	NAME	DATE	REV.	DATE	NAME	CHANGES	REVISION
DRAWN BY:	TJF	2/5/2015	A	2/5/2015	t.frieday		A
APPROVED BY:							SCHEME
							5.1

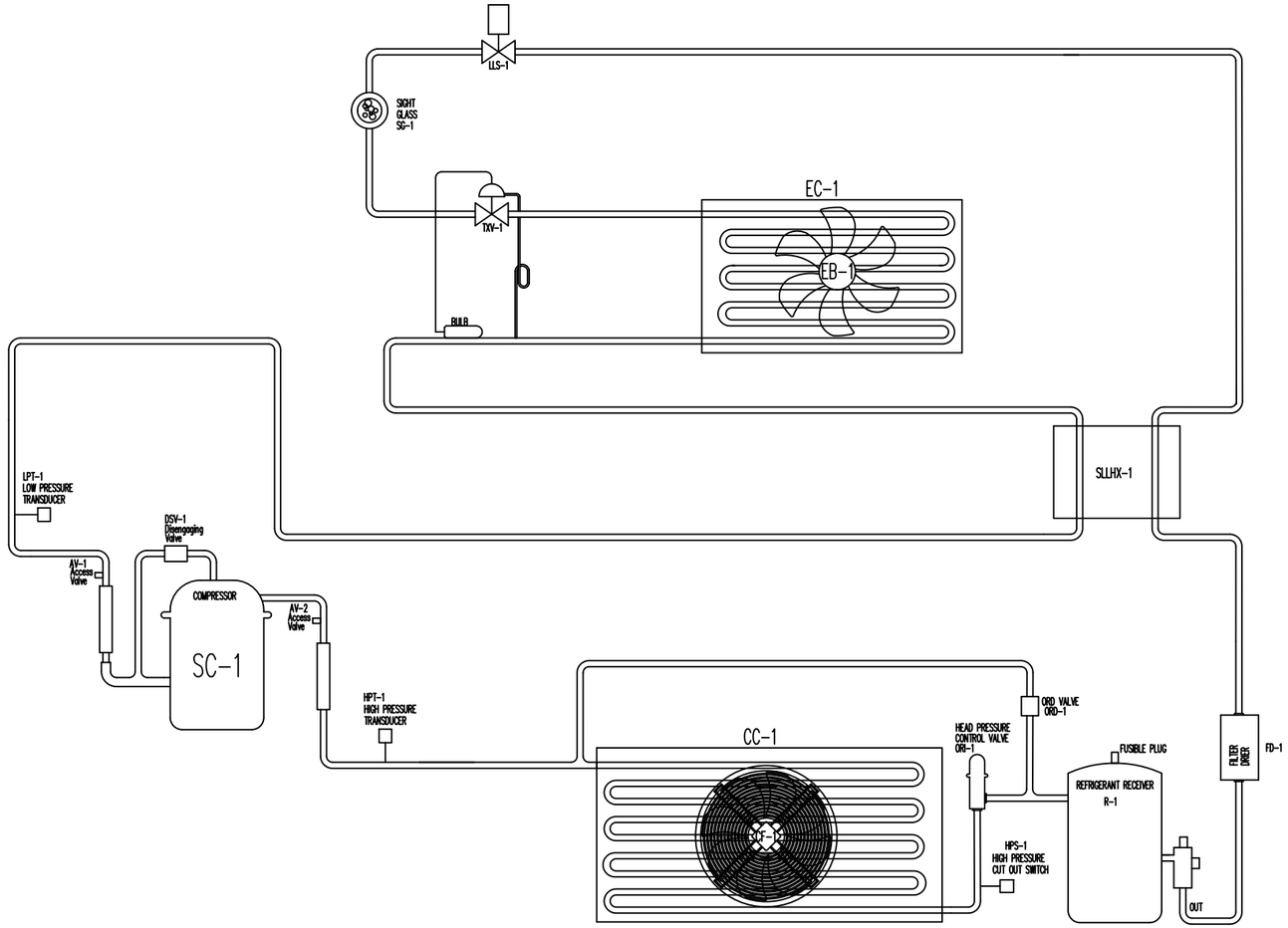
D120FMCGA2DDA01 — DIGITAL COMP CONTROL

CHARGING INFORMATION

Proper Refrigerant charge is critical for proper operation of unit across varying ambient conditions. System may operate with clear sight glass in warmer temperatures then charge may be insufficient once ambient temperatures drop.
Service Personnel should be familiar with head pressure control valves and their operation.
Consequently the only accurate method is to remove all refrigerant and weigh in charge to system name plate specifications.
If removing refrigerant to weigh use only clean non contaminating recovery tanks.
Systems using blended refrigerants and had refrigerant leaks we recommend replacing with all new refrigerant. 407C is a blended refrigerant.

