GEMINI™ SELECT
38APS025-050,38APD025-100
Commercial Air-Cooled Condensing Units
with *COMFORT*LINK™ Controls
50/60 Hz

Controls, Start-Up, Operation, Service, and Troubleshooting

CONTENTS

SAFETY CONSIDERATIONS

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

When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging, and setting this equipment, and in handling all electrical components.

⚠ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

⚠ WARNING

DO NOT VENT refrigerant relief valves within a building. Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation. Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

⚠ WARNING

DO NOT attempt to unbraze factory joints when servicing this equipment. Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines. Cut lines with a tubing cutter as required when performing service. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to system. DO NOT re-use compressor oil.

⚠ CAUTION

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

⚠ CAUTION

Puron® refrigerant (R-410A) systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron refrigerant equipment. If service equipment is not rated for Puron refrigerant, equipment damage or personal injury may result.

⚠ CAUTION

Refrigerant charge must be removed slowly to prevent loss of compressor oil that could result in compressor failure.

GENERAL

This publication contains Controls Start-Up, Service, Operation, and Troubleshooting information for the Gemini™ Select 38AP condensing units with *Comfort*Link controls. See Table 1 for unit size information.

Table 1 — Unit Sizes

38AP UNIT SIZE	NOMINAL CAPACITY, TONS, 60 Hz
025	25
027	27
030	30
040	40
050	50
060	60
070	70
080	80
090	90
100	100

CONTROLS

General — The 38AP air-cooled condensing unit contains the *Comfort*Link™ electronic control system that controls and monitors all operations of the unit.

The control system is composed of several components as listed in the sections below. See Fig. 1-3 for typical control box drawing. See Fig. 4-17 for power and control wiring.

Conventions Used in This Manual — The following conventions for discussing configuration points for the local display (scrolling marquee or Navigator™ accessory) will be used in this manual.

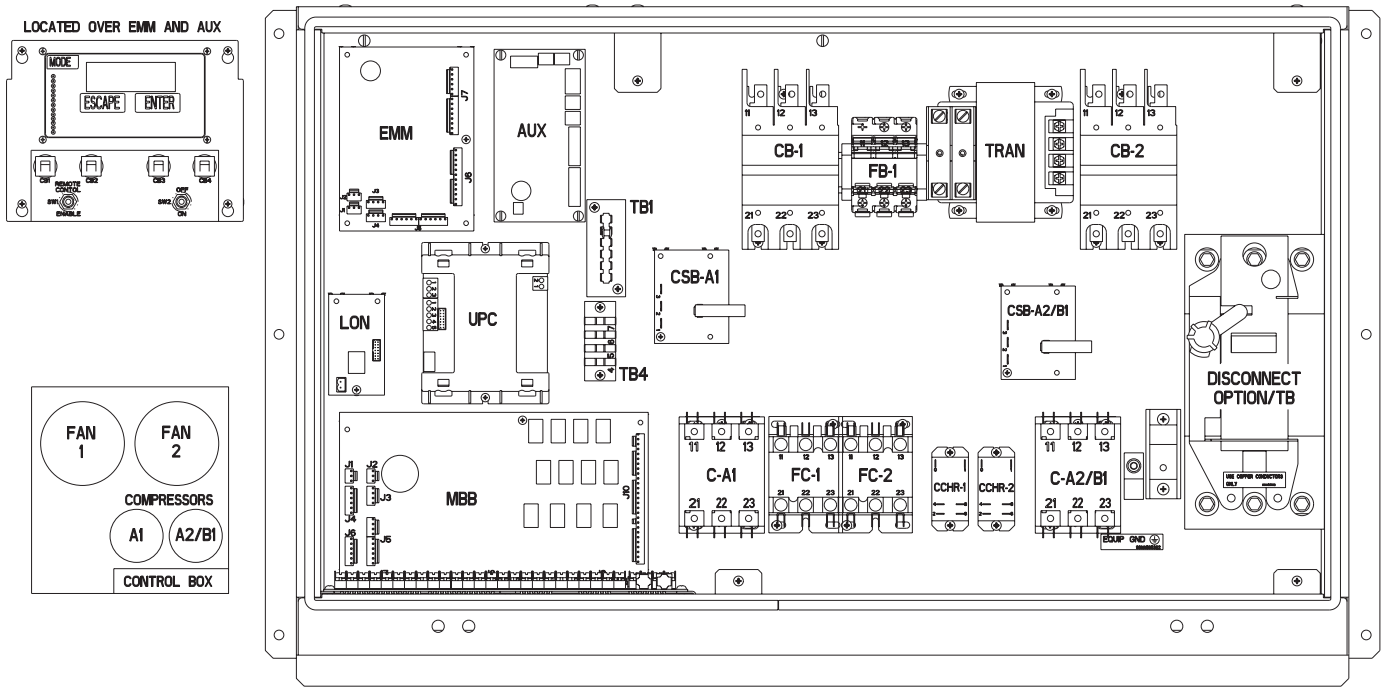
Point names will be written with the mode name first, then any sub-modes, then the point name, each separated by an arrow symbol (→). Names will also be shown in bold and italics. As an example, the Lead/Lag Circuit Select Point, which is located in the Configuration mode, Option sub-mode, would be written as ***Configuration →OPT2→LLCS***.

This path name will show the user how to navigate through the local display to reach the desired configuration. The user would scroll through the modes and sub-modes using the ▲ and ▼ keys. The arrow symbol in the path name represents pressing ENTER to move into the next level of the menu structure.

When a value is included as part of the path name, it will be shown at the end of the path name after an equals sign. If the value represents a configuration setting, an explanation will be shown in parenthesis after the value. As an example, ***Configuration→OPT2→LLCS* = 2** (Circuit A leads).

Pressing the ESCAPE and ENTER keys simultaneously will scroll an expanded text description of the point name or value across the display. The expanded description is shown in the local display tables but will not be shown with the path names in text.

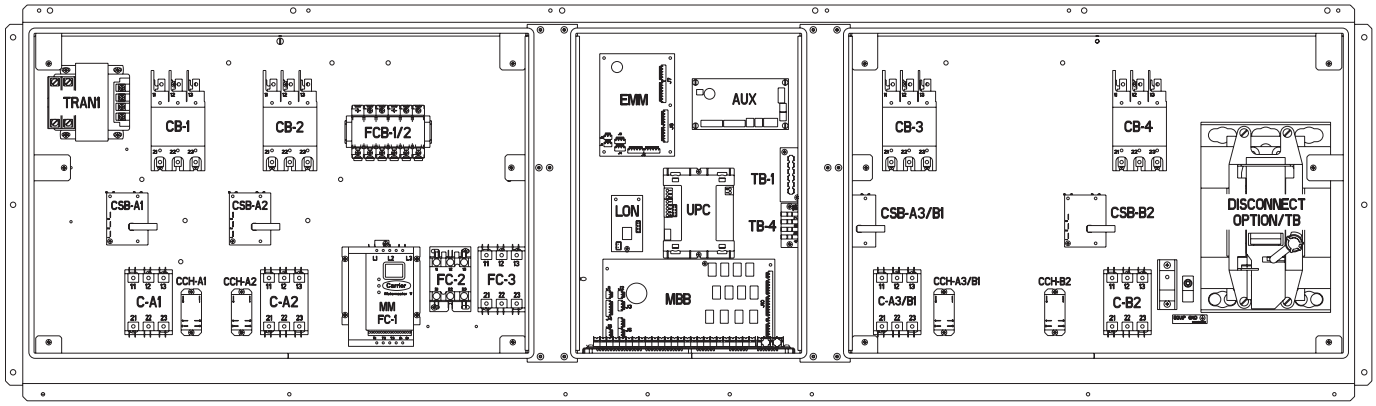
The CCN (Carrier Comfort Network®) point names are also referenced in the local display tables for users configuring the unit with CCN software instead of the local display. The CCN tables are located in Appendix B of the manual.

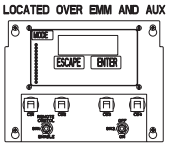


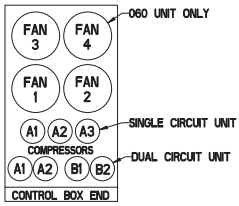
LEGEND

AUX	—	Auxiliary
C	—	Contactor
CB	—	Circuit Breaker
CCHR	—	Crankcase Heater Relay
CSB	—	Current Sensor Board
EMM	—	Energy Management Module
EQUIP GND	—	Equipment Ground
FB	—	Fuse Block
FC	—	Fan Contactor
LON	—	Local Operating Network
MBB	—	Main Base Board
SW	—	Switch
TB	—	Terminal Block
TRAN	—	Transformer
UPC	—	Unitary Protocol Converter

Fig. 1 — Component Arrangement — Unit Sizes 025-030



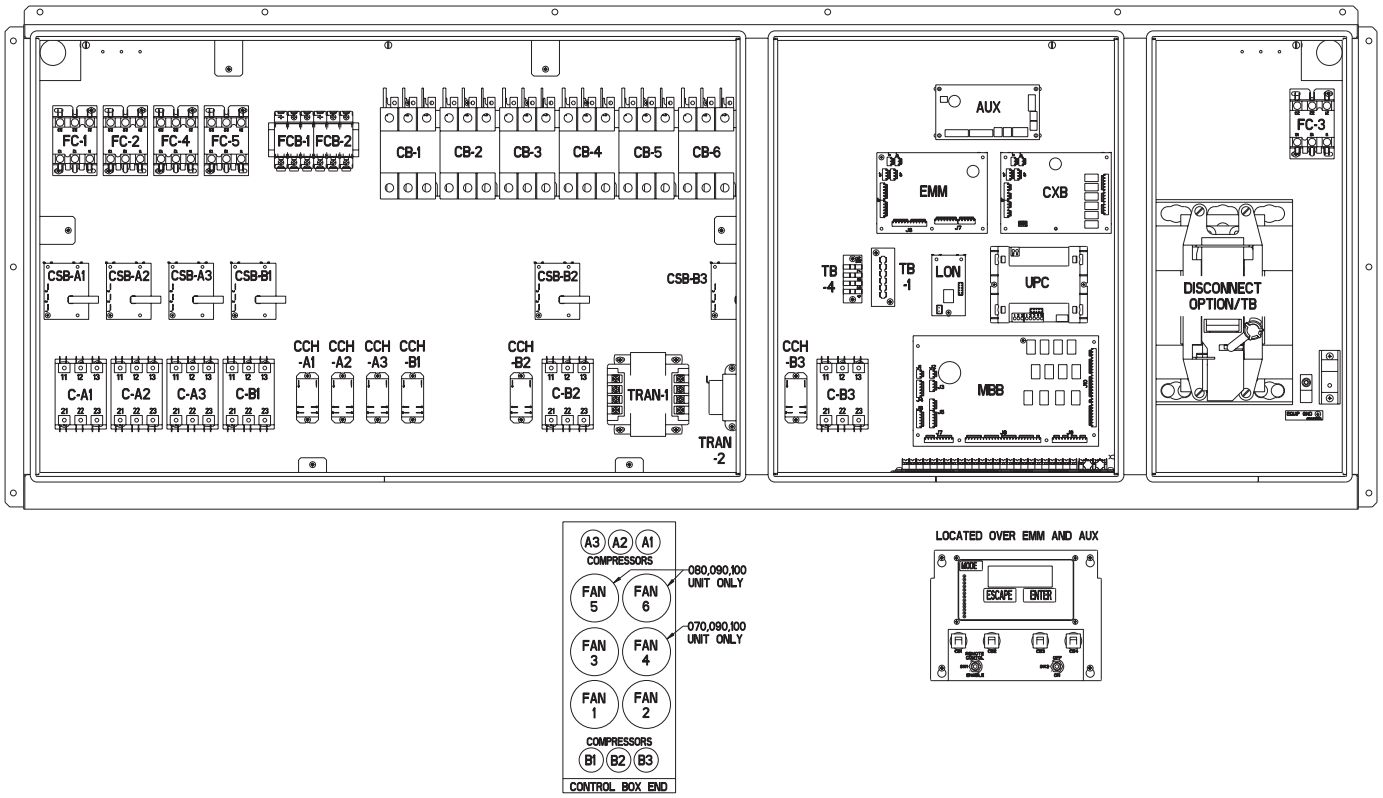




LEGEND

AUX	—	Auxiliary
C	—	Contactor
CB	—	Circuit Breaker
CCH	—	Crankcase Heater Relay
CSB	—	Current Sensor Board
EMM	—	Energy Management Module
EQUIP GND	—	Equipment Ground
FC	—	Fan Contactor
FCB	—	Fan Circuit Breaker
LON	—	Local Operating Network
MBB	—	Main Base Board
MM	—	Motormaster®
SW	—	Switch
TB	—	Terminal Block
TRAN	—	Transformer
UPC	—	Unitary Protocol Converter

Fig. 2 — Component Arrangement — Unit Sizes 040-060



LEGEND

AUX	—	Auxiliary
C	—	Contactor
CB	—	Circuit Breaker
CCH	—	Crankcase Heater Relay
CSB	—	Current Sensor Board
CXB	—	Compressor Expansion Board
EMM	—	Energy Management Module
EQUIP GND	—	Equipment Ground
FC	—	Fan Contactor
FCB	—	Fan Circuit Breaker
LON	—	Local Operating Network
MBB	—	Main Base Board
SW	—	Switch
TB	—	Terminal Block
TRAN	—	Transformer
UPC	—	Unitary Protocol Converter

Fig. 3 — Component Arrangement — Unit Sizes 070-100

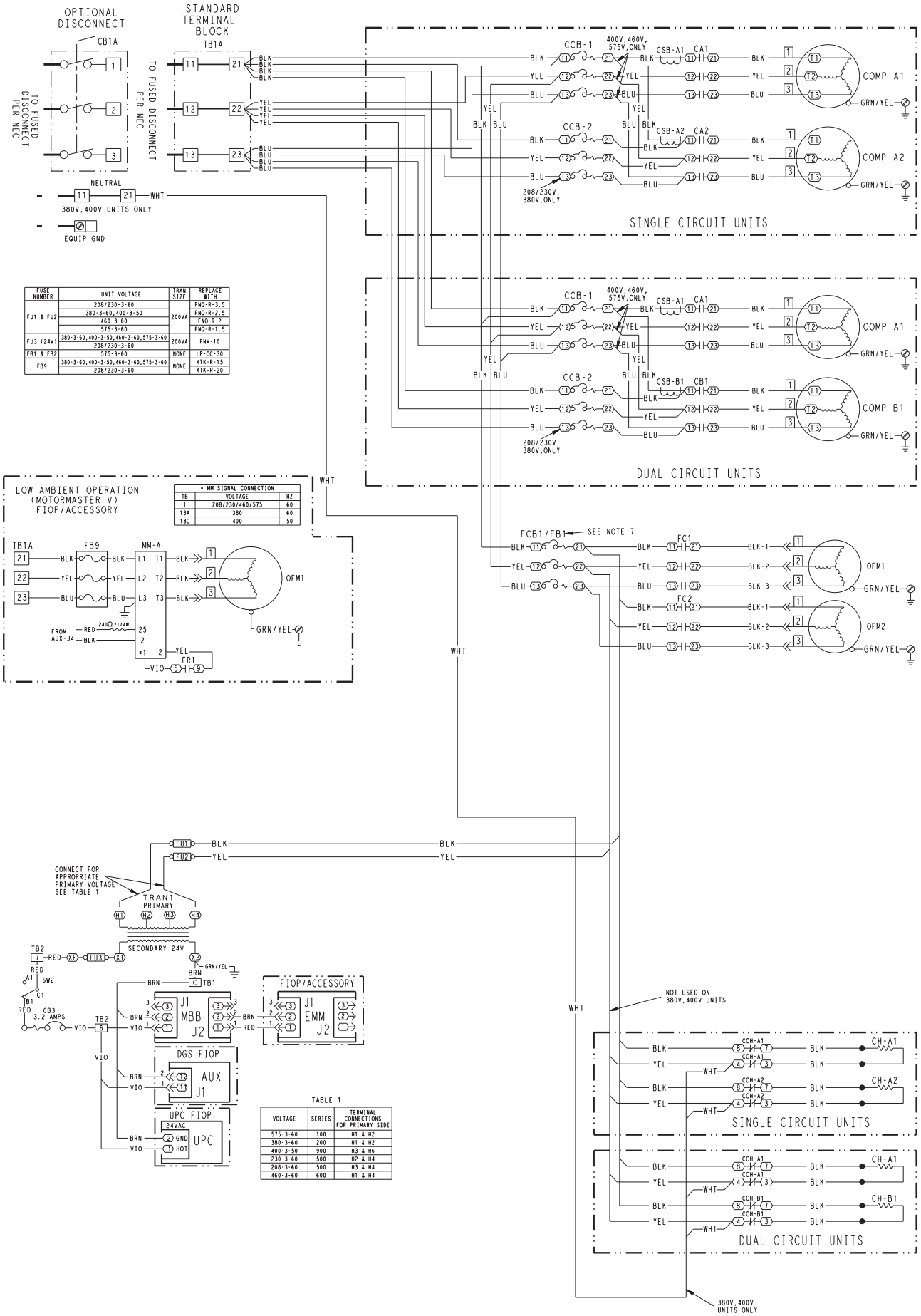


Fig. 4 — Power Wiring Schematic — 38APS,APD025-030

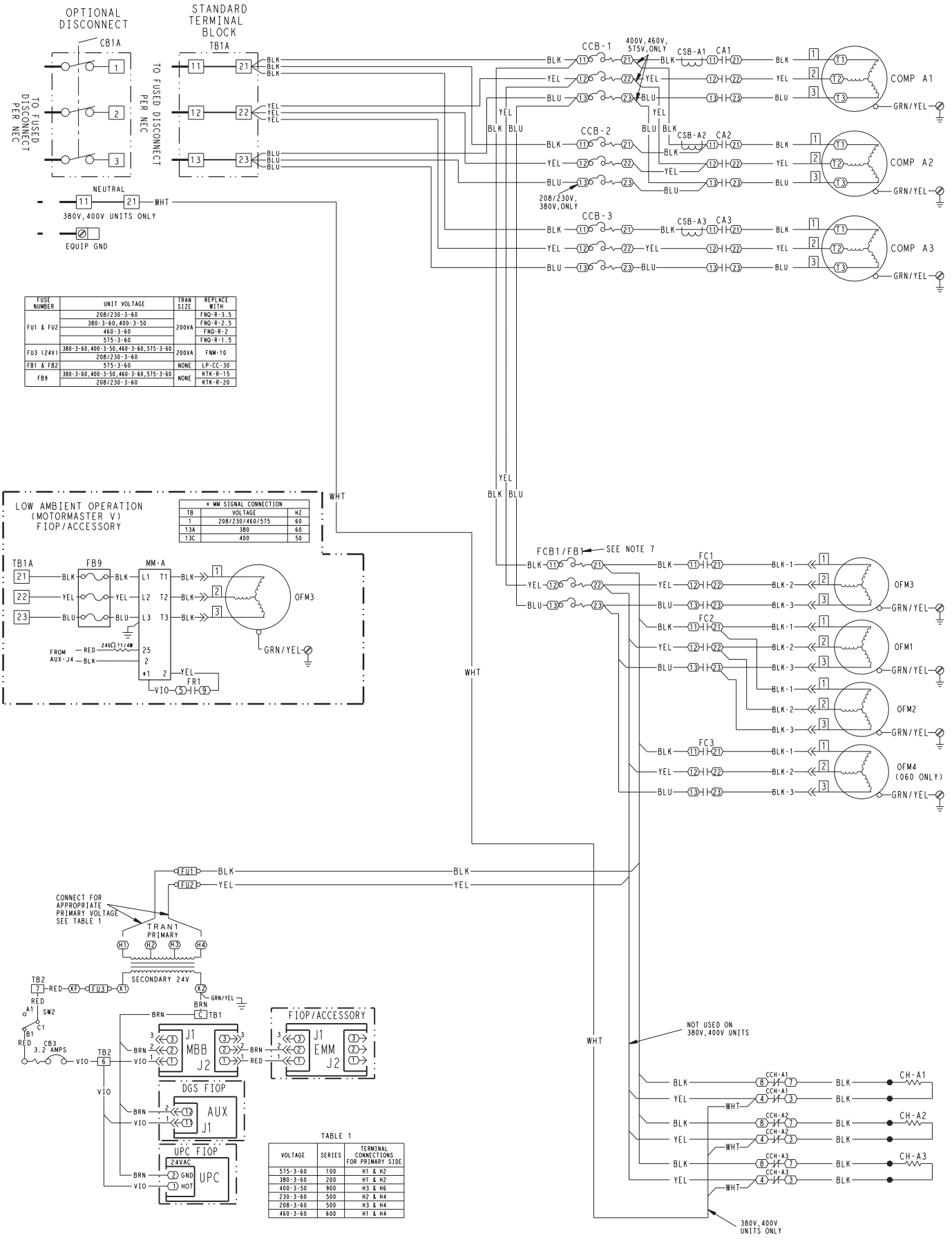
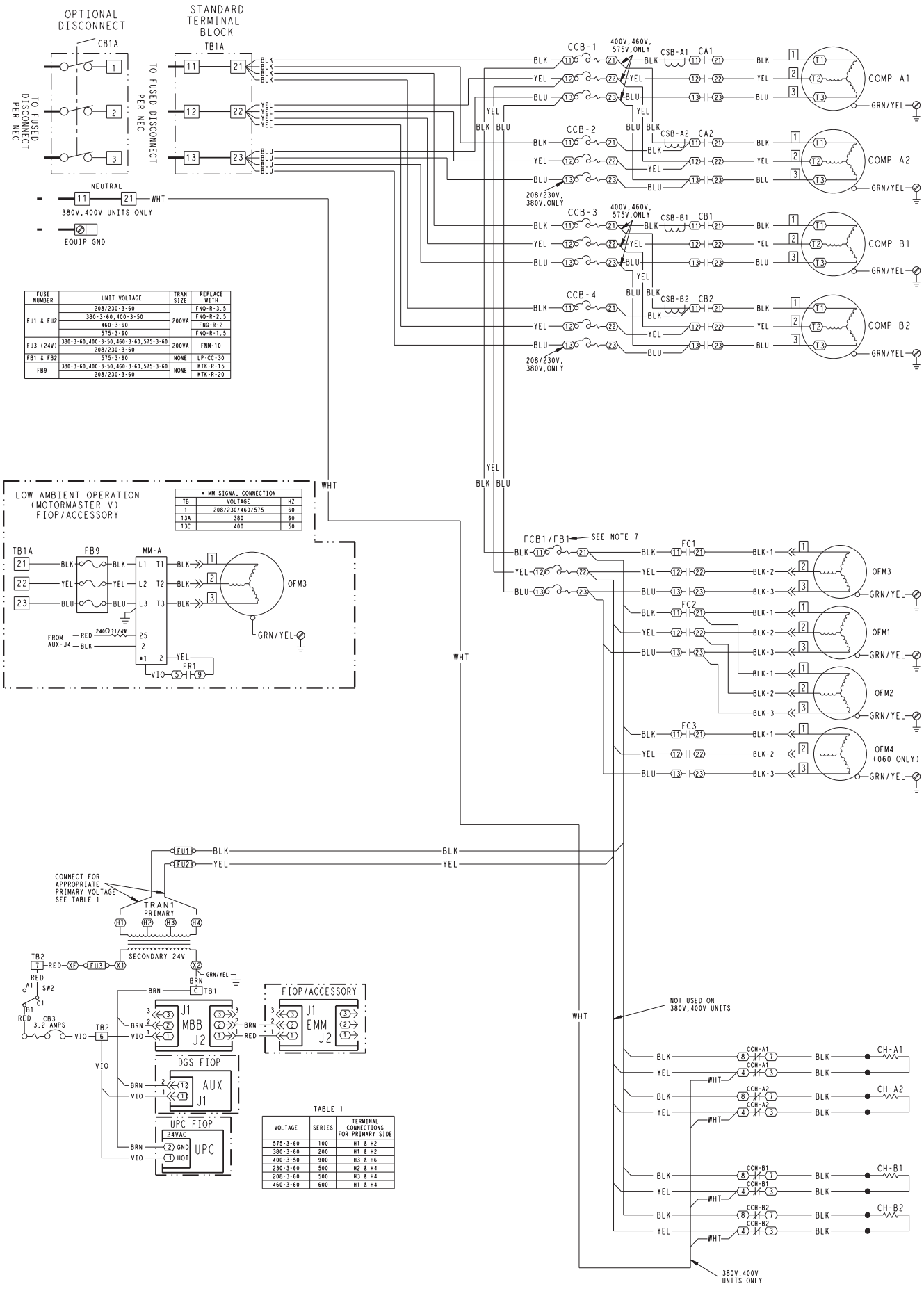


Fig. 5 — Power Wiring Schematic — 38APS040,050



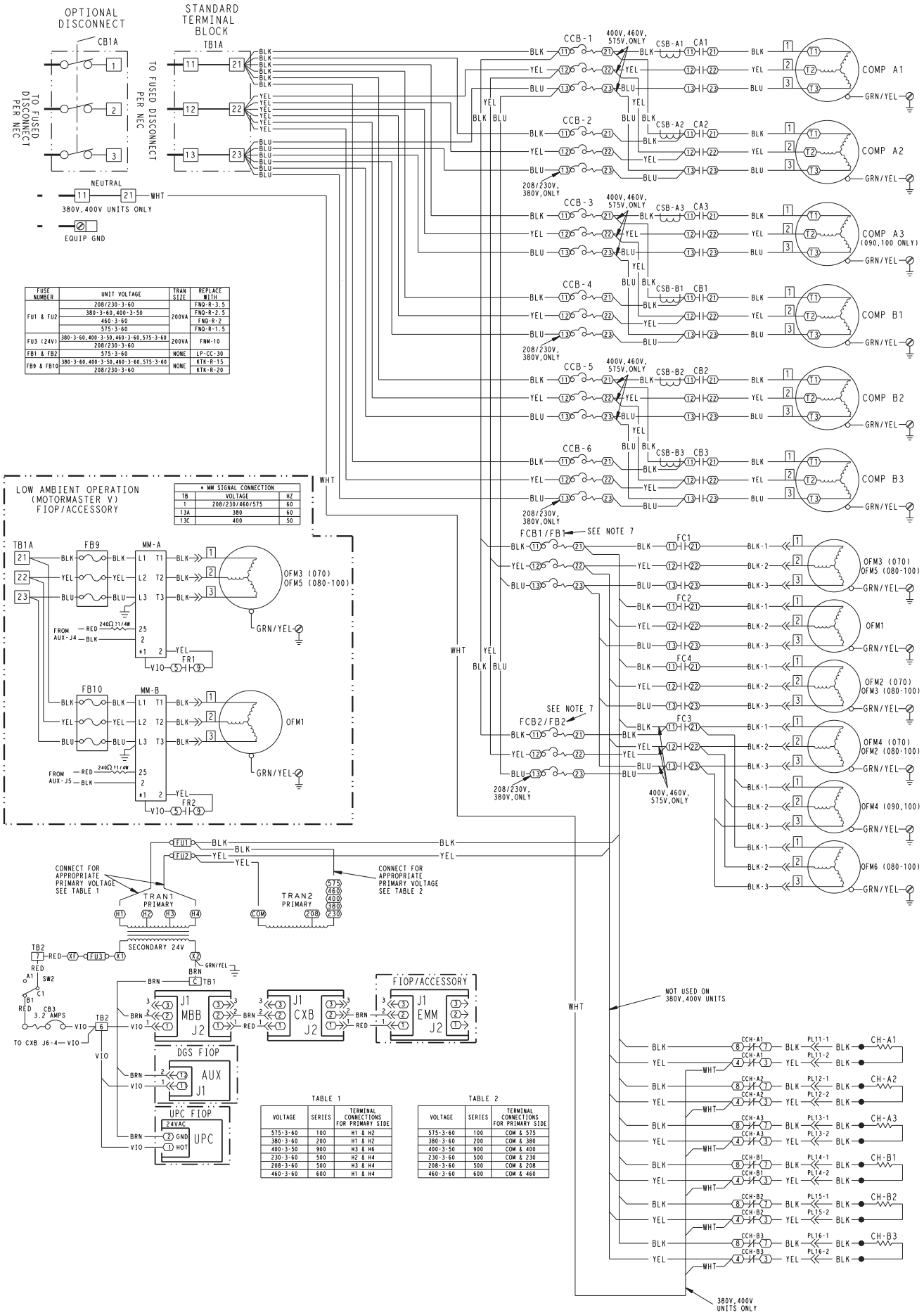
FUSE NUMBER	UNIT VOLTAGE	TRAN SIZE	REPLACE WITH
FU1 & FU2	208/230-3-60	200VA	FNQ-R-3.5
	380-3-60,400-3-50		FNQ-R-2.5
	460-3-60		FNQ-R-2
	575-3-60		FNQ-R-1.5
FU3 (24V)	380-3-60,400-3-50,460-3-60,575-3-60	200VA	FNM-10
FB1 & FB2	208/230-3-60	NONE	LP-CC-30
	575-3-60		
FB9	380-3-60,400-3-50,460-3-60,575-3-60	NONE	KTK-R-15
	208/230-3-60		KTK-R-20

* MM SIGNAL CONNECTION		
TB	VOLTAGE	HZ
1	208/230/460/575	60
13A	380	60
13C	400	50

TABLE 1

VOLTAGE	SERIES	TERMINAL CONNECTIONS FOR PRIMARY SIDE
575-3-60	100	H1 & H2
380-3-60	200	H1 & H2
400-3-50	900	H3 & H6
230-3-60	500	H2 & H4
208-3-60	500	H3 & H4
460-3-60	600	H1 & H4

Fig. 6 — Power Wiring Schematic — 38APD040-060



FUSE NUMBER	UNIT VOLTAGE	TRAN SIZE	REPLACE WITH
FU1 & FU2	208/230-3-60	200VA	FNQ-R-3.5
	380-3-60, 400-3-50		FNQ-R-2.5
	460-3-60		FNQ-R-2
	575-3-60		FNQ-R-1.5
FU3 (24V)	380-3-60, 400-3-50, 460-3-60, 575-3-60	200VA	FNM-10
	208/230-3-60		
FB1 & FB2	575-3-60	NONE	LP-CC-30
FB9 & FB10	380-3-60, 400-3-50, 460-3-60, 575-3-60	NONE	KTK-R-15
	208/230-3-60		KTK-R-20

TABLE 1

VOLTAGE	SERIES	TERMINAL CONNECTIONS FOR PRIMARY SIDE
575-3-60	100	H1 & H2
380-3-60	200	H1 & H2
400-3-50	900	H3 & H6
230-3-60	500	H2 & H4
208-3-60	500	H3 & H4
460-3-60	600	H1 & H4

TABLE 2

VOLTAGE	SERIES	TERMINAL CONNECTIONS FOR PRIMARY SIDE
575-3-60	100	COM & 575
380-3-60	200	COM & 380
400-3-50	900	COM & 400
230-3-60	500	COM & 230
208-3-60	500	COM & 208
460-3-60	600	COM & 460