REVISION HISTORY

REV	DESCRIPTION	DATE	ECN#
A	INITIAL RELEASE	10/18/2010	



ABBREVIATION	DEFINITION
AV	ACCESS VALVE
CC	CONDENSER COIL
CF	CONDENSER FAN
DSV	DISENGAGING VALVE
EB	EVAPORATOR BLOWER
EC	EVAPORATOR COIL
FD	FILTER-DRYER
HPS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
LLS	LIQUID LINE SOLENOID
LPT	LOW PRESSURE TRANSDUCER
ORD	DIFFERENTIAL PRESSURE VALVE
ORI	HEAD PRESSURE CONTROL VALVE
R	RECEIVER
SC	SCROLL COMPRESSOR
SG	SIGHT GLASS
SLLHX	SUCTION LIQUID LINE HEAT EXCHANGER
TXV	THERMAL EXPANSION VALVE

	NAME	DATE
DRAWN	TMR	4/14
CHECKED	TMR	4/14
ENG. APPR.	TMR	4/14

Northern-Air

TITLE: REFRIGERATION DIAGRAM

SIZE	DWG. NO.	REV
B	D120FM-12-00001	A

SCALE: NONE | WEIGHT: | SHEET 1 OF 1

DIGITAL SCROLL INFORMATION

Flash Code Troubleshooting

While each ALERT code is active, the alarm relay contacts (A1 and A2) are closed. The ALERT code will remain active and the alarm relay contacts closed until the reset conditions have been met or 24 VAC power has been cycled off and on. All Flash Codes except Code 6 and 8 result in the compressor contactor, unloader solenoid and vapor injection being deenergized.

All LEDs flashing at the same rate indicates 24VAC supply is too low for operation. All LEDs on solid at the same time indicates Digital Compressor Controller failure.

Whenever power is cycled off and on, the current Flash Code and all internal counters are reset.

Flash Code 1 – Reserved for future use

Flash Code 2 – High Discharge Temperature

The discharge temperature thermistor has measured a temperature above 268°F (130°C) or the thermistor is short circuited (jumpered out)

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

The compressor will be allowed to restart after a 30 minute delay and after the thermistor temperature is below 250°F (120°C). The Flash Code and alarm relay contacts will be reset after the compressor has run for 60 uninterrupted minutes without any other alerts.

If five high discharge temperature ALERTs have occurred within four hours, the Digital Compressor Controller will lock out the compressor. The lockout can only be reset by cycling the 24VAC power off and on.

Flash Code 3 – Compressor Protector Trip

The demand signal from the system controller is greater than 1.44VDC and there is no compressor current detected. This could be due to the compressor's internal overload protector being open, fuse or breaker open, power disconnected to compressor contactor, compressor power wiring not run through Digital Compressor Controller current transformer port or a compressor contactor failure.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

The Digital Compressor Controller will wait for the two minute anti-short cycle timer to time out and if the system controller demand signal is still greater than 1.44VDC, energize the compressor contactor again. If compressor current is detected on the restart, the ALERT code and alarm relay output will reset. The Digital Compressor Controller will attempt to restart compressor as long as the system controller demand is above 1.44VDC there is no lockout feature for this ALERT.

Flash Code 4 – Locked Rotor

A locked rotor condition in the compressor is sensed by the Digital Compressor Controller on four consecutive start ups.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

This code results in a lockout and can only be reset by cycling the 24VAC power off and on.

Flash Code 5 – Demand Signal Loss

The demand signal input has dropped below 0.5VDC. The demand input signal wire may be disconnected or the system controller providing the signal may not be powered.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

Once the system controller demand signal input has risen above 0.5VDC, the ALERT code, and alarm relay output will reset. If the demand signal is above 1.44VDC and the anti-short cycle timer has timed out, the compressor will restart.

The alarm relay contacts will close and the Digital Compressor Controller will not increase the capacity of the compressor beyond 50% loading.

This ALERT code and alarm relay output are reset by reconnecting the thermistor.

Flash Code 7 - Unloader Solenoid Fault

Reserved for future use

Flash Code 8 - Compressor Contactor Fault

Compressor current is detected when the system controller demand signal is below 1.44VDC. The compressor contactor may have welded contacts or the contacts may be mechanically jammed. The compressor will continue to run in this condition since the Digital Compressor Controller cannot open the compressor contactor.

The Digital Compressor Controller will energize the compressor contactor and vapor injection solenoid. The alarm relay contacts will close. The unloader solenoid will remain energized causing the compressor to run unloaded as long as the system controller demand signal is less than 1.44VDC. If the system controller demand is greater than 1.44VDC, the unloader solenoid will deenergize causing the compressor to run loaded.

The ALERT code and alarm relay output are reset when current is no longer detected while system controller demand signal is below 1.44VDC.

Flash Code 9 - Low 24VAC Supply

Supply voltage to the Digital Compressor Controller has dropped below 18.5VAC.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts may close if the voltage is high enough for the alarm relay to pull in.

The ALERT code and alarm relay output are reset when the supply voltage to the Digital Compressor Controller rises above 19.5VAC.

Testing the Installed Digital Compressor Controller

Once installed, the Digital Compressor Controller can be tested to verify it is working properly. In each test, 24VAC must be supplied to 24VAC and 24COM. For the output test, 24VAC must be supplied to L1 and L2.