Fig. 7 — Power Wiring Schematic — 38APD070-100

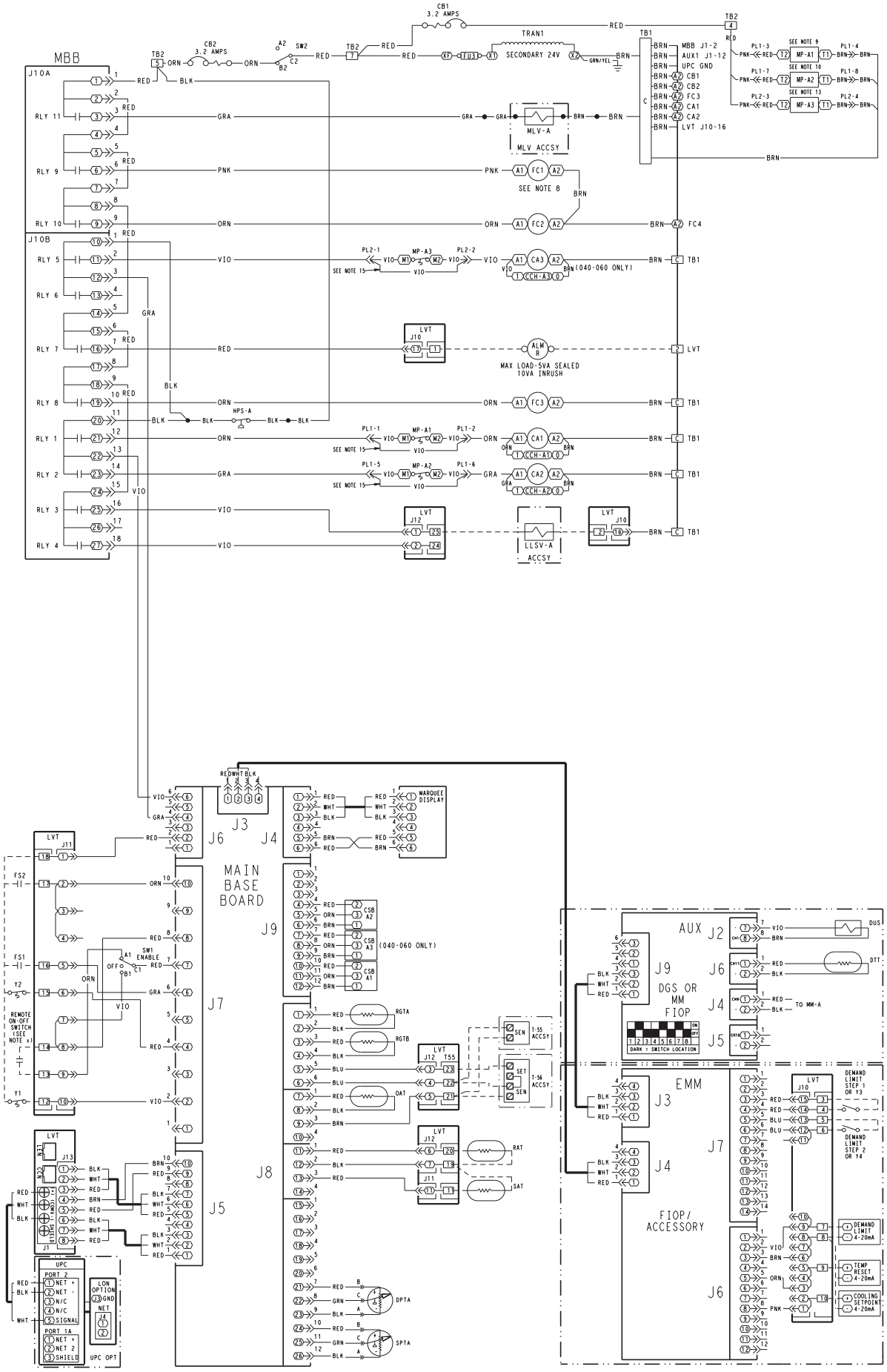


Fig. 8 — Control Wiring Schematic — 38APS025-050

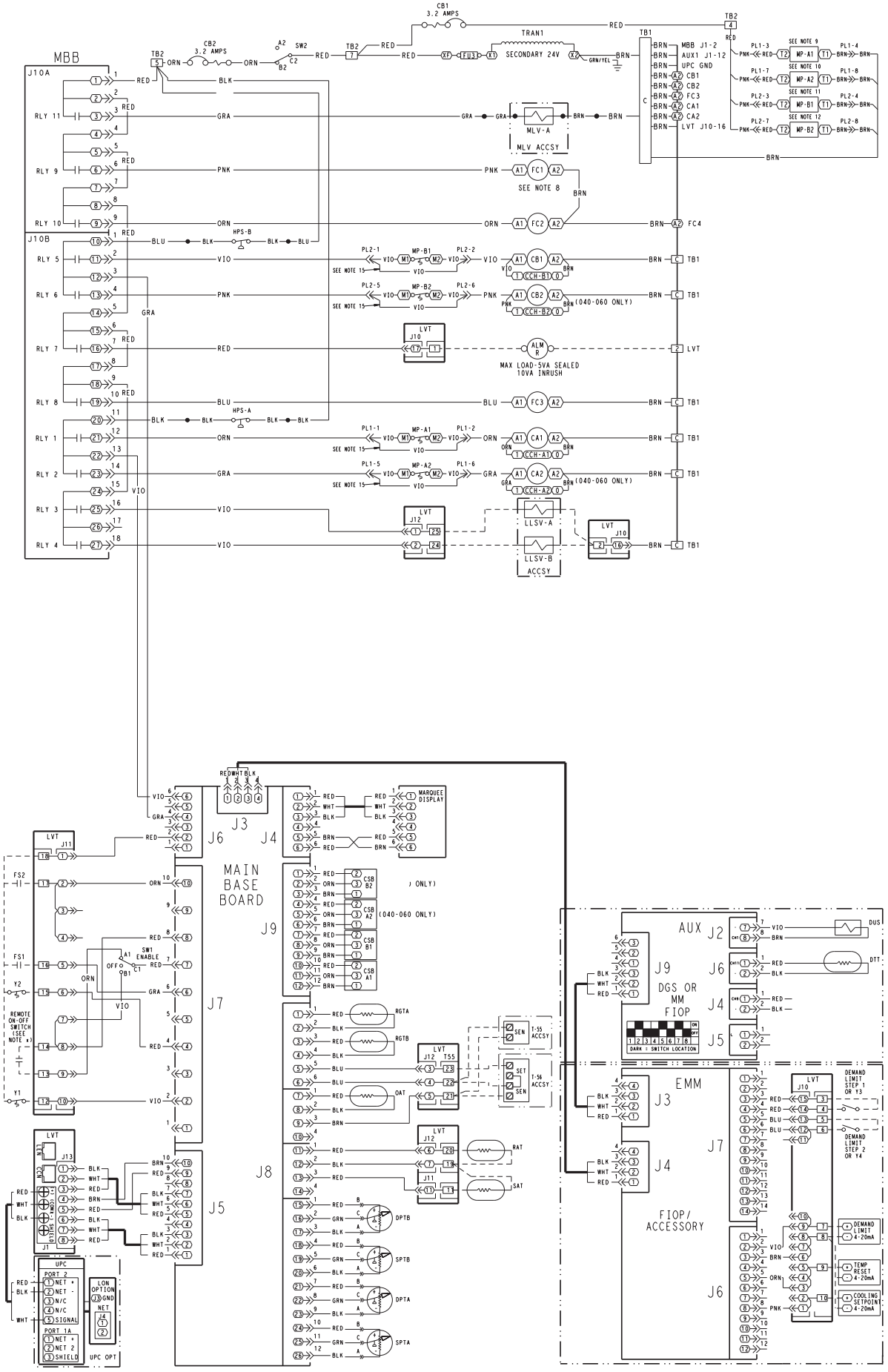


Fig. 9 — Control Wiring Schematic — 38APD025-060

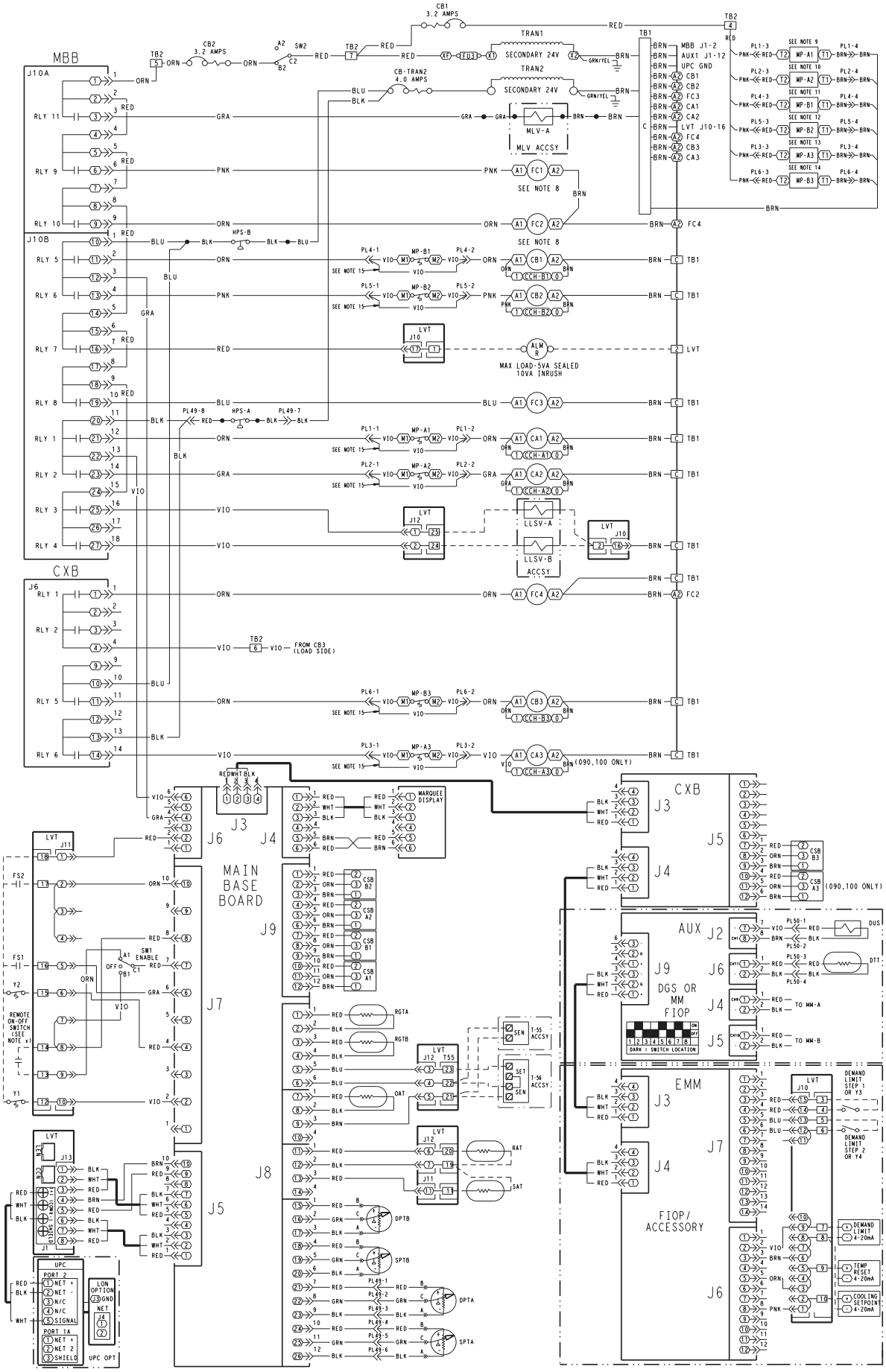


Fig. 10 — Control Wiring Schematic — 38APD070-100

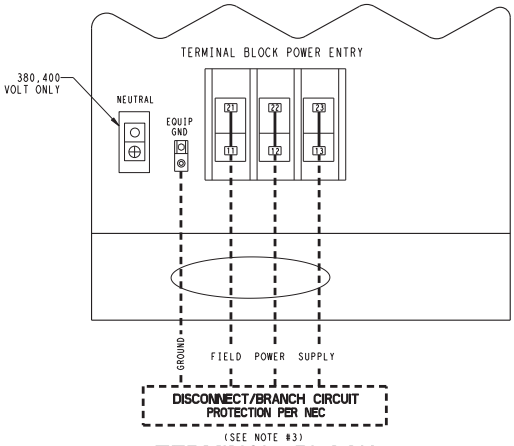
Legend and Notes for Fig. 4-10

LEGEND

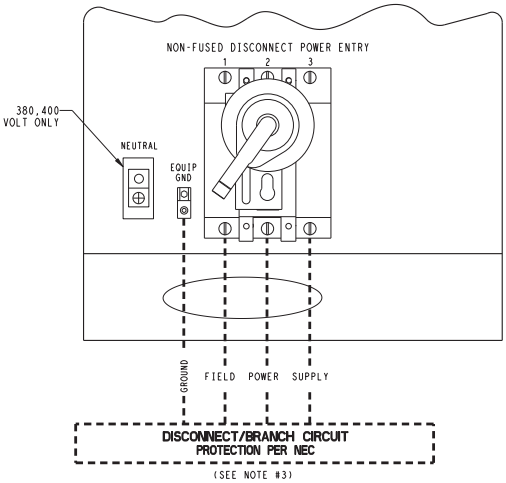
ACCSY	— Accessory
ALM	— Alarm
AMPS	— Amperes
AUX	— Auxiliary
C	— Contactor
CB	— Circuit Breaker
CCB	— Compressor Circuit Breaker
CCH	— Crankcase Heater Relay
CH	— Crankcase Heater
COMP	— Compressor
CSB	— Current Sensor Board
CXB	— Compressor Expansion Module
DGS	— Digital Scroll
DPT	— Discharge Pressure Transducer
DTT	— Discharge Temperature Thermistor
DUS	— Digital Unloaded Solenoid
EMM	— Energy Management Module
EQUIP GND	— Equipment Ground
FB	— Fuse Block
FC	— Fan Contactor
FCB	— Fan Circuit Breaker
FIOP	— Factory-Installed Option
FR	— Fan Relay
FS	— Fan Status
FU	— Fuse
GND	— Ground
HPS	— High Pressure Switch
LLSV	— Liquid Line Solenoid Valve
LVT	— Low Voltage Terminal
MBB	— Main Base Board
MLV	— Minimum Load Valve
MM	— Motormaster
MP	— Modular Motor Protector
NEC	— National Electrical Code
OAT	— Outdoor Air Thermistor
OFM	— Outdoor Fan Motor
OPT	— Option
PL	— Plug
RAT	— Return Air Temperature
RGT	— Return Gas Temperature
RLY	— Relay
SAT	— Supply Air Temperature
SEN	— Sensor Terminal Block
SET	— Set Point Terminal Block
SPT	— Suction Pressure Transducer
SW	— Switch
TB	— Terminal Block
TEMP	— Temperature
TRAN	— Transformer
UPC	— Unitary Protocol Converter
Y	— Cool Stage

NOTES:

1. Factory wiring is in accordance with UL (Underwriters Laboratories) 1995 standards. Any field modifications or additions must be in compliance with all applicable codes.
2. Use 75 C minimum wire for field power supply.
3. All field interlock contacts must have a minimum rating of 2 amps at 24-vac sealed. See field interlock wiring.
4. Compressor and fan motors are thermally protected. Three-phase motors protected against single-phase conditions.
5. Terminals 13 and 14 of LVT are for field connection of remote on-off. The contact must be rated for dry circuit application capable of handling a 5-vdc, 1 mA to 20 mA load.
6. For 500 series unit operation at 208-3-60 line voltage, TRAN1 primary connections must be moved to terminals H3 and H4.
7. For 575-3-60 units, fan circuit breakers FCB1 and FCB2 are replaced with fuse blocks FB1 and FB2.
8. For units with low ambient Motormaster® V factory-installed option or field-installed acessory, fan contactors FC1 and FC2 are replaced with fan relays FR1 and FR2.
9. MP-A1 not used in the following units:
   070-100: 400-v, 460-v units without digital scroll
10. MP-A2 not used in the following units:
    070-100: 400-v, 460-v
11. MP-B1 not used in the following units:
    070: all units
    080-100: 400-v, 460-v
12. MP-B2 not used in the following units:
    070: all units
    080-100: 400-v, 460-v
13. MP-A3 not used in the following units:
    090,100: 400-v, 460-v
14. MP-B3 not used in the following units:
    070: all units
    080-100: 400-v, 460-v
15. Jumper plug required when modular motor protector is not used.



TERMINAL BLOCK



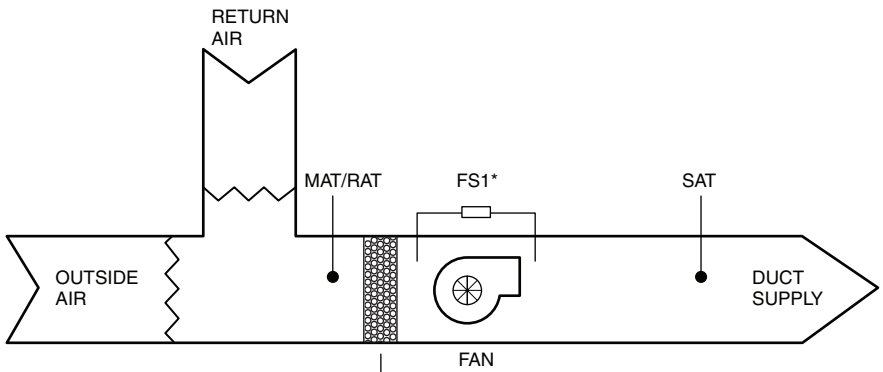
NON-FUSED DISCONNECT

LEGEND

EQUIP GND — Equipment Ground
NEC — National Electrical Code

NOTES:
1. Factory wiring is in accordance with UL 1995 standards. Field modifications or additions must be in compliance with all applicable codes.
2. All units or modules have single point primary power connection. Main power must be supplied from a field or factory-supplied disconnect.
3. Wiring for main field supply must be rated 75 C. Use copper conductors only.
   a. Incoming wire size range for terminal block with MCA (minimum circuit amps) up to 175 amps is 14 AWG (American Wire Gage) to 2/0.
   b. Incoming wire size range for terminal block with MCA from 175.1 amps to 420 amps is 2 AWG to 600 kcmil.
   c. Incoming wire size range for non-fused disconnect with MCA up to 100 amps is 14 AWG to 1/0.
   d. Incoming wire size range for non-fused disconnect with MCA from 100.1 amp to 200 amps is 6 AWG to 350 kcmil.
   e. Incoming wire size range for non-fused disconnect with MCA from 200.1 amp to 450 amps is 3/0 to 500 kcmil.
4. Refer to certified dimensional drawings for exact locations of the main power and control power entrance locations.