Input Tests

Thermistor Input – disconnect the discharge temperature sensor wires from terminals T1 and T2. If functioning normally, the Digital Compressor Controller should display a Code 6 unless a previous ALERT code was present.

Demand Input – disconnect the System Controller Demand signal wires from C1 and C2. If functioning normally, the Digital Compressor Controller should display a Code 5 unless a previous ALERT code was present.

Output Tests

Contactor Output – while the Digital Compressor Controller is powered off (no supply voltage to 24VAC and 24COM), disconnect the System Controller Demand signal wire from C1 and C2. Add a jumper wire from P3 to C2 and a second jumper wire from P1 to C1. Reapply power to 24VAC and 24COM. If functioning normally, a voltmeter should read the same voltage across M1 and M2 as is measured across L1 and L2, unless an ALERT code is present.

Unloader Output – while Digital Compressor Controller is modulating the unloader solenoid, a voltmeter should read the same voltage across U1 and U2 as is measured across L1 and L2 whenever the yellow “Unloader “LED is lit.

3605 Buffalo Rd.
Rochester, NY 14624
Phone: 585-594-5050
Fax: 585-594-8888
www.northernairsystems.com

QUICK REFERENCE GUIDE

CAREL CONTROLLER: PCO 3 Small - 2.8v / 3.0v

MAIN MENU

- **Main Screen – Normal display screens, current running temperature, humidity and pressures.**
- **On/Off unit – Enables and disables system**
- **Set Points – Ability to change all temperature and humidity set points.**
- **Run Times – Displays run hours of all compressors.**
- **Min/Max reading – Displays min and max temperature and humidity in last 24 hours.**
- **Factory menu – Factory set and factory authorized changes only**
- **Network status – Display status of devices on the network.**
- **Alarm history – Shows all past alarms**

VIEW AND CHANGE SET POINTS

- **Press "Prg" to view menu list**
- **Press ↓ to highlight "Set Points"**
- **Press ↵**
- **Press ↵ to move cursor to password**
- **Press ↓ to set password to 9999**
- **Press ↵ (Set points will be displayed)**
- **Press ↓ until desired set point is displayed**
- **Press ↵ to move cursor to desired set point**
- **Press ↑ or ↓to change the set point**
- **Press ↵ to initialize & save the set point**
- **Press "Esc" twice to exit set points and return to the "systems status" screens**

VIEW ALARM HISTORY

- **Same as above but select "Alarm History" rather than "Set Points"**
- **Press ↑ to view past alarms**

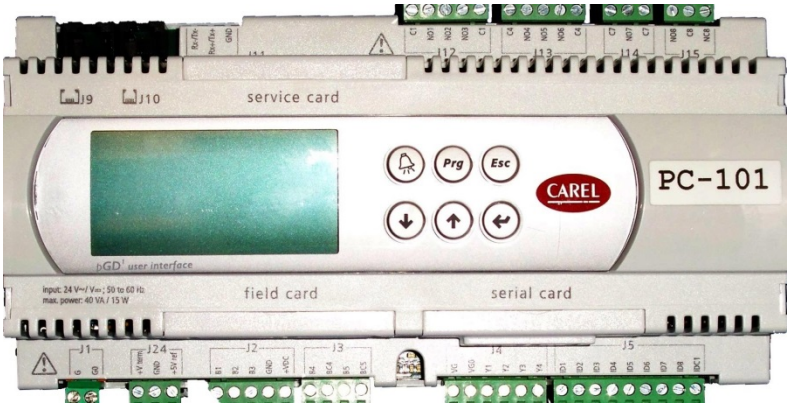
TO VIEW CURRENT ALARMS

- **Press 🔔**
- **Press ↓to view**
- **Press ↵ when prompted to clear current alarms**