Fig. 11 — Field Power Wiring

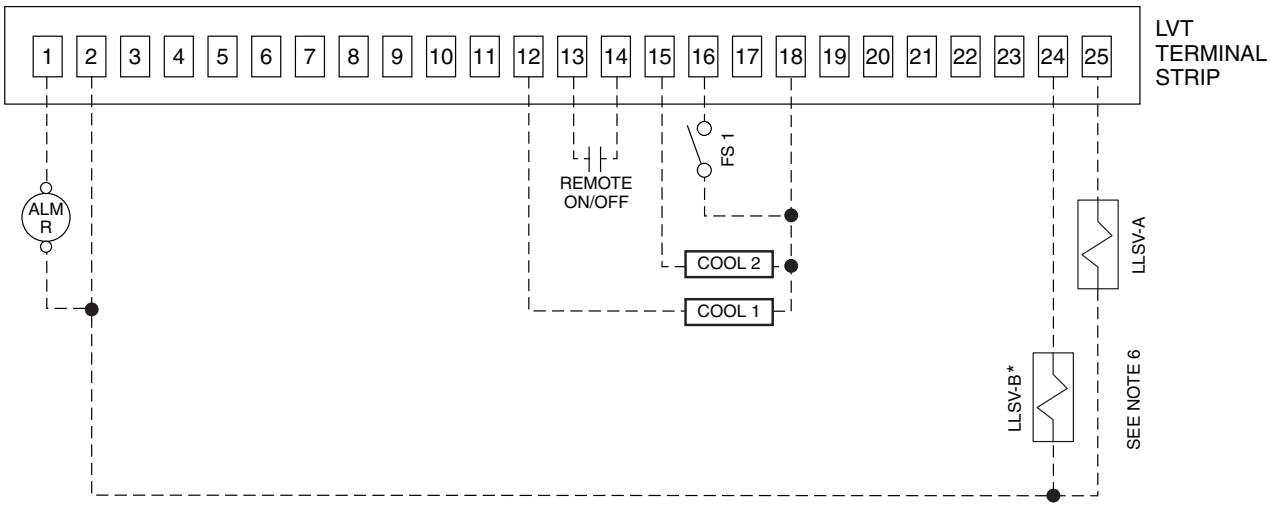


LEGEND

FS1 — Fan Status Switch (24-v)
MAT — Mixed Air Temperature Sensor
RAT — Return Air Temperature Sensor
SAT — Supply Air Temperature Sensor

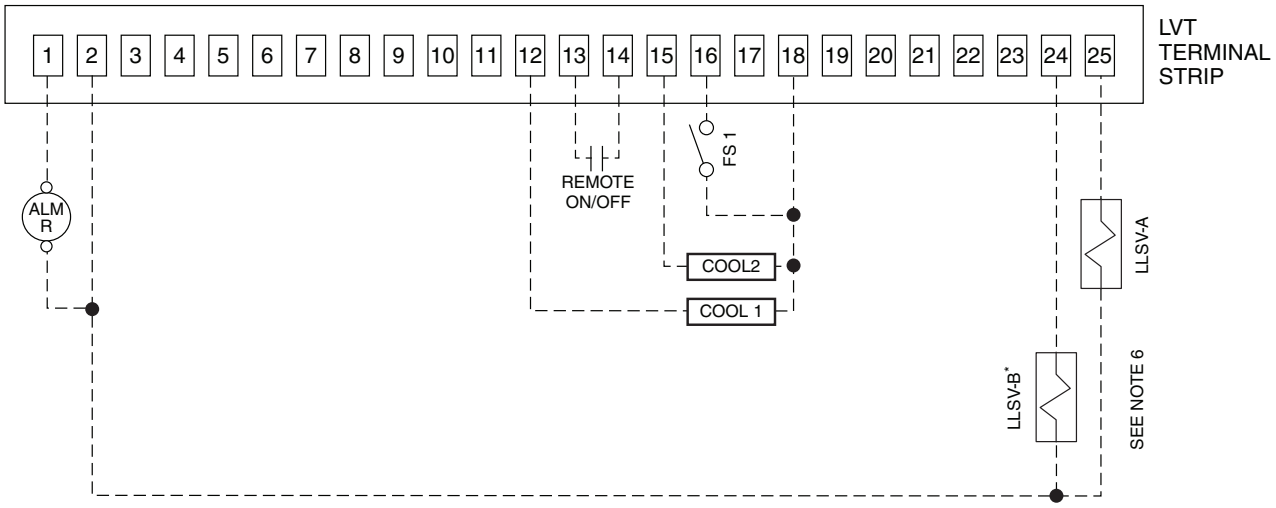
*FS1 can be pressure differential switch (shown), motor current detection, or sail switch.

Fig. 12 — MAT/RAT and SAT Sensor Layout



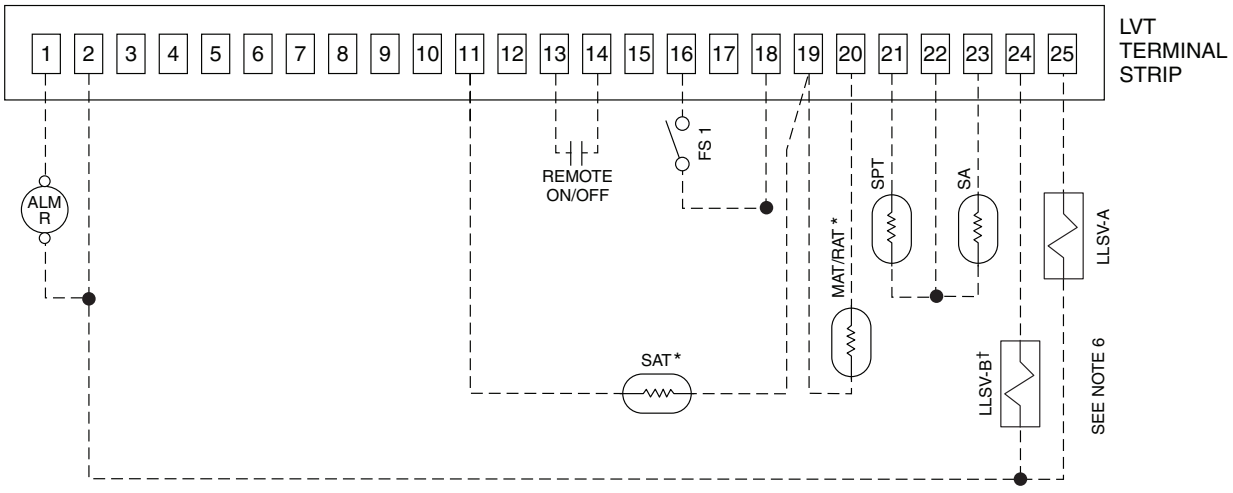
*Not required for single circuit units.

Fig. 13 — Constant Volume Application Wiring Diagram 2-Stage Thermostat Control, Sizes 025-030 — without Digital Scroll Option



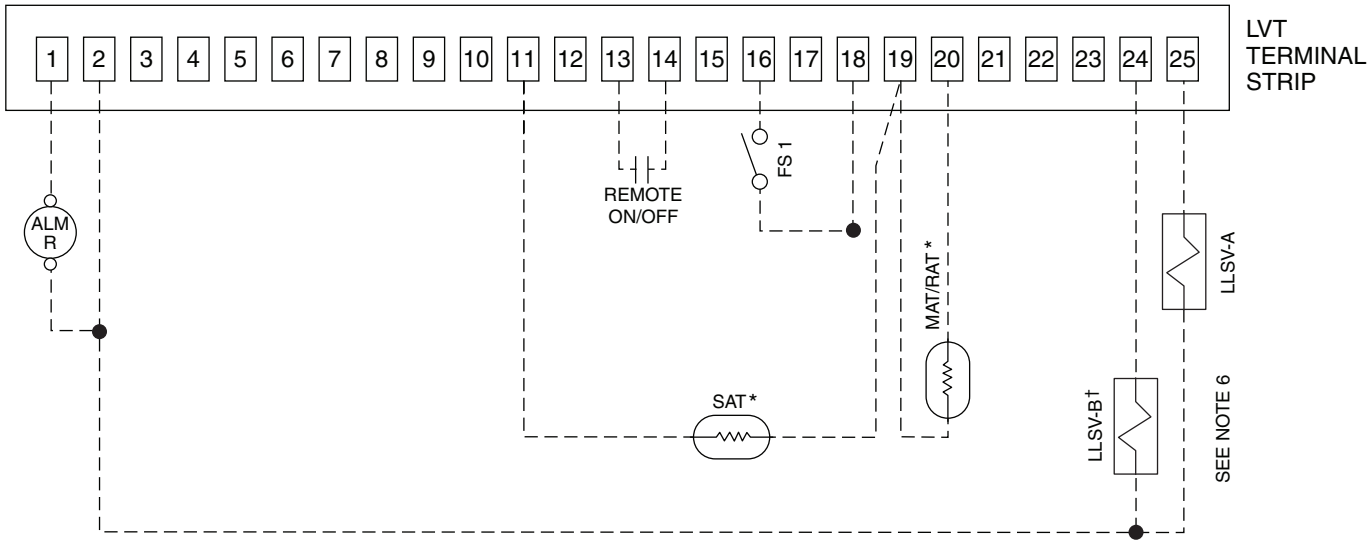
*See Fig. 12 for MAT/RAT and SAT location.
†Not required for single circuit units.

Fig. 14 — Constant Volume Application Wiring Diagram 2-Stage Thermostat Control — with Digital Scroll Option, Sizes 025-030 or All Sizes 040-100



*See Fig. 12 for MAT/RAT and SAT location.
†Not required for single circuit units.

Fig. 15 — Constant Volume Application Wiring Diagram Space Temperature Sensor Control, Sizes 025-100



*See Fig. 12 for MAT/RAT and SAT location.
†Not required for single circuit units.

Fig. 16 — Variable Air Volume Application Wiring Diagram, Sizes 025-100

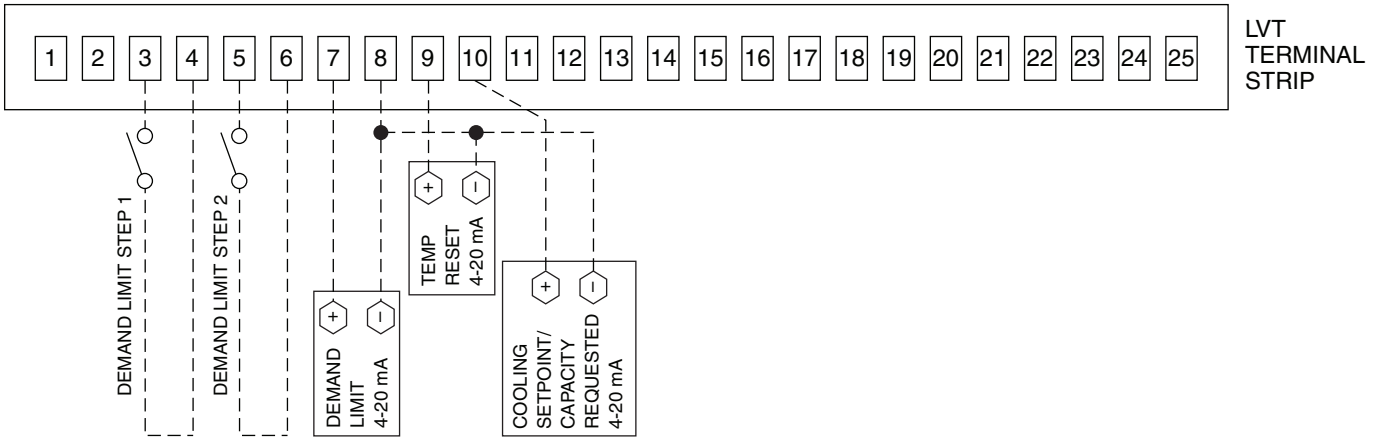


Fig. 17 — Optional Energy Management Module Wiring

Legend and Notes for Fig. 13-17

LEGEND

ALM R	—	Alarm Relay (24-v), 5-va Maximum
COOL1	—	Thermostat Stage 1 (24-v)
COOL2	—	Thermostat Stage 2 (24-v)
FS1	—	Fan Status Switch (24-v)
LLSV	—	Liquid Line Solenoid Valve
LVT	—	Low Voltage Terminal
MAT	—	Mixed Air Temperature Sensor
RAT	—	Return Air Temperature Sensor
SA	—	Set Point Adjustment (T-56, T-59)
SAT	—	Supply Air Temperature Sensor
SPT	—	Space Temperature Sensor (T-55, T-56, T-59)
- - - -		Field Control Wiring

NOTES:
1. Factory wiring is in accordance with UL 1995 standards. Field modifications or additions must be in compliance with all applicable codes.
2. All units or modules have single point primary power connection. Main power must be supplied from a field or factory-supplied disconnect.
3. Wiring for main field supply must be rated 75 C. Use copper conductors only.
   a. Incoming wire size range for terminal block with MCA (minimum circuit amps) up to 175 amps is 14 AWG (American Wire Gage) to 2/0.
   b. Incoming wire size range for terminal block with MCA from 175.1 amps to 420 amps is 2 AWG to 600 kcmil.
   c. Incoming wire size range for non-fused disconnect with MCA up to 100 amps is 14 AWG to 1/0.
   d. Incoming wire size range for non-fused disconnect with MCA from 100.1 amp to 200 amps is 6 AWG to 350 kcmil.
   e. Incoming wire size range for non-fused disconnect with MCA from 200.1 amp to 450 amps is 3/0 to 500 kcmil.
4. Terminals 1 and 2 of the LVT are for the alarm relay. The maximum load allowed for the alarm relay is 5-va sealed and 10-va inrush at 24-v. Field power supply is not required.
5. Refer to certified dimensional drawings for exact locations of the main power and control power entrance locations.
6. Terminals 24, 25, and 2 of the LVT are for the control of the field-supplied LLSV. The maximum load allowed for the LLSV is 15-va sealed and 30-va inrush at 24-v. Field power supply is not required.
7. LLSV (24-v) should be 15-va maximum per valve as required.
8. Installation of fan status switch (FS1) is recommended.
9. The contacts for remote ON/OFF, fan status, and demand limit options must be rated for dry circuit application capable of handling a 24-vac load up to 50 mA.

Display Module Usage

SCROLLING MARQUEE DISPLAY — This device is the keypad interface used for accessing unit information, reading sensor values, and testing the unit. See Fig. 18. The scrolling marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display. Eleven mode LEDs are located on the display as well as an Alarm Status LED. See Appendix A — Display Tables for further details.

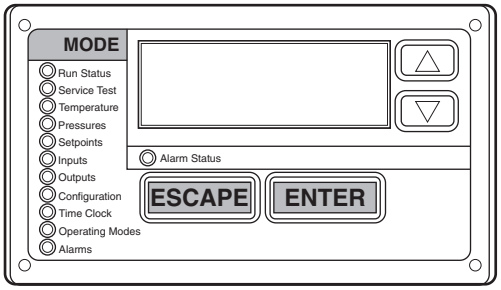


Fig. 18 — Scrolling Marquee Display

The scrolling marquee display module provides the user interface to the *Comfort*Link™ control system. The display has up and down arrow keys, an ESCAPE key, and an ENTER key. These keys are used to navigate through the different levels of the display structure. See Table 2. Press the ESCAPE key until the display is blank to move through the top 11 mode levels indicated by LEDs on the left side of the display.

Pressing the ESCAPE and ENTER keys simultaneously will scroll a clear language text description across the display indicating the full meaning of each display acronym. Pressing the ESCAPE and ENTER keys when the display is blank (Mode LED level) will return the scrolling marquee display to its default menu of rotating display items. In addition, the password will be disabled requiring that it be entered again before changes can be made to password protected items. Clear language descriptions will be displayed in English.

When a specific item is located, the display will flash showing the operator, the item, followed by the item value and then followed by the item units (if any). Press the ENTER key to stop the display at the item value. Items in the Configuration and Service Test modes are password protected. The display will flash PASS and WORD when required. Use the ENTER and arrow keys to enter the 4 digits of the password. The default password is 1111.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press ENTER to stop the display at the item value. Press the ENTER key again so that the item value flashes. Use the arrow keys to change the value or state of an item and press the ENTER key to accept it. Press the ESCAPE key and the item, value, or units display will resume. Repeat the process as required for other items.

ACCESSORY NAVIGATOR™ DISPLAY MODULE — The Navigator module provides a mobile user interface to the *Comfort*Link™ control system, which is only available as a field-installed accessory. The display has up and down arrow keys, an ENTER key, and an ESCAPE key. These keys are used to navigate through the different levels of the display structure. Press the ESCAPE key until 'Select a Menu Item' is displayed to move through the top 11 mode levels indicated by LEDs on the left side of the display. See Fig. 19.

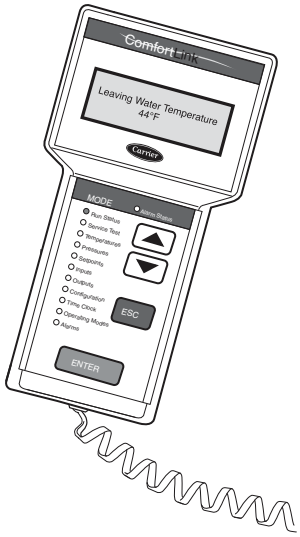


Fig. 19 — Accessory Navigator Display Module

Once within a Mode or sub-mode, a ">" indicates the currently selected item on the display screen. Pressing the ENTER and ESCAPE keys simultaneously will put the Navigator module into expanded text mode where the full meaning of all sub-modes, items and their values can be displayed. Pressing the ENTER and ESCAPE keys when the display says 'Select Menu Item' (Mode LED level) will return the Navigator module to its default menu of rotating display items (those items in ***Run Status→VIEW***). In addition, the password will be disabled, requiring that it be entered again before changes can be made to password protected items. Press the ESCAPE key to exit out of the expanded text mode.