TO VIEW CURRENT STATUS

- **Press "Esc" as needed**
- **Press ↑ or ↓ to view**

*** AT ANY TIME THE ESC KEY TO GET BACK TO THE MAIN "SYSTEMS DISPLAY SCREENS"**



PLC MENUS AND DISPLAYS

MENU	DISPLAY	OPTIONS	DESCRIPTION
SYSTEM STATUS			
	TEMPERATURE	X DEG F	Displays current room temperature
	HIGH PRESSURE	X PSI	Displays current high pressure
	LOW PRESSURE	X PSI	Displays current low pressure
	HUMIDITY	X %	Displays current relative humidity (optional)
	HEAT DEMAND	X %	Displays current heating demand
	COOL DEMAND	X %	Displays current compressor demand
	COND FAN DEMAND	X %	Displays current condenser fan demand
	EVAP FAN SPEED	X %	Displays current evaporator fan speed
	HUMIDITY DEMAND	X %	Displays current humidification demand (optional)
	HEAT STAGE	X	Displays current heating stage
	TEMP SETPOINT	X DEG F	Displays current room temperature set point
	HUM SETPOINT	X %	Displays current room humidification set point (optional)
	DEHUM SETPOINT	X %	Displays current room dehumidification set point (optional)
	UNIT MODE	Multiple	Displays the current mode of operation
	STATUS	ON / OFF by switch	Displays the position of the unit ON/OFF switch
UNIT ON/OFF			
System ON/OFF	STATUS	ON/OFF BY SWITCH	Displays position of unit ON/OFF switch
	STARTUP DELAY:	X MIN	Allows fans to run for X amount of time before starting the compressor
	UNIT ADDRESS	X	Displays the units Plan communication address
	UNIT MODE	Multiple	Allows selection of unit mode of operation
SETPOINTS			
PSWD: 9999	TEMPERATURE	X DEG F	Controls temperature setpoint
	HUM SETPOINT:	X %	Controls humidification setpoint (optional)
	DEHUM SETPOINT:	X %	Controls dehumidification setpoint (optional)
	DEHUM STOP BAND	X DEG F	Number of degrees above or below setpoint dehumidification starts and stops
FACTORY MENU / CONFIGURATION			
	COND VFD SETP	X PSI	Controls the high pressure at which the condenser fan is set to maintain
	COND VFD EN	X PSI	High pressure set point used to enable the condenser fan VFD
	COND VFD START	X %	Percentage at which condenser fan will run during purge cycle on start up
	LEAD/LAG ENABLE	OFF	Not used
	ALT DUAL ENABLE	OFF	Not used
	ALT DUAL SETUP	X DEG F	Not used. DO NOT CHANGE
	DEMAND SD TIMER	X MIN	Compressor will shut down after having zero demand for this amount of time
	MIN COMP RUN V	X V	Output voltage to compressor controller at zero demand while running
	COMP OFF VOLT	X V	Output voltage to compressor controller while compressor is not running

	COMP MIN OFF	X MIN	Minimum amount of time in minutes that the compressor cannot be off
	COMP TYPE	CYCLYING	Allows the compressors to be set for cycling or continuous run. DO NOT CHANGE
	DEMAND SD TIME	X MIN	The amount of time in minutes the compressor demand is at 0% before the compressor will be deactivated.
	LP SETPOINT	X PSI	Low pressure set point the compressor is modulating to maintain during cooling operation
	COOL ON SETP	X DEG F	Degrees above set point when cooling is activated
	DIG TANDEM COMP	NO	Not used. For use with Tandem compressors
	EVAP VFD SPEED	X %	For use on systems with evaporator fan VFD DO NOT CHANGE
	COND VFD TUNING	MULTIPLE	PI control loop settings for condenser fan, DO NOT CHANGE
	COOLING TUNING	MULTIPLE	PI control loop settings for compressor, DO NOT CHANGE
	HEATING TUNING	MULTIPLE	PI control loop settings for heating, DO NOT CHANGE
	HUMIDIFIER TUNING	MULTIPLE	PI control loop settings for humidification, DO NOT CHANGE
	CLOCK	TIME/DATE	Allows user to set the time and date
	TEMPERATURE UNITS	°F / °C	Allows change of temperature unit of measure
	PRESSURE UNITS	PSI	Displays the pressure unit of measure
	CHANGE PASSWORD SERVICE	XXXX	Allows change of service level password
	CHANGE FACTORY PASSWORD	XXXX	Allows change of factory level password
FACTORY MENU / I/O CONFIGURATION			
	LOW PRESSURE	MULTIPLE	Low pressure sensor set up & calibration
	HIGH PRESSURE	MULTIPLE	High pressure sensor set up & calibration
	HUMIDITY	MULTIPLE	Humidity sensor set up & calibration (optional)
	TEMPERATURE	MULTIPLE	Temperature sensor set up and calibration
	SUCTION TEMP	MULTIPLE	Suction temp sensor set up & calibration (optional)
	PHASE MONITOR	MULTIPLE	Phase monitor input set up
	EVAP FAN FAILURE	MULTIPLE	Evap fan failure input set up
	COND FAN FAILURE	MULTIPLE	Condenser fan fault input set up
	AIR FLOW SWITCH	MULTIPLE	Optional airflow switch can be used to indicate dirty filters
	HEATER FAILURE	MULTIPLE	Heater failure input set up
	COMPRESSOR OVERLOAD	MULTIPLE	Compressor fault input set up
	HUMIDIFIER FAILURE	MULTIPLE	Humidifier fault input set up (optional) If humidifier CP4 board faults, this alarm will be activated. See troubleshooting guide in humidifier section in this manual
	ON/OFF SWITCH	MULTIPLE	ON/OFF switch input set up
	REMOTE PANEL OPR	MULTIPLE	Remote panel operations input set up
	GENERATOR STATUS	MULTIPLE	Generator input set up (optional)
FACTORY MENU / MANUAL CONTROL			
	COND VFD	AUTO/HAND %	Allows manual operation of the condenser fan VFD
	EVAP COND VFD	AUTO/HAND %	Only used on systems equipped with evaporator fan VFD. Allow manual control of evaporator fan VFD
	MOD COMP	AUTO/HAND %	Allows manual operation of the modulating compressor