NOTE: When the Language Selection (***Configuration→DISP→LANG***), variable is changed, all appropriate display expansions will immediately change to the new language. No power-off or control reset is required when reconfiguring languages.

When a specific item is located, the item name appears on the left of the display, the value will appear near the middle of the display and the units (if any) will appear on the far right of the display. Press the ENTER key at a changeable item and the value will begin to flash. Use the up and down arrow keys to change the value, and confirm the value by pressing the ENTER key.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press ENTER so that the item value flashes. Use the arrow keys to change the value or state and press the ENTER key to accept it. Press the ESCAPE key to return to the next higher level of structure. Repeat the process as required for other items.

Items in the Configuration and Service Test modes are password protected. The words **Enter Password** will be displayed when required, with 1111 also being displayed. The default password is 0111. Use the arrow keys to change the number and press ENTER to enter the digit. Continue with the remaining digits of the password. The password can only be changed through CCN operator interface software such as ComfortWORKS®, ComfortVIEW™ and Service Tool.

Adjusting the Contrast — The contrast of the display can be adjusted to suit ambient conditions. To adjust the contrast of the Navigator module, press the ESCAPE key until the display reads, "Select a menu item." Using the arrow keys move to the Configuration mode. Press ENTER to obtain access to this mode. The display will read:

> TEST OFF
METR OFF
LANG ENGLISH

Pressing ENTER will cause the "OFF" to flash. Use the up or down arrow to change "OFF" to "ON". Pressing ENTER will illuminate all LEDs and display all pixels in the view screen. Pressing ENTER and ESCAPE simultaneously allows the user to adjust the display contrast. Use the up or down arrows to adjust the contrast. The screen's contrast will change with the adjustment. Press ENTER to accept the change. The Navigator module will keep this setting as long as it is plugged in to the LEN bus.

Adjusting the Backlight Brightness — The backlight of the display can be adjusted to suit ambient conditions. The factory default is set to the highest level. To adjust the backlight of the Navigator module, press the ESCAPE key until the display reads, "Select a menu item." Using the arrow keys move to the Configuration mode. Press ENTER to obtain access to this mode. The display will read:

> TEST OFF
METR OFF
LANG ENGLISH

Pressing ENTER will cause the "OFF" to flash. Use the up or down arrow keys to change "OFF" to "ON". Pressing ENTER will illuminate all LEDs and display all pixels in the view screen. Pressing the up and down arrow keys simultaneously allows the user to adjust the display brightness. Use the up or down arrow keys to adjust screen brightness. Press ENTER to accept the change. The Navigator module will keep this setting as long as it is plugged in to the LEN bus.

Main Base Board (MBB) — See Fig. 20. The MBB is the heart of the *Comfort*Link control system. It contains the major portion of operating software and controls the operation of the machine. The MBB continuously monitors input/output channel information received from its inputs and from all other modules. The MBB receives inputs from the discharge and suction pressure transducers, current sensor boards (CSB) and thermistors. See Table 3. The MBB also receives the discrete inputs from the thermostat contacts and other status switches. See Table 4. The MBB also controls several outputs. Information is transmitted between modules via a 3-wire communication bus or LEN (Local Equipment Network). The CCN (Carrier Comfort Network®) bus is also supported. Connections to both LEN and CCN buses are made at the LVT (low voltage terminal) terminal strip.

Current Sensor Board (CSB) — The CSB is used to monitor the status of the compressors by measuring current and providing an analog input to the main base board (MBB) or compressor expansion module (CXB).

Energy Management Module (EMM) — The EMM module is available as a factory-installed option or as a field-installed accessory. The EMM module receives 4 to 20 mA inputs for the percent capacity, temperature reset, cooling set point, and demand limit functions. The EMM module also receives the switch inputs for the field-installed 2-stage demand limit and when two thermostats are used for one unit. The EMM module communicates the status of all inputs with the MBB, and the MBB adjusts the control point, capacity limit, and other functions according to the inputs received.

Table 2 — Scrolling Marquee Display Menu Structure*

MODE	RUN STATUS	SERVICE TEST	TEMPERATURES	PRESSURES	SET POINTS	INPUTS	OUTPUTS	CONFIGURATION	TIME CLOCK	OPERATING MODES	ALARMS
SUB-MODE	Auto Display (VIEW)	Manual Mode On/Off (TEST)	Unit Temperatures (UNIT)	Ckt A Pressures (PRC.A)	Cooling (COOL)	Unit Discrete (GEN.I)	Unit Discrete (GEN.O)	Display (DISP)	Unit Time (TIME)	Modes (MODE)	Current (CRNT)
	Machine Hours/Starts (RUN)	Unit Outputs (OUTS)	Ckt A Temperatures (CIR.A)	Ckt B Pressures (PRC.B)	Head Pressure (HEAD)	Ckt A/B (CRCT)	Ckt A (CIR.A)	Unit Configuration (UNIT)	Unit Date (DATE)	Task State (TSKS)	Reset Alarms (RCRN)
	Compressor Run Hours (HOUR)	Ckt A Comp Tests (CMPA)	Ckt B Temperatures (CIR.B)			Unit Analog (4-20)	Ckt B (CIR.B)	CCN Network (CCN)	Daylight Saving Time (DST)		Alarm History (HIST)
	Compressor Starts (STRT)	Ckt B Comp Tests (CMPB)						Options 1 (OPT1)	Local Holiday Schedules (HOL.L)		
	Preventive Maintenance (PM)							Options 2 (OPT2)	Schedule Number (SCH.N)		
	Software Version (VERS)							Motormaster (M.MST)	Local Schedule Number (SCH.L)		
								Reset Cool Temperature (RSET)	Schedule Overide (OVR)		
								Set Point Select (SLCT)			
								Service Configuration (SERV)			
								Broadcast Configuration (BCST)			

LEGEND

Ckt — Circuit

*Throughout this text, the location of items in the menu structure will be described in the following format:
Item Expansion (***Mode Name→Sub-mode Name→ITEM***)

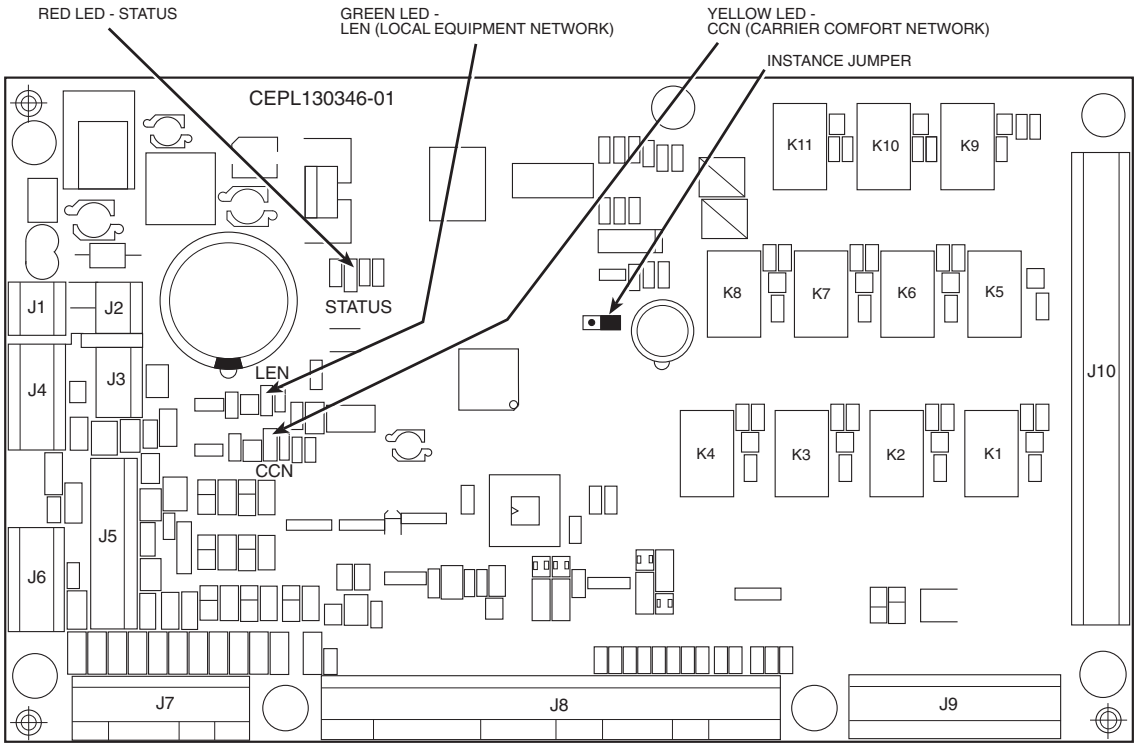


Fig. 20 — Main Base Board

Table 3 — Thermistor Designations

THERMISTOR INPUT	PIN CONNECTION POINT
Return Air (Accessory)	MBB J8-11,12; LVT 19,20
Supply Air (Accessory)	MBB J8-12,13; LVT 11,19
Compressor Return Gas Temperature A	MBB J8-1,2
Compressor Return Gas Temperature B	MBB J8-3,4
Outdoor Air Temperature	MBB J8-7,8
Discharge Temperature (Digital Option Only)	AUX J6-1,2
Space Temperature (Accessory)	MBB J8-5,6; LVT 21,22

Table 4 — Switch Inputs

SWITCH INPUT	PIN CONNECTION POINT
Thermostat Y1 (Accessory)	LVT 12,18
Thermostat Y2 (Accessory)	LVT 15,18
Fan Status 1 (Accessory)	LVT 16,18
Fan Status 2 (Accessory)	LVT 17,18
Remote On/Off	LVT 13,14
High Pressure Switch A	MBB J6-4
High Pressure Switch B	MBB J6-6

Compressor Expansion Module (CXB) — The CXB is only used on unit sizes 070-100 to provide additional inputs and outputs for fans and compressors when the unit has more than 4 compressors.

AUX Board (AUX) — The AUX is used with the digital scroll option and the low ambient head pressure option. It provides additional inputs and outputs for digital scroll control along with analog outputs to control head pressure control fan speeds.

Enable/Off/Remote Contact Switch — The Enable/Off/Remote Contact switch is a 3-position switch used to control the unit. When switched to the Enable position, the unit is under its own control. Move the switch to the Off position to shut the unit down. Move the switch to the Remote Contact position and a field-installed dry contact can be used to start the unit. The contacts must be capable of handling a 24 vac, 50 mA load. In the Enable and Remote Contact (dry contacts closed) positions, the unit is allowed to operate and respond to the scheduling configuration, CCN configuration and set point data. See Fig. 21.

Emergency On/Off Switch — The Emergency On/Off switch should only be used when it is required to shut the unit off immediately. Power to the MBB, CXB, AUX, EMM, and scrolling marquee display is interrupted when this switch is off and all outputs from these modules will be turned off.

Board Addresses — The main base board (MBB) has a 3-position Instance jumper that must be set to '1.' All other boards have 4-position DIP switches. All switches are set to 'On' for all boards.

Control Module Communication

RED LED — Proper operation of the control boards can be visually checked by looking at the red status LEDs (light-emitting diodes). When operating correctly, the red status LEDs should be blinking in unison at a rate of once every 2 seconds. If the red LEDs are not blinking in unison, verify that correct power is being supplied to all modules. Be sure that the main base board (MBB) is supplied with the current software. If necessary, reload current software. If the problem still persists, replace the MBB. A red LED that is lit continuously or blinking at a rate of once per second or faster indicates that the board should be replaced.

GREEN LED — The MBB has one green LED. The Local Equipment Network (LEN) LED should always be blinking whenever power is on. All other boards have a LEN LED which should be blinking whenever power is on. Check LEN connections for potential communication errors at the board J3 and/or J4 connectors. Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module. The J4 connector on the MBB provides both power and communication directly to the marquee display only.

YELLOW LED — The MBB has one yellow LED. The Carrier Comfort Network (CCN) LED will blink during times of network communication.

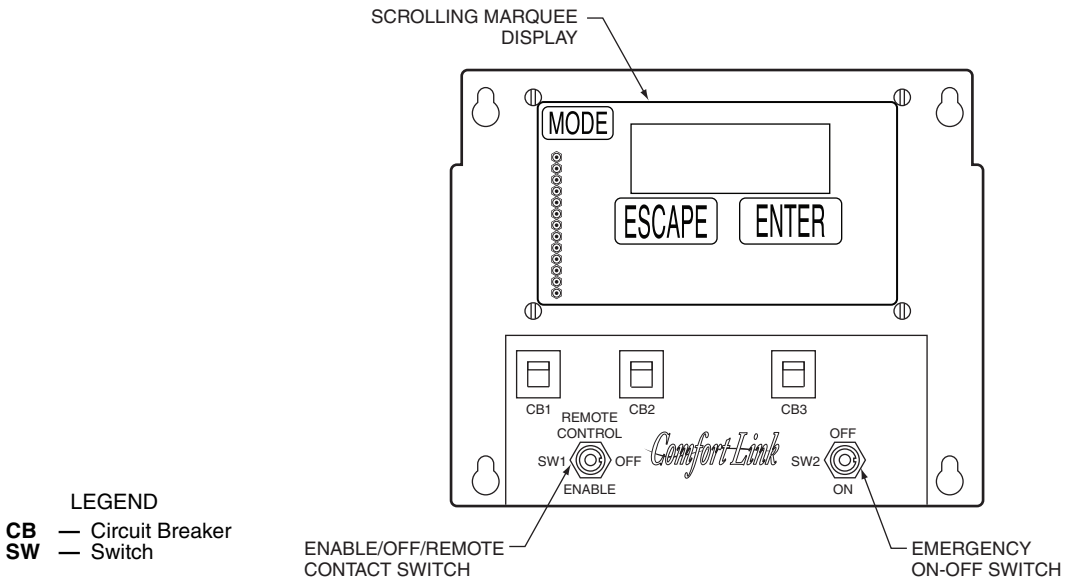


Fig. 21 — Scrolling Marquee, Enable/Off/Remote Contact Switch, and Emergency On/Off Switch Locations

Carrier Comfort Network® (CCN) Interface — The 38AP units can be connected to the CCN if desired. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is supplied and installed in the field. See Table 5. The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system elements on either side of it. This is also required for the negative and signal ground pins of each system element. Wiring connections for CCN should be made at LVT. Consult the CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20 C to 60 C is required. Wire manufactured by Alpha (2413 or 5463), American (A22503), Belden (8772), or Columbia (02525) meets the above mentioned requirements.

It is important when connecting to a CCN communication bus that a color coding scheme be used for the entire network to simplify the installation. It is recommended that red be used for the signal positive, black for the signal negative, and white for the signal ground. Use a similar scheme for cables containing different colored wires.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only). To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (–) conductors. (Substitute appropriate colors for different colored cables.)
3. Connect the red wire to (+) terminal on LVT of the plug, the white wire to COM terminal, and the black wire to the (–) terminal.
4. The RJ14 CCN connector on LVT can also be used, but is only intended for temporary connection (for example, a laptop computer running Service Tool).

IMPORTANT: A shorted CCN bus cable will prevent some routines from running and may prevent the unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check the CCN connector and cable. Run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

Table 5 — CCN Communication Bus Wiring

MANUFACTURER	PART NO.	
	Regular Wiring	Plenum Wiring
Alpha	1895	—
American	A21451	A48301
Belden	8205	884421
Columbia	D6451	—
Manhattan	M13402	M64430
Quabik	6130	—

OPERATING DATA

Sensors — The electronic control uses 3 to 7 thermistors to sense temperatures for controlling unit operation. See Table 3. These sensors are outlined below. Three different thermistor curves are utilized depending on the thermistor and the configuration of the input. The three different types are 5 kΩ at 77 F (25 C), 10 kΩ at 77 F (25 C), and 86 kΩ at 77 F (25 C). See Thermistors section on page 49 for additional information.

RETURN AIR TEMPERATURE (RAT) ACCESSORY (Part No. 33ZCSENSAT) — A return air temperature sensor is required for unit sizes 040-100 and all units equipped with the digital scroll option. The sensor is field installed in the indoor unit and wired to the LVT of the unit to measure the air temperature entering the evaporator coil. The sensor should be located directly in front of the evaporator coil after an outside air intake.

The RAT sensor consists of a thermistor encased within a stainless steel probe. See Fig. 22. The sensor probe is 6 in. nominal length with 114 in. of unshielded, 2-conductor 18 AWG twisted-pair cables. The sensor temperature range is –40 to 245 F with a nominal resistance of 10,000 ohms at 77 F. The sensor has with an accuracy of ±0.36 F.