	HUMDIFIER	AUTO/HAND %	Allows manual operation of the modulating humidifier
	HEATER 1	AUTO/HAND ON/OFF	Allows manual operation of the stage 1 heater contactor (optional)
	HEATER 2	AUTO/HAND ON/OFF	Allows manual operation of the stage 2 heater contactor (optional)
	HEATER 3	AUTO/HAND ON/OFF	Allows manual operation of the stage 3 heater contactor (optional)
	EVAP FAN	AUTO/HAND ON/OFF	Allows manual operation of the evaporator fan contactor
	COND EN	AUTO/HAND ON/OFF	Allows manual operation of the condenser fan VFD enable
	HUMID EN	AUTO/HAND ON/OFF	Allows manual operation of the humidifier enable
	COMP2	AUTO/HAND ON/OFF	Allows manual control of compressor#2 only used on systems equipped with 2 compressors
	ALARM	AUTO/HAND ON/OFF	Allows manual control of remote alarm output. Used to test light bulb and/or siren
FACTORY MENU / ALARM SET POINTS			
	TEMP AL DELAY	X MIN	Delay on start up only before hi or lo temp alarm is allowed
	HI TEMPERATURE	X DEG F	Degrees above set point when hi room temp alarm is activated
	LO TEMPERATURE	X DEG F	Degrees below set point when lo room temp alarm is activated
	LO PR SHUTDOWN	X PSI	Low pressure alarm set point that compressor will shutdown
	LO FREQUENT PR	X PSI	Frequent low pressure alarm set point no comp shutdown
	LO PR TIMEOUT	X MIN	Delay before alarming on frequent low pressure alarm
	HI PR SHUTDOWN	X PSI	High pressure alarm set point that compressor will shutdown
	HI FREQUENT PR	X PSI	Frequent high pressure alarm set point no comp shutdown
	HP TIMEOUT	X MIN	Delay before alarming on frequent high pressure alarm
	PLAN ALARM DLY	X SECONDS	The amount of time in seconds the PLAN network is off line before alarm is activated
	HIGH HUMIDITY	X %	Relative humidity at which high humidity alarm is activated
	LOW HUMIDITY	X %	Relative humidity at which low humidity alarm is activated
FACTORY MENU / HUMIDIFY/DEHUM			
	HUMIDIFIER ENABLE	ON/OFF	Activates humidification control option
	DEHUM ENABLE	ON/OFF	Activates dehumidification control option
	DEHUM BAND	X %	Controls RH% at which dehum is activated and deactivated
FACTORY MENU / HEAT SETUP			
	HEAT STAGE DELAY	X MIN	Delay time between stages of heat activation
	HEATING OFFSET	X DEG F	Degrees below set point when heating is activated
	STAGING	X %	Controls the demand for heat at which each stage is activated and deactivated.
FACTORY MENU / VALVE SETUP			
	ENABLE HOT GAS EVD	NO	Allows the enabling of electronic hot gas bypass valve controls. Not used DO NOT CHANGE

	ENABLE SPRHT EVD	NO	Allows the enabling of electronic pressure regulating valve controls. Not used DO NOT CHANGE
RUN TIMES			
	HEATER 1	X HRS	Displays current total hours of operation (optional)
	HEATER 2	X HRS	Displays current total hours of operation (optional)
	HEATER 3	X HRS	Displays current total hours of operation (optional)
	EVAPORATOR FAN	X HRS	Displays current total hours of operation
	COND FAN EN	X HRS	Displays current total hours of operation
	HUMIDIFIER EN	X HRS	Displays current total hours of operation (optional)
	COMPRESSOR	X DEG F	Displays current total hours of operation
MIN/MAX READINGS			
	HIGH PR	X PSI	Displays min and max readings over past 24 hours of operation
	LOW PR	X PSI	Displays min and max readings over past 24 hours of operation
	HUMIDITY	X %	Displays min and max readings over past 24 hours of operation (optional)
	TEMP	X DEG F	Displays min and max readings over past 24 hours of operation
NETWORK STATUS			
	NETWORK STATUS	NONE	Displays current network status an component address
ALARM HISTORY			
	ALARMS	ALARMS	Displays all past alarms with time and date stamp. Also the power supplied from generator or shore during the fault (optional)

SYSTEM ALARMS & TROUBLESHOOTING

DISPLAY	DESCRIPTION & TROUBLESHOOTING TIPS
FREQUENT LOW PRESSURE	Low pressure is nearing the low pressure shutdown setpoint: check for accurate pressure sensor reading, dirty evaporator coil or air filters. Make sure liquid line solenoid is open and liquid line filter drier is not plugged. Check for proper refrigerant charge & leak check.
LOW PRESSURE SHUTDOWN	Low pressure has reached the low pressure shutdown setpoint and has shut down the compressor: check for accurate pressure sensor reading, dirty evaporator coil or air filters. Make sure liquid line solenoid is open and liquid line filter drier is not plugged. Check for proper refrigerant charge & leak check.
FREQUENT HIGH PRESSURE	High pressure is nearing the high pressure shutdown setpoint: check for accurate pressure sensor reading, dirty condenser coil or lack of air flow through the condensing coil.
HIGH PRESSURE SHUTDOWN	High pressure has reached the high pressure shutdown setpoint and has shut down the compressor: check for accurate pressure sensor reading, dirty condenser coil or lack of air flow through the condensing coil.
LOW HUMIDITY	(Optional) The relative humidity level is below the alarm set point, check the humidifier, humidifier water supply tank and pump for proper operation. Also check for accurate humidity reading.
HIGH HUMIDITY	(Optional) The relative humidity level is above the alarm set point, check for accurate humidity reading, if dehumidification is needed ensure that the dehumidification option is activated in the factory menu.
LOW TEMPERATURE	The room temperature is below the low temperature alarm set point, check heater operation.
HIGH TEMPERATURE	The room temperature is above the high temperature alarm set point, check air conditioning operation.
EVAPORATOR FAN FAULT	The evaporator fan has possibly overheated: using the schematics in this manual check all wiring connections to the fan motor. Check all wiring from EBCR-1 to PCO3 controller. Check fan for high motor temperature and or seized bearings. Check the EBCR-1 for green light to be on. If green light is on, but alarm is present and all wiring is tight and correct, replace EBCR-1. If light on EBCR-1 is not on, check for 24vac at NO4 on PCO3 controller, if no 24vac, replace PCO3. If 24vac is good, check for continuity to ground on terminal A2 of EBCR-1. If it is open and no loose connections, replace fan as necessary.
CONDENSER FAN FAULT	The condenser fan has possibly overheated: Check all wiring connections to the fan motor. Check fan for high motor temperature and or seized bearings. Check motor overload wires for continuity, if open replace fan as necessary.
PHASE MONITOR FAULT	(Optional) Phase protection monitor has faulted: Check for 3 phase line voltage to be within the setting on the phase monitor & adjust phase monitor if required. If 3 phase line voltage is within the setting, check wiring connections to phase monitor from the PCO controller, replace monitor if necessary.

HEATER FAULT	The electric heaters have possibly overheated: If heat contactor is pulled in and running check the heat contactors for defective auxiliary contacts. If the heat contactors are not pulled in check all wiring connections to the heat contactors and heat elements. Check the auto reset high limit switch for closure, if open and plenum is below 145 degrees replace the automatic high limit switch. Also ensure the one shot high voltage cut out switches are closed.
COMPRESSOR FAULT	The digital compressor controller has faulted or the manual reset high pressure switch has tripped: Push the high pressure switch reset button located on the high side of the system, if compressor starts then look for dirty condenser coils or lack of air flow through condenser coil. If switch was not tripped check the compressor body for excessively high temperature, if compressor is truly overheated check refrigerant charge for 10 degree sub cooling and proper 12 degree superheat, adjust charge accordingly and leak check. If compressor is not hot check wiring to the compressor and the compressor controller. Count the red flashing light on the digital compressor controller and refer to this manual for the compressor controller fault codes and explanations.
LOW PRESSURE SENSOR FAIL HIGH PRESSURE SENSOR FAIL HUMIDITY SENSOR FAIL (optional) ROOM TEMPERATURE SENSOR FAIL SUCTION TEMPERATURE SENSOR FAIL (optional) OUTSIDE AIR TEMP SENSOR FAIL (optional)	The PLC has lost the input signal from the sensor. Check for broken wires, loose connections or terminations. Replace sensor as needed.

NORTHERN AIR SYSTEMS		+1-888-723-9230
ELECTRICAL PARTS LIST		
DESCRIPTION:	**PART NUMBER:**	**QTY- PER SIDE**
Controller, PCO3 Small	20EPCO3000ES0	1
Transformer	20E694M2A	1
Compressor Controller-DCC	20ETT72A10	1
Solenoid Coil, Unloader, Compressor, 24vac	20R923005800	1
Contactor, 25 amp, 24vac	20G55801	2
Compressor Contactor, 32 amp, 24vac	20ED32B7	1
Compressor Run Capacitor	20E014006427	1
Compressor Secure Start Module	20E543012000	1
Crank Case Heater, Compressor	20E918-0043-00	1
Solenoid Coil, Liquid Line, 24vac	20S45201	1
Relay, Evap. Blower Fault, 24vac, EBCR-1	20E700HTLT2U24	1
ON/OFF Selector Switch	20G56901	1
ON/OFF Selector Switch Base	20G57001	1
Phase Monitor	20EICM408	1
High Pressure Switch, Manual Reset- 475psi	20E100DA2	1
Pressure Sensor	20C12101	2
Pressure Sensor Cables	20C13601	2
Temperature Sensor, Wall Mount- NTC	20C11901	1
Remote Display, Wall Mount- PGD1 (option)	20EPGD1	1
Evaporator Blower Assembly, EC	20MR3G280AF35	1
Condenser Fan Assembly, EC	20MS3G500	1
HEATER PARTS LIST		**QTY- PER SIDE**
Heater Element	20E45KW208	2
High Temperature Cutout, 300°, One Shot	20EL300F	2
High Temperature Cutout, 150°, Auto Reset	20ETT72A3	1