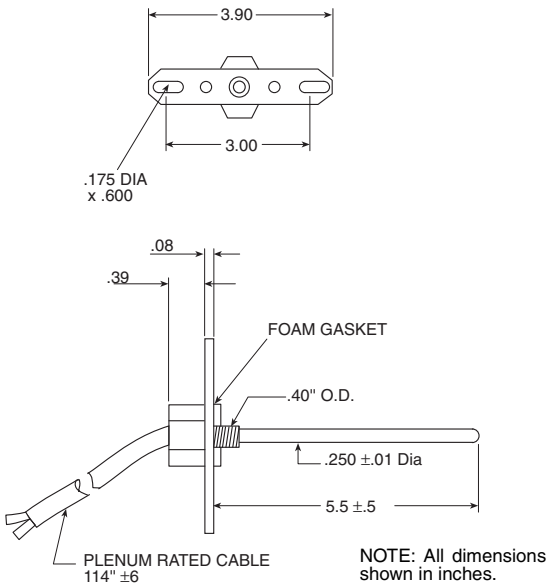


Fig. 22 — 33ZCSENSAT Sensor

SUPPLY AIR TEMPERATURE (SAT) ACCESSORY (33ZCSENSAT) — A supply air temperature sensor is required for unit sizes 040-100 and all units equipped with the digital scroll option. The SAT sensor consists of a thermistor encased within a stainless steel probe. See Fig. 22. The SAT sensor probe is 6 in. nominal length with 114 in. of unshielded, 2-conductor 18 AWG twisted-pair cables. The sensor temperature range is –40 to 245 F with a nominal resistance of 10,000 ohms at 77 F. The sensor has an accuracy of ±0.36 F.

NOTE: The sensor must be mounted in the discharge of the unit, downstream of the cooling coil and before any heating coil or heat exchanger if reheat is utilized. Be sure the probe tip does not come in contact with any of the unit surfaces.

COMPRESSOR RETURN GAS TEMPERATURE SENSOR (RGT) — These sensors are factory installed in a friction fit well located in the suction line of each circuit. They are a 5 kΩ thermistor connected to the main base board.

OUTDOOR-AIR TEMPERATURE SENSOR (OAT) — This sensor is factory installed on a bracket which is inserted through the base pan of the unit on the unit sizes 025-060 and mounted to the back of the control box on the unit sizes 070-100. This sensor is a 5 kΩ thermistor connected to the main base board.

DISCHARGE TEMPERATURE THERMISTOR (DTT) — This sensor is only used on units with a digital compressor. The sensor is mounted on the discharge line close to the discharge of the digital compressor. It attaches to the discharge line using a spring clip and protects the system from high discharge gas temperature when the digital compressor is used. This sensor is a 86 kΩ thermistor connected to the AUX board.

SPACE TEMPERATURE SENSOR (SPT) — The space temperature sensors are used to measure the interior temperature of a building. The following three types of SPT sensors are available:

- Space temperature sensor (33ZCT55SPT) with timed override button (see Fig. 23)
- Space temperature sensor (33ZCT56SPT) with timed override button and set point adjustment (see Fig. 24)
- Space temperature sensor (33ZCT59SPT) with occupancy override button, set point adjustment slidebar, and LCD (liquid crystal display) display

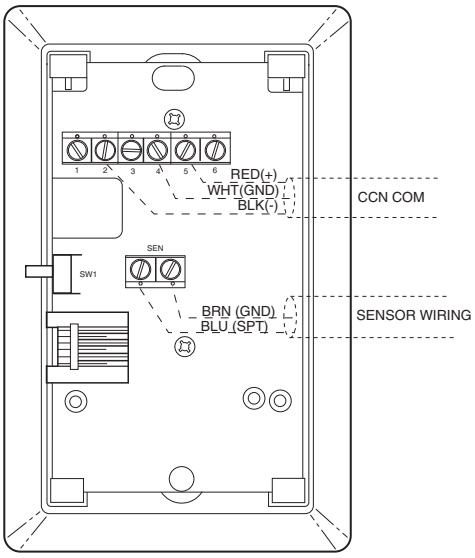


Fig. 23 — Space Temperature Sensor Typical Wiring (33ZCT55SPT)

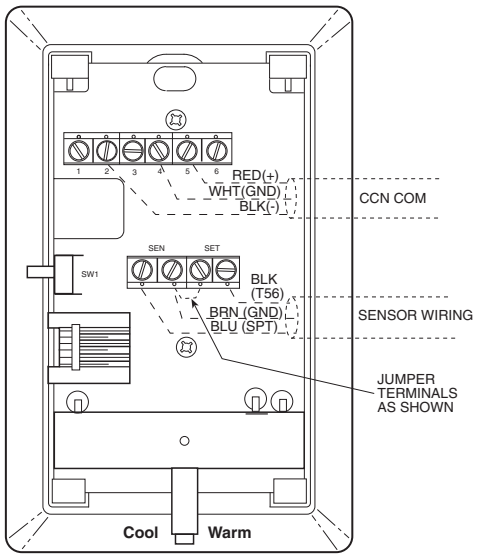


Fig. 24 — Space Temperature Sensor Typical Wiring (33ZCT56SPT)

The sensor should be mounted approximately 5 ft from the floor in an area representing the average temperature in the space. Allow at least 4 ft between the sensor and any corner. Mount the sensor at least 2 ft from an open doorway.

To connect the space temperature sensor (Fig. 25):

1. Use a 20 gage wire to connect the sensor to the controller. The wire is suitable for distances of up to 500 ft. Use a three-conductor shielded cable for the sensor and set point adjustment connections. The standard CCN communication cable may be used. If the set point adjustment (slidebar) is not required, then an unshielded, 18 or 20 gage, two-conductor, twisted pair cable may be used. Connect one wire of the twisted pair to one SEN terminal and connect the other wire to the other SEN terminal located under the cover of the space temperature sensor.
2. Connect the other ends of the wires to terminals 21 and 22 on LVT located in the unit control box.
3. Connect the T56 set point adjustment between the SET terminal and LVT terminal 23.

Units on the CCN can be monitored from the space using the RJ11 connector provided with the space sensor, if desired. To wire the RJ11 connector into the CCN (Fig. 26):

IMPORTANT: The cable selected for the RJ11 connector wiring MUST be identical to the CCN communication bus wire used for the entire network. Refer to Table 5 for acceptable wiring.

1. Cut the CCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to terminal 5 of the space temperature sensor terminal block.
3. Insert and secure the white (ground) wire to terminal 4 of the space temperature sensor.
4. Insert and secure the black (–) wire to terminal 2 of the space temperature sensor.
5. Connect the other end of the communication bus cable to the remainder of the CCN communication bus.

NOTE: See Fig. 27 for space temperature averaging.

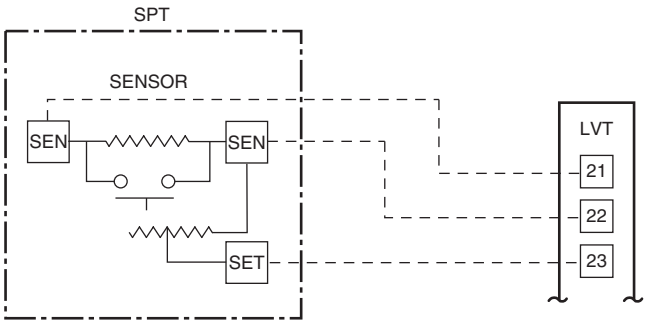


Fig. 25 — Typical SPT Wiring

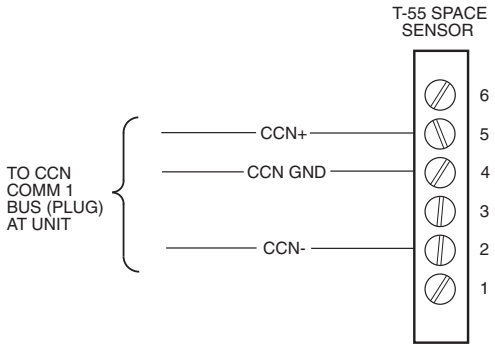
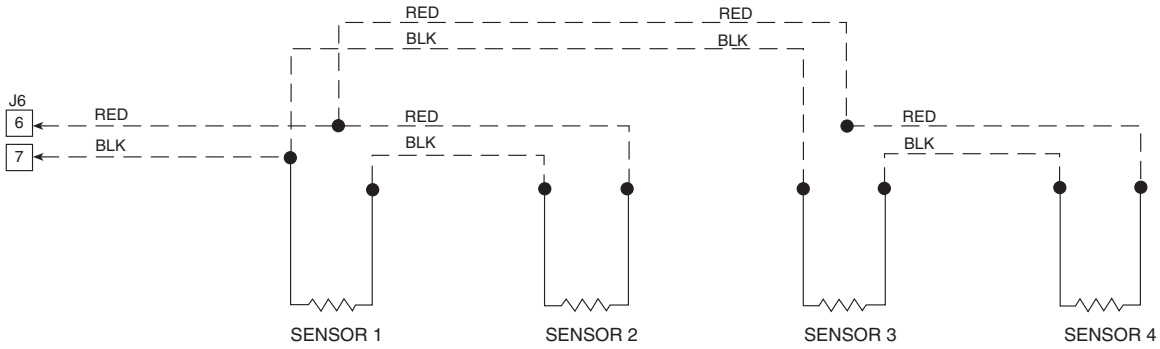
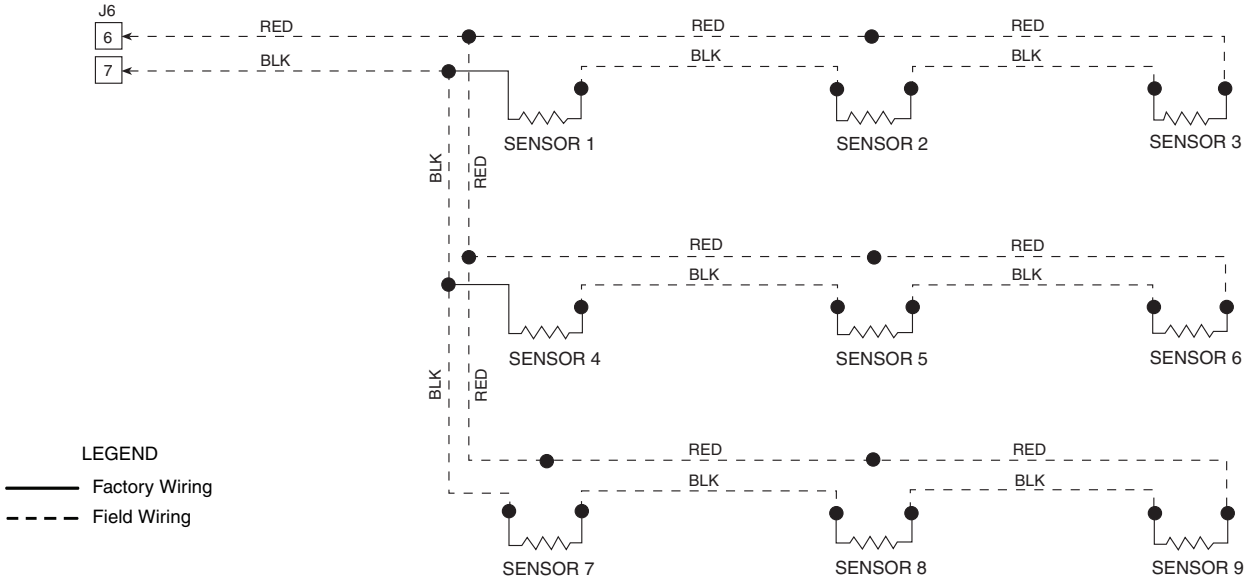


Fig. 26 — CCN Communications Bus Wiring to Optimal Space Sensor RJ11 Connector



SPACE TEMPERATURE AVERAGING — 4 SENSOR APPLICATION



SPACE TEMPERATURE AVERAGING — 9 SENSOR APPLICATION

Fig. 27 — Space Temperature Averaging

Fan Status Input — A proof-of-fan operation is recommended and needs to be field installed in the indoor unit. Several different types of switches can be utilized, such as a differential pressure switch located across the indoor fan or auxiliary contacts on an indoor fan contactor.

Thermostat Input — A two-stage thermostat can be used for constant volume applications to provide Y1 and Y2 cooling inputs.

Pressure Transducer Inputs — Each refrigerant circuit is equipped with a suction and discharge pressure transducer. The suction pressure transducers have a yellow body with a pressure range of -6.7 to 420 psig while the discharge transducers have a red body with a pressure range of 14.5 to 667 psig. These inputs connect to the MBB (main base board) and are used to monitor the status of the unit and to ensure the unit operates within the compressor envelope. The transducers are used to protect the compressor from operating at too low or too high of a pressure condition. In some cases, the unit may not be able to run at full capacity. The MBB will automatically reduce the capacity of a circuit as needed to maintain specified maximum/minimum operating pressures.

Energy Management Module (Fig. 28) — The energy management module (EMM) is a factory-installed option (FIOP) or field-installed accessory used for the following types of temperature reset, demand limit, and capacity control features:

- 4 to 20 mA temperature reset
- 4 to 20 mA cooling set point
- 4 to 20 mA desired capacity set point
- 4 to 20 mA demand limit
- Discrete inputs for 2-step demand limit (requires field-supplied dry contacts capable of handling a 24 vac, 50 mA load)
- Discrete inputs for units with dual thermostats

NOTE: A field-supplied 4 to 20 mA signal generator is required for use with the EMM.

See VAV Supply Air Temperature Reset and Demand Limit sections on pages 29 and 31 for further details.

⚠ CAUTION

Care should be taken when interfacing with other manufacturer's control systems due to possible power supply differences, full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link™ controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used.

Control — When mechanical cooling is required, the MBB has the capability to control the unit capacity by staging multiple scroll compressors and controlling the digital scroll compressor operation. The control also checks on various other operation parameters in the unit to make sure that safeties are not exceeded and the compressors are reliably operated.

The *Comfort*Link™ control system offers two basic control approaches to mechanical cooling; constant volume operation for 2 stages of cooling or VAV operation for multiple stages of cooling. In addition to these methods of control, the *Comfort*Link control offers the ability to run multiple stages of cooling for either a space temperature sensor or thermostat control by controlling the unit to either a low or high cool set point. The control type ***Configuration→OPT2→C.TYP*** determines the selection of the type of cooling control as well as the method for selecting a cooling mode.

SETTING UP THE SYSTEM

Machine Control Type (***Configuration→OPT2→ C.TYP***) — The most important cooling control configuration is located under ***Configuration→ OPT2***. This configuration defines the method and control source responsible for selecting a cooling mode. The configuration also determines the method by which compressors are staged. Control types are:

- ***C.TYP* = 1** (VAV-RAT) configuration refers to standard VAV operation.

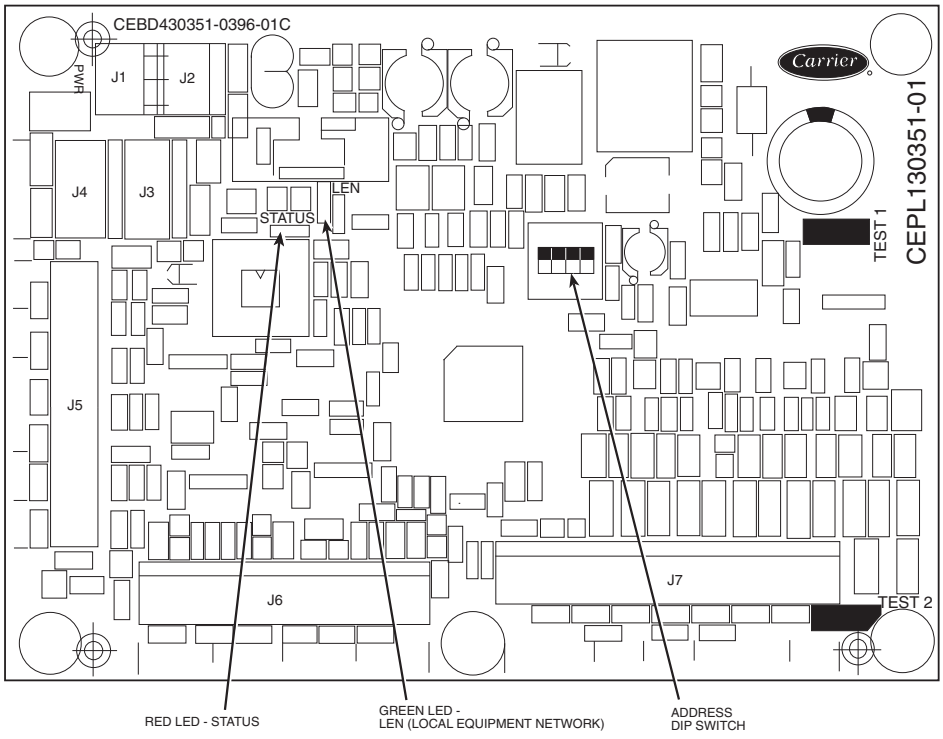


Fig. 28 — Energy Management Module

- ***C.TYP* = 3** (TSTAT-MULTI) configuration will force the MBB to monitor the thermostat inputs to make a determination of mode. Unlike traditional 2-stage thermostat control, the unit is allowed to use multiple stages of cooling control and perform VAV style operation. The control will be able to call out a low set point or a high set point to maintain supply air temperature. (Required for 025-030 units with digital scroll option and 040-100 units with two-stage thermostat control.)
- ***C.TYP* = 4** (TSTAT-2STG) configuration will force the MBB to monitor the thermostat inputs to make a determination of mode.
- ***C.TYP* = 5** (SPT-MULTI) configuration will force the MBB to monitor a space temperature sensor to make a determination of mode. Unlike traditional 2-stage space temperature control, the unit is allowed to use multiple stages of cooling control and perform VAV style operation. The control will be able to call out a low set point or a high set point to maintain supply air temperature.
- ***C.TYP* = 7** (% CAPACITY) configuration will force the MBB to monitor the 4-20 cooling demand ***CL.MA*** input and translate this into desired % capacity for the unit.
- ***C.TYP* = 9** (VAV-SETPOINT) configuration will force the MBB to monitor the 4-20 cooling demand ***CL.MA*** input. This value will be translated into a desired leaving-air set point ranging from 40 to 80 F. The control will translate the input linearly with 4 ma equal to 40 F set point and 20 mA equal to 80 F set point.