NORTHERN AIR SYSTEMS	+1-888-723-9230	
REFRIGERATION PARTS LIST		
DESCRIPTION:	**PART NUMBER:**	**QTY- PER SIDE**
Compressor, Digital	20RZRD612301	1
Isolators, Compressor	20M527011600	1 PKG
Unloader Solenoid Valve & Tubing Kit	20R998007300	1
Liquid Receiver	20RL516C	1
Sight Glass, 1/2"	20S43102	1
Access Ports, Bulk Head Connections	20R3DXA2	2
Flexible Line, 36”	20RSEC99AB36	2
Solenoid Valve, Liquid Line, 1/2"	20RTT72A6	1
Drier, Liquid, Sweat, 1/2"	20SC164S	1
Suction Liquid Line Heat Exchanger	20RHXR150	1
Thermostatic Expansion Valve	20RBBIVE5	1
Head Pressure Control Valve	20S45601	1
Pressure Differential Valve	20S46901	1
Coil, Evaporator, Left	20REC16X38L	1
Coil, Evaporator, Right	20REC16X38R	1
Coil, Condenser, Right	20RCC48-1	1
Coil, Condenser, Left	20RCC48-1M	1
Refrigerant, 407C	20R407C	17 lbs
Filters, Return Air, Pleated- 18x20x2	20M1TBE4	2
Access Latch, Tool Slotted Cam	20M12265A53	1

Installation Instructions

To prevent warranty voiding installation and start up is to be performed by factory approved and trained personnel. These instructions are reference only.

- **CONDENSATE DRAIN CONNECTIONS:**

Connect all condensate drains with a minimum of ¾" line size and a 4" trap on each.

- **MAIN ELECTRICAL CONNECTIONS:**

Supply proper power using unit nameplate in electrical compartment conforming to local codes and ordinances. Install cover after connections are made.

- **INSTALL TEMP SENSORS:**

Mount and wire temperature sensors in proper location based on system design wiring diagram to show wire terminations.

- **MOUNTING TEMP/HUMIDITY SENSOR (When equipped)**

Connect temp/humidity sensor for room to designated 18/4 conductor cable off the front of A/C unit. Electrical diagram in this manual will show connections. Mount sensor in proper location based on system design.

- **CALIBRATE ALL SENSORS FOR HUMIDITY AND TEMPERATURE**

- **TEST AND RUN HEATING SYSTEM (When equipped)**

- **CHECK FLOW RATES AND CIRCUIT SETTER OPERATION (When equipped) Chillers Only**

Northern-Air Systems	Date	
	Unit Model No.	
	Unit Serial No.	

A/C UNIT START UP PROCEDURE

NOTE: "Side 1" is on the right when facing the condenser side of the unit.
"Side 2" is on the left when facing the condenser side of the unit.

Side 1	Side 2	
_____	_____	Mount and seal the system water-tight to the building or trailer.
_____	_____	Connect the approved supply and return duct systems to the unit.
_____	_____	Where desired, mount and connect the air temperature sensor and remote display. *Sensor placement is crucial to proper operation.*
_____	_____	Connect the condensate drain piping to the system if required.
_____	_____	Connect high voltage power leads to the unit's line voltage breaker. Connect ground wire to ground lug mounted on electrical panel.
_____	_____	Check for loose wiring on all high voltage connections including: phase monitor (optional), distribution block and contactors, by tightening each screw terminal as well as inspecting the wire terminations themselves.
_____	_____	Be sure all screw terminals and plug connections on the PCO controller are tight and secure
_____	_____	Inspect all mounting hardware for tightness on all fan motors, compressors, top skin, doors and all metal skins and covers.

Northern-Air Systems

A/C UNIT START UP PROCEDURE
Continued

Side 1	Side 2	
_____	_____	Inspect all copper piping for proper mounting and strapping. Make sure there are no places where friction or rubbing can occur
_____	_____	Check access ports to be sure all caps are present. Look for any signs of oil which could indicate a refrigerant leak or damage in shipping
_____	_____	Inspect refrigerant piping insulation to ensure a good adhesion.
_____	_____	Make sure there is no continuity from L1, L2 or L3 to ground.
_____	_____	Make sure the system switch in the panel is turned off.
_____	_____	Turn on the main line voltage breaker in the electrical panel.
_____	_____	Power up high voltage to unit.
_____	_____	Check to make sure the controller powers up.
_____	_____	Check compressor crankcase heaters for operation.
_____	_____	Check the controller display for an accurate temperature reading against your temperature meter and adjust as needed in “Factory Menu” under “I/O Configuration”. (Password is 9230)
_____	_____	Check for any alarms and troubleshoot as needed.
_____	_____	Check the remote display for operation.

A/C UNIT START UP PROCEDURE
Concluded

Side 1	Side 2	
_____	_____	Make sure the condenser door panels are open, all other doors and panel covers are closed and air ducts are finished and diffusers open.
_____	_____	Turn system switch to on
_____	_____	Adjust the temperature set point under “Setpoints” menu on the controller (Password is 9999). Raise the temperature set point above currently displayed temp to call for heat. When heating starts, take an amp draw reading on the heater contactors to ensure heat is functioning. Let the heat run full out for five minutes. Refer to name plate label on the inside of electrical door for amp draw ratings.
_____	_____	Check for proper condenser fan operation.
_____	_____	Adjust the set point back to 72°F or as desired.
_____	_____	Let the unit continue to run and periodically check for any alarms on the display.
_____	_____	Northern Air Systems recommends replacing the air filters prior to system release to the end user.