Unit Capacity Control Based on Unit Type — The MBB uses several set points to control capacity depending on unit type. The set points are located in the set point area of the display ***SetPoints→COOL***. Refer to Table 6 and the following descriptions.

Table 6 — Unit Capacity Control

ITEM	DESCRIPTION	RANGE	UNITS	DEFAULT
CSP1	Cooling Set Point 1	40-80	F	65
CSP2	Cooling Set Point 2	40-80	F	55
SPS.P	Space Temperature Cooling Set Point	65-80	F	74
L.C.ON	Demand Level Low Cool On	–1-2	^F	1.5
H.C.ON	Demand Level (+) High Cool On	0.5-20.0	^F	0.5
L.C.OF	Demand Level (–) Low Cool Off	0.5-2	^F	1

- ***C.TYP* = 1** (VAV-RAT) is a capacity control routine that controls compressor capacity to supply air temperature. The MBB will attempt to control leaving temperature to the control point (***CTPT***) which equals ***CSP1*** plus any reset which is being applied.
- ***C.TYP* = 3** (TSTAT-MULTI) configuration will force the MBB to monitor the thermostat inputs to make a determination of control point (***CTPT***). The control will vary the control point based on Y1 and Y2 inputs. When Y1 is closed ***CSP1*** will be used and when Y2 is closed ***CSP2*** will be used as the supply air temperature set point. ***CSP1*** should be greater than ***CSP2***.
- ***C.TYP* = 4** (TSTAT-2STG) configuration will force the MBB to monitor the thermostat inputs to make a determination of mode and capacity. If Y1 input is closed, 50% of the unit capacity will be energized and if Y2 is closed, 100% of the unit capacity will be energized.

  NOTE: This is not a preferred method of control for units with greater than 2 stages of capacity
- ***C.TYP* = 5** (SPT-MULTI) configuration will force the MBB to monitor the thermostat inputs to determine mode and cooling set point as the unit is controlled by space temperature vs space temperature set point **SPS.P**. Unlike traditional 2-stage thermostat control, the unit is allowed to use multiple stages of cooling control and perform VAV style operation. The control will be able to call out a low set point (***CSP1***) or high set point (***CSP2***) for supply air depending on space temperature vs space temperature set point. The control uses ***SPS.P***, ***LC.ON***, ***HC.ON***, and ***LC.OF*** to determine the leaving set point. ***LC.ON*** and ***HC.ON*** are added to the space temperature set point to determine when cooling mode will begin and when ***CSP1*** and ***CSP2*** will be used for leaving set point.

  Based on ***LC.OF***, the control point transitions between ***CSP1*** and ***CSP2***. ***LC.OF*** is used to calculate the space temperature at which control point is raised based on space temperature vs space temperature set point (***SPS.P***) plus ***LC.ON*** minus ***LC.OF***. The control point transition from ***CSP2*** to ***CSP1*** occurs when space temperature is below ***LC.OF*** divided by 2.

  For example (see Fig. 29):

  Given: ***SPS.P*** = 72 F, ***LC.ON*** = 1, ***HC.ON*** = 3, ***LC.OF*** = 2 F, ***CSP1*** = 60 F, and ***CSP2*** = 55 F

  If space temperature equals 73 F (72+1) (Low Cool) cooling will begin and control set point equals 60 F (***CSP1***).

  If space temperature is greater than 76 F (72+1+3 = 76) (High Cool), control point set point would equal 55 F (***CSP2***).

  If space temperature falls below 72 F (73-2/2) (Low Cool minus ***LC.OF***/2), control point transitions back to 60 F ***CSP1*** if space continues to fall below 71 F (73-2) (Low Cool minus ***LC.OF***), the unit is shut off.

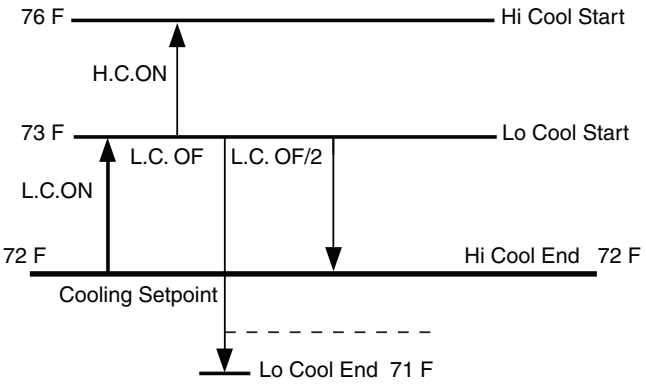


Fig. 29 — Space Temperature vs. Space Temperature Set Point

- ***C.TYP* = 7** (% CAPACITY) configuration will force the MBB to monitor the input 4-20 cooling demand ***CL.MA*** and translate this into desired % capacity for the unit. The control will attempt to match the desired capacity insuring the unit operates the compressor within compressor safeties and timeguards. (Requires the EMM option or accessory.)
- ***C.TYP* = 9** (VAV-SETPOINT) configuration will force the MBB to operate as a VAV unit and control capacity to meet supply air temperature. The control point is developed from the 4-20 cooling demand ***CL.MA*** input value. The 4 to 20 mA input will be translated into a desired control point ranging from 40 to 80 F. The control will translate the input linearly with 4 mA equal to 40 F set point and 20 mA equal to 80 F set point. (Requires the EMM option or accessory.)

Capacity Control Logic when Control is Controlling to Supply Temperature — The control system cycles compressors, hot gas bypass and the digital compressor to maintain the supply temperature at or close to the control point of the unit. The SAT and RAT sensors are used by the main base board (MBB) to determine the temperature drop across the evaporator and are used in determining the optimum time to add or subtract capacity stages. The CSP set points can be automatically reset by

the return temperature, space, or outdoor-air temperature reset features. It can also be reset from an external 4 to 20 mA signal (requires energy management module factory-installed option or field-installed accessory).

The control has an automatic lead-lag feature built in which determines the wear factor (combination of starts and run hours) for each compressor. If all compressors are off and less than 30 minutes has elapsed since the last compressor was turned off, the wear factor is used to determine which compressor to start next. As additional stages of compression are required, the processor control will add them. If a circuit is to be stopped, the compressor with the lowest wear factor will be shut off first. See Table 7 for compressor size information and Table 8 for compressor loading sequence.

The capacity control algorithm runs every 30 seconds. The algorithm attempts to maintain the control point at the desired set point. Each time it runs, the control reads the entering and leaving temperatures. The control determines the rate at which conditions are changing and calculates 2 variables based on these conditions. Next, a capacity ratio is calculated using the 2 variables to determine whether or not to make any changes to the current stages of capacity. This ratio value ranges from –100 to +100%. If the next stage of capacity is a compressor, the control starts (stops) a compressor when the ratio reaches +100% (-100%). A delay of 90 seconds occurs after each capacity step change. Refer to Table 8.

Table 7 — Compressor Size Information

UNIT SIZE	CIRCUIT A (Nominal hp)			CIRCUIT B (Nominal hp)		
	Compressor A1	Compressor A2	Compressor A3	Compressor B1	Compressor B2	Compressor B3
38APS025	11	11	—	—	—	—
38APD025	11	—	—	11	—	—
38APS027	13	13	—	—	—	—
38APD027	13	—	—	13	—	—
38APS030	15	15	—	—	—	—
38APD030	15	—	—	15	—	—
38APS040	13	13	13	—	—	—
38APD040	10	10	—	9	9	—
38APS050	15	15	15	—	—	—
38APD050	12	12	—	13	13	—
38APD060	13	13	—	15	15	—
38APD070	15	15	—	11	11	11
38APD080	15	15	—	15	15	15
38APD090	13	13	13	15	15	15
38APD100	15	15	15	15	15	15

Table 8 — Part Load Data Percent

38AP UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement	Compressor	% Displacement	Compressor
38APS025-030	1 2	50 100	A1 A1,A2	— —	— —
38APD025-030	1 2	50 100	A1 A1, B1	50 100	B1 A1,B1
38APS040,050	1 2 3	33 67 100	A1 A1,A2 A1,A2,A3	— — —	— — —
38APD040	1 2 3 4	27 50 77 100	A1 A1,B1 A1,A2,B1 A1,A2,B1,B2	23 50 73 100	B1 A1,B1 A1,B1,B2 A1,A2,B1,B2
38APD050,060	1 2 3 4	23 50 73 100	A1 A1,B1 A1,A2,B1 A1,A2,B1,B2	27 50 77 100	B1 A1,B1 A1,B1,B2 A1,A2,B1,B2
38APD070	1 2 3 4 5	15 42 57 85 100	A1 A1,B1 A1,A2,B1 A1,A2,B1,B2 A1,A2,B1,B2,B3	15 42 57 85 100	B1 A1,B1 A1,B1,B2 A1,A2,B1,B2 A1,A2,B1,B2,B3
38APD080	1 2 3 4 5	20 40 60 80 100	A1 A1,B1 A1,A2,B1 A1,A2,B1,B2 A1,A2,B1,B2,B3	20 40 60 80 100	B1 A1,B1 A1,B1,B2 A1,A2,B1,B2 A1,A2,B1,B2,B3
38APD090	1 2 3 4 5 6	15 32 48 66 82 100	A1 A1,B1 A1,A2,B1 A1,A2,B1,B2 A1,A2,A3,B1,B2,B3 A1,A2,A3,B1,B2,B3	18 32 51 66 85 100	B1 A1,B1 A1,B1,B2 A1,A2,B1,B2 A1,A2,B1,B2,B3 A1,A2,A3,B1,B2,B3
38APD100	1 2 3 4 5 6	17 33 50 67 83 100	A1 A1,B1 A1,A2,B1 A1,A2,B1,B2 A1,A2,A3,B1,B2 A1,A2,A3,B1,B2,B3	17 33 50 67 83 100	B1 A1,B1 A1,B1,B2 A1,A2,B1,B2 A1,A2,B1,B2,B3 A1,A2,A3,B1,B2,B3

NOTES:
1. These capacity steps may vary due to different capacity staging sequences.
2. When unit is equiped with digital scroll option, sequence A is always used.

MINUTES LEFT FOR START — This value is displayed only in the network display tables (using Service Tool, ComfortVIEW™ or ComfortWORKS® software) and represents the amount of time to elapse before the unit will start its initialization routine. This value can be zero without the machine running in many situations. This can include being unoccupied, ENABLE/OFF/REMOTE CONTACT switch in the OFF position, CCN not allowing unit to start, Demand Limit in effect, no call for cooling due to no load, and alarm or alert conditions present. If the machine should be running and none of the above are true, a minimum off time (DELY, see below) may be in effect. The machine should start normally once the time limit has expired.

MINUTES OFF TIME (***Configuration→OPT2 →DELY)*** — This user-configurable time period is used by the control to determine how long unit operation is delayed after power is applied/restored to the unit. Typically, this time period is configured when multiple machines are located on a single site. For example, this gives the user the ability to prevent all the units from restarting at once after a power failure. A value of zero for this variable does not mean that the unit should be running.

NOTE: If the unit has digital scroll or hot gas bypass, circuit A is always lead.

LEAD/LAG DETERMINATION — This is a configurable choice and is factory set to be automatic for all units. The value can be changed to Circuit A or Circuit B leading as desired. Set at automatic, the control will sum the current number of logged circuit starts and one-quarter of the current operating hours for each circuit. The circuit with the lowest sum is started first. Changes to which circuit is the lead circuit and which is the lag are also made when total machine capacity is at 100% or when there is a change in the direction of capacity (increase or decrease) and each circuit's capacity is equal.

CAPACITY CONTROL OVERRIDES — The following overrides will modify the normal operation of the routine.

Deadband Multiplier — The user configurable deadband multiplier (***Configuration→SLCT→Z.GN)*** has a default value of 1.0. The range is from 1.0 to 4.0. When set to other than 1.0, this factor is applied to the capacity Load/Unload Factor. The larger this value is set, the longer the control will delay between adding or removing stages of capacity.

First Stage Override — If the current capacity stage is zero, the control will modify the routine with a 1.2 factor on adding the first stage to reduce cycling. This factor is also applied when the control is attempting to remove the last stage of capacity.

Slow Change Override — This control prevents the capacity stages from being changed when the supply temperature is close to the set point (within an adjustable deadband) and moving toward the set point.

Ramp Loading — The ramp loading control (***Configuration →SLCT→CRMP)*** limits the rate of change of supply temperature. If the unit is in a Cooling mode and configured for Ramp Loading, the control makes 2 comparisons before deciding to change stages of capacity. The control calculates a temperature difference between the control point and supply temperature. If the difference is greater than 4° F (2.2° C) and the rate of change (°F or °C per minute) is more than the configured Cooling Ramp Loading value (***CRMP***), the control does not allow any changes to the current stage of capacity.

Minimum Load Control — If equipped, the minimum load control valve is energized only when one compressor on the circuit is running and the unit is unloading.

Low Saturated Suction Protection — The control will try to prevent shutting a circuit down due to low saturated suction conditions by removing stages of capacity. See Alerts section.

Head Pressure Control — The main base board (MBB) controls the condenser fans to maintain the lowest condensing temperature possible, and thus the highest unit efficiency. The MBB uses the saturated condensing temperature input from the discharge pressure transducer and outside air temperature sensor to control the fans. If OAT is greater than 70 F before a circuit is starting, then all condenser fan stages will be energized. A fan stage is increased based on SCT. When the highest SCT of both circuits is greater than fan on set point, then an additional stage of fan will be added to the current fan stage. Fan On Set Point (***F.ON***) equals Head Set Point ON (115 F) except after a fan stage increase when Head Set Point is increased by Fan Stage Delta (10 F). A fan stage is decreased when the SCTs of both circuits are less than fan off set point for two minutes. Fan Off Set Point (***F.OFF***) equals Head Set Point OFF (–72 F). Table 9 shows the number of fan stages, contactors energized and the fans that are on during the fan stage. Unit sizes 025 to 060 have common fan control. Unit sizes 070 to 100 have some fans that are common and some that are controlled individually. Figure 30 shows the location of each fan and compressor within the unit.

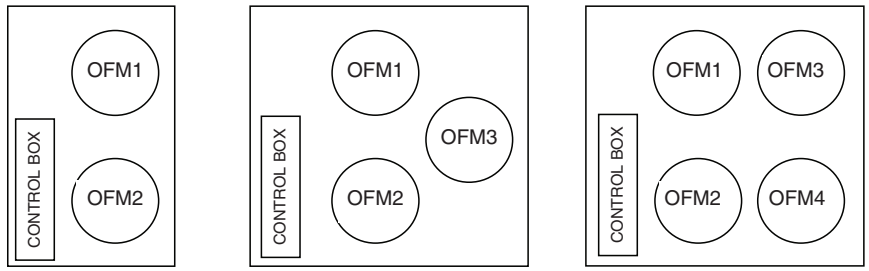
MOTORMASTER® V OPTION — For low-ambient operation, the first stage of fans is equipped with the Motormaster V head pressure controller option or accessory. For units with common fans, the control will control the Head Pressure Setpoint (–10 F) and the highest SCT to try to maintain it at 100 F. Unit sizes 070 to 100 have one Motormaster V for each circuit and the control tries to maintain SCT at 100 F for the circuit. The controller is given an ON command with the first stage of fan and adjusts fan speed.