System commissioning is complete.

Thank you for choosing a Northern Air Systems custom air conditioning unit.

To contact us: 3605 Buffalo Road, Rochester, NY 14624, 888-723-9230
www.northernairtech.com

MAINTENANCE GUIDELINES

General

Restricted airflow through the evaporator & condenser coils will reduce the operating efficiency of the unit and can result in high temperatures and loss of cooling or heating. Clean all coils of debris that will inhibit air flow. This can be done with compressed air or an environmentally safe commercial coil cleaner. Thoroughly rinse the coil to remove any cleaner residue. Check for bent or damaged fins and repair as necessary. In winter, do not permit snow to accumulate around the sides or underneath the condenser coil. Snow or ice accumulations on the fan blades will cause them to be out of balance.

Condenser Fans

Inspect the motor & fan assembly to ensure bearings are free and motor is secure within its mount.

Evaporator Fan Section

Check air filters after initial run period and monthly thereafter, replacing as necessary.

Replace with the same size, and type filters as originally furnished. Periodic checks of the blower package include: motor mounts, fan bearings and wheels.

Refrigerant Piping

Visually inspect all refrigerant lines for signs of oil leaks, an indicator of a refrigerant leak. Check the refrigerant charge at the system sight glass. A bubbling sight glass does not always mean low charge. Use good troubleshooting methods to determine a leak location or possible restrictions leading to this condition. Check all piping for vibration isolation and support as necessary. Also check all roto-lock connections for tightness on compressors.

Electrical

Check and record all running amperage of all fan motors, heaters and compressors. Also look for signs of heat and loose connections. Make sure line voltage is switched off while tightening wires.

Northern-Air Systems	Date	
	Unit Model No.	
	Trailer No.	
	Unit Serial No.	

A/C PM Service Checklist- Per Side

This form is to be filled out and signed by the person performing the preventive maintenance service procedure.

_____ Check for loose wiring on all high voltage breakers, variable frequency drives, overload starters and contactors by tightening each screw terminal and inspecting the wire terminations.

_____ Inspect and tighten all compressor wiring.

_____ Inspect all low voltage wiring connections to the low voltage terminal block, control boards and controllers. Check by pulling on each individual wire ensuring that all connections are secure.

_____ Inspect all mounting hardware for tightness on all fan motors, compressors, doors, all metal skins and covers.

_____ Inspect refrigerant piping for any signs of leaks and repair as necessary.

_____ Inspect the humidifier (if equipped) for any signs of water leakage.

_____ Inspect the humidifier canister for excessive debris and sediment build up. Canister must be replaced at least once a year. If Canister fills more than ¾ full of water before producing steam and/or is impossible to see into, then replace the canister.

_____ Make sure all seams are caulked and sealed tight on the exterior portion of the A/C unit.

_____ Inspect condenser mounting hardware, Isolators, fan blades, motor brackets and fan guards.

_____ Inspect refrigerant pipe insulation and repair as necessary.

_____ Inspect all isolators: make sure they are not twisted, or deteriorated.

_____ Clean both A/C coils with coil wash solution as necessary.

_____ Inspect both A/C coils for damaged or bent fins and repair as necessary.

_____ Replace the air filters in the A/C unit. Use only high grade pleated filters.

_____ Check all sensors for accurate readings, including the pressure sensors. Calibrate sensors as needed.

_____ Check for any alarms and troubleshoot as needed.

Company: _____

Print Name: _____

Signature: _____

Date: _____

PCO3 SENSOR CALIBRATION INSTRUCTIONS

1-Press PRG key until you see the menu list
2-Arrow down to “factory menu”
3-Press enter 2 times (left pointing arrow key)
4-Arrow down and set password 9230
5-Press enter
6-Arrow down to “I/O setup”
7- Press enter
8-Arrow down to the sensor screen that needs calibrating (ex. Temperature)
9-Press enter to move cursor to the cal offset setting(calibration offset)
10-Arrow up or down to set cal. offset +/- degrees as needed
11-Press enter
12-The actual temperature reading is on the bottom of the screen.
13- Press esc twice to get back to main temperature screens

RIGGING INSTRUCTIONS

To prevent possible damage to the system
Please use the Factory supplied lifting jig or qualified personnel to field install.
Contact factory for further instructions.
585-594-5050

Attention Service Personnel
Please Read!

Report all service calls to factory +1-585-594-5050
24 Hour Emergency Technical Support +888-723-9230

Before working on this system you should be familiar with the products in this system. It is imperative that you understand the charging procedure for head pressure control valves for proper winter and summer operation. Only use exact replacement O.E.M. parts. The electrical control system has special characteristics and factory support should be utilized. Failure to call will void warranty and might delay repairs.