Table 9 — Fan Stages

38AP UNIT SIZE	CIRCUIT A STAGES/COMMON FAN STAGES			CIRCUIT B FAN STAGES		
	Fan Stage	Contactor Energized	Fans Operating	Fan Stage	Contactor Energized	Fans Operating
025-030	Stage 1 Stage 2	FC1 FC1,2	OFM1 OFM1,2	—	—	—
040,050	Stage 1 Stage 2 Stage 3	FC1 FC2 FC1,2	OFM3 OFM1,2 OFM1,2,3	—	—	—
060	Stage 1 Stage 2 Stage 3 Stage 4	FC1 FC2 FC1,2 FC1,2,3	OFM3 OFM1,2 OFM1,2,3 OFM1,2,3,4	—	—	—
070	Stage 1* Stage 2 Stage 3	FC2,4 FC1 FC1,3	OFM1,2 OFM3 OFM3,4	Stage 1* Stage 2 Stage 3	FC1,3 FC2 FC2,4	OFM3,4 OFM1 OFM1,2
080	Stage 1 Stage 2	FC1 FC1,3	OFM5 OFM5,6,(2)	Stage 1 Stage 2 Stage 3	FC4 FC3,4 FC2,3,4	OFM3 OFM3,2,(6) OFM3,1,2,(6)
090,100	Stage 1 Stage 2 Stage 3 Stage 4 Stage 5 Stage 6	FC4 FC1 FC4,1 FC4,3 FC1,3 FC4,1,3	OFM3 OFM5 OFM3,5 OFM3,(2),4,6 OFM5,(2),4,6 OFM3,5,(2),4,6	Stage 1 Stage 2 Stage 3 Stage 4 Stage 5 Stage 6	FC4 FC2 FC4,2 FC4,3 FC2,3 FC4,2,3	OFM3 OFM1 OFM3,1 OFM3,2,4,(6) OFM1,2,4,(6) OFM3,1,2,4,(6)

* Fan Stage 1 on unit size 070 is used only when ambient temperature is less than 32 F.

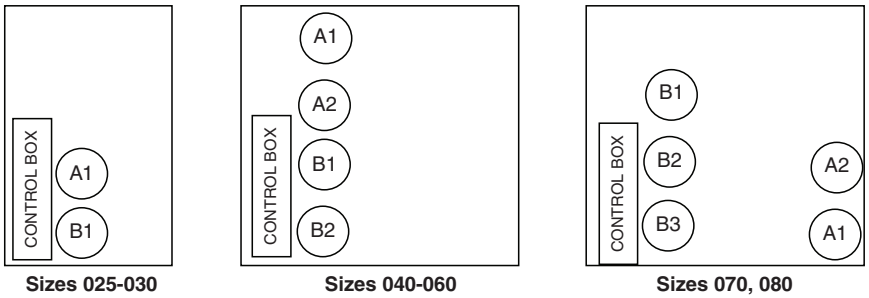
Outdoor Fan Layout – Top View



Sizes 025-030 | Sizes 040, 050 | Sizes 060, 070

Size 080 | Sizes 090, 100

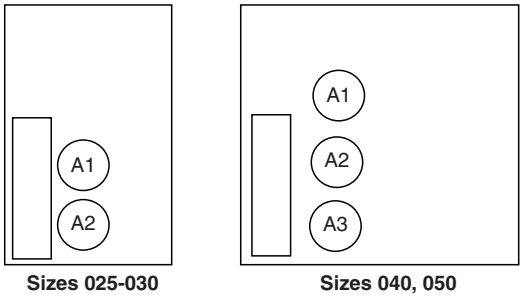
Compressor Layout Dual Circuit – Top View



Sizes 025-030 | Sizes 040-060 | Sizes 070, 080

Sizes 090, 100

Compressor Layout Single Circuit – Top View



Sizes 025-030 | Sizes 040, 050

Fig. 30 — Compressor and Fan Location

Service Test — *Both main power and control circuit power must be on*.

The Service Test function should be used to verify proper operation of condenser fan(s), compressors, minimum load valve solenoid (if installed), liquid line solenoid valve (if installed), and remote alarm relay. To use the Service Test mode, the Enable/Off/Remote Contact switch must be in the OFF position. Use the display keys and Service Test Mode and Sub-Mode Directory table in Appendix A to enter the mode and display TEST. Press ENTER twice so that OFF flashes. Enter the password if required. Use either arrow key to change the TEST value to the ON position and press ENTER. Place the Enable/Off/Remote Contact switch in the ENABLE position. The Service Test mode is now enabled. Press ESCAPE and the ▼ down key to enter the OUTS, COMPA or COMPB sub-mode.

Test the condenser fans, liquid line solenoid and alarm relay by changing the item values from OFF to ON. These discrete outputs are then turned off if there is no keypad activity for 10 minutes. When testing the digital output the display can be changed from 1 to 15 by using either the up or down arrow; the number represents the cycle rate out of a 15 second duty cycle that the output will be energized. If the cycle is set for 7, the output will be energized 7 seconds out of every 15 seconds. Test the compressor and minimum load valve solenoid (if installed) outputs in a similar manner. The minimum load valve solenoids will be turned off if there is no keypad activity for 10 minutes. Compressors will stay on until they are turned off by the operator. The Service Test mode will remain enabled for as long as there is one or more compressors running. All safeties are monitored during this test and they will turn a compressor, circuit or the machine off if required. Any other mode or sub-mode can be accessed, viewed, or changed during the TEST mode. The STAT item (***Run/Status→VIEW***) will display "0" as long as the Service mode is enabled. The TEST sub-mode value must be changed back to OFF before the unit can be switched to Enable or Remote contact for normal operation.

Operating Modes

RAMP LOAD LIMITED (MD05) — Ramp load (pull-down) limiting is in effect. In this mode, the rate at which supply fluid temperature is dropped is limited to a predetermined value to prevent compressor overloading. See Cooling Ramp Loading (***Configuration→SLCT→CRMP***). The pull-down limit can be modified, if desired, to any rate from 0.2 to 2° F (0.1 to 1° C) per minute.

TIMED OVERRIDE IN EFFECT (MD06) — Timed override is in effect. This is a 1 to 4 hour temporary override of the programmed schedule, forcing unit to Occupied mode. Override can be implemented with unit under Local (Enable) or CCN (Carrier Comfort Network®) control. Override expires after each use.

SLOW CHANGE OVERRIDE (MD09) — Slow change override is in effect. The supply fluid temperature is close to and moving towards the control point.

MINIMUM OFF TIME ACTIVE (MD10) — Unit is being held off by Minutes Off Time (***Configuration→OPT2→DELY***).

TEMPERATURE RESET (MD14) — Temperature reset is in effect. In this mode, unit is using temperature reset to adjust supply fluid set point upward and is currently controlling to the modified set point. The set point can be modified based on return fluid, outdoor-air-temperature, space temperature, or 4 to 20 mA signal.

DEMAND LIMITED (MD15) — Demand limit is in effect. This indicates that the capacity of the unit is being limited by demand limit control option. Because of this limitation, the unit may not be able to produce the desired supply fluid temperature. Demand limit can be controlled by switch inputs or a 4 to 20 mA signal.

LOW TEMPERATURE COOLING (MD17) — Unit is in Cooling mode and the rate of change of the supply fluid is negative and decreasing faster than -0.5° F per minute. Error between supply fluid and control point exceeds fixed amount. Control will automatically unload the unit if necessary.

HIGH TEMPERATURE COOLING (MD18) — Unit is in Cooling mode and the rate of change of the supply fluid is positive and increasing. Error between supply fluid and control point exceeds fixed amount. Control will automatically load the unit if necessary to better match the increasing load.

TIME GUARD ACTIVE (MDTG) — Compressor time guard is active, preventing the compressor from starting.

HIGH SCT CIRCUIT A (MD21) — Unit is in a Cooling mode and the saturated condensing temperature (SCT) is greater than the calculated maximum limit. No additional stages of capacity will be added. Unit capacity may be reduced if SCT continues to rise to avoid high-pressure switch trips by reducing condensing temperature.

HIGH SCT CIRCUIT B (MD22) — Unit is in a Cooling mode and the saturated condensing temperature (SCT) is greater than the calculated maximum limit. No additional stages of capacity will be added. Unit capacity may be reduced if SCT continues to rise to avoid high-pressure switch trips by reducing condensing temperature.

MINIMUM COMP ON TIME (MD23) — Cooling load may be satisfied, however control continues to operate compressor to ensure proper oil return. This may be an indication of oversized application, low fluid flow rate or low loop volume.

LOW SOUND MODE (MD25) — Not applicable.

Operation of Machine Based on Control Method — Machine On/Off control is determined by the configuration of the control method (***Configuration→OPT2→CTRL***). With the control method set to 0, simply switching the Enable/Off/Remote Contact switch to the Enable or Remote Contact position (external contacts closed) will put the unit in an occupied state. The control mode (***Operating Modes→MODE***) will be 1 (OFF LOCAL) when the switch is Off and will be 5 (ON LOCAL) when in the Enable position or Remote Contact position with external contacts closed.

Two other control methods are available for Machine On/Off control:

OCCUPANCY SCHEDULE (***CTRL*=2**) — The main base board will use the operating schedules as defined under the Time Clock mode in the scrolling marquee display. These schedules are identical. The schedule number must be set to 1 for local schedule.

The schedule number can be set anywhere from 65 to 99 for operation under a CCN global schedule. The Enable/Off/Remote Contact must be in the Enable or Remote Contact position. The control mode (***Operating Modes→MODE***) will be 1 when the switch is Off. The control mode will be 3 when the Enable/Off/Remote Contact switch input is On and the time of day is during an unoccupied period. Similarly, the control mode will be 7 when the time of day is during an occupied period.

CCN SCHEDULE (***CTRL*=3**) — An external CCN device controls the On/Off state of the machine. This CCN device forces the variable 'CHIL_S_S' between Start/Stop to control the unit. The control mode (***Operating Modes→MODE***) will be 1 when the switch is Off. The control mode will be 2 when the Enable/Off/Remote Contact switch input is On and the

CHIL_S_S variable is 'Stop.' Similarly, the control mode will be 6 when the CHIL_S_S variable is 'Start.'

Set Point Adjustment

CV SET POINT ADJUSTMENT — If the unit is configured for control type SPT MULTI (***C.TYP*** =5) and the Space Temperature Offset Sensor is enabled. (***SP.O.S***) set to enable [***Configuration→OPT1***]. Space temperature offset corresponds to a slider on a T56 sensor that allows the occupant to adjust the space temperature by a configured range during an occupied period. The space temperature offset range (***SP.O.R***) value is either added or subtracted from the space temperature cool set point. Example ***SPS.P*** equals 72 F and ***SP.O.R*** equals 5 then the cooling set point can be adjusted from 68 to 77 F by adjusting the T56 slider.

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
SP.O.S	Space Temp Offset Sensor	Enable/ Disable		SPTOSENS
SP.O.R	Space Temp Offset Range	1-10		SPTO_RNG

VAV SUPPLY AIR TEMPERATURE RESET — The control system is capable of changing the controlling set point based on several different methods. The methods are return temperature, space temperature (SPT), outside air temperature (OAT) and from an externally powered 4 to 20 mA signal. Return air is a measure of the building load. The return temperature reset is in effect an average building load reset method. An accessory sensor must be used for SPT reset; either a T55, T56, or T59 sensor can be used. The energy management module (EMM) must be used for temperature reset using a 4 to 20 mA signal. To use 4 to 20 mA reset, one variable must be configured ***MA.DG***, which is the amount of reset desired with a 20 mA signal. The control will interpolate between 0 degrees reset at 4 mA and the value entered for ***MA.DG*** at 20 mA. See Table 10 for an example of 4 to 20 mA reset.

⚠ CAUTION

Care should be taken when interfacing with other control systems due to possible power supply differences; full wave bridge versus half wave rectification. Connection of control devices with different power supplies may result in permanent equipment damage. *Comfort*Link™ controls incorporate power supplies with half wave rectification. A signal isolation device should be utilized if the signal generator incorporates a full wave bridge rectifier.

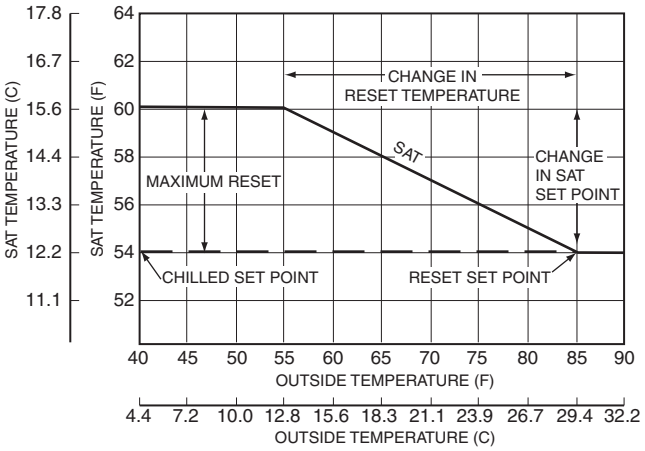
To use Outdoor Air or Space Temperature reset, four variables must be configured. In the Configuration mode under the sub-mode ***RSET***, items ***CRST***, ***RM.NO***, ***RM.F*** and ***RT.DG*** must be properly set. See Table 11. The outdoor air reset example provides 0° F (0° C) reset to the active set point at 85 F (29.4 C) outdoor-air temperature and 6 F (3.3 C) reset at 55 F (12.8 C) outdoor-air temperature. See Fig 31. The space temperature reset example provides 0° F (0° C) reset to the active set point at 72 F (22.2 C) space temperature and 6 F (3.3 C) reset at 68 F (20.0 C) space temperature. See Fig 32. The variable ***CRST*** should be configured for the type of reset desired. The variable ***RM.NO*** should be set to the temperature that no reset should occur. The variable ***RM.F*** should be set to the temperature that maximum reset is to occur. The variable ***RM.DG*** should be set to the maximum amount of reset desired.

To use Return reset, four variables must be configured. In the Configuration mode under the sub-mode ***RSET***, items ***CRST***, ***RT.NO***, ***RT.F*** and ***RT.DG*** must be properly set. See Table 12.

This example provides 5 F (2.8 C) active set point reset at 2 F (1.1 C) ΔT and 0° F (0° C) reset at 10 F (5.6 C) ΔT. The variable ***RT.NO*** should be set to the air temperature difference (ΔT) where no reset should occur. The variable ***RT.F*** should be set to the temperature difference where the maximum reset should occur. The variable ***RM.DG*** should be set to the maximum amount of reset desired. To verify that reset is functioning correctly proceed to Run Status mode, sub-mode ***VIEW***, and subtract the active set point (***SETP***) from the control point (***CTPT***) to determine the degrees reset. Under normal operation, the unit will maintain a constant leaving temperature approximately equal to the cooling set point. As the unit load varies, the return air temperature will change in proportion to the load. Usually the unit size and supply air temperature set point are selected based on a full-load condition. At part load, the air temperature set point may be colder than required. If the leaving air temperature was allowed to increase at part load, the efficiency of the machine would increase.

Return temperature reset allows for the leaving temperature set point to be reset upward as a function of the return air temperature or, in effect, the building load.

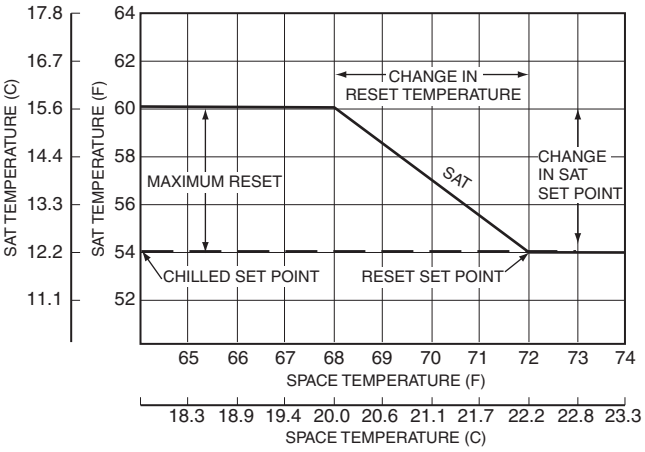
Figures 31 and 32 are examples of outdoor air and space temperature reset.



LEGEND

SAT — Supply Air Temperature

Fig. 31 — Outdoor-Air Temperature Reset



LEGEND

SAT — Supply Air Temperature

Fig. 32 — Space Temperature Reset

Table 10 — 4 to 20 mA Reset

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
RSET	ENTER	CRST	1	COOLING RESET TYPE	0 = no reset 1 = 4 to 20 mA Input 2 = Outdoor Air Temp 3 = Return Fluid 4 = Space Temperature
	▼	MA.DG	5.0 F (2.8 C)	4-20 mA DEGREES RESET	Default: 0° F (0° C) Reset at 20 mA Range: –30 to 30 F (–16.7 to 16.7 C)

NOTE: The example above shows how to configure the unit for 4 to 20 mA reset. No reset will occur at 4.0 mA input, and a 5.0 F reset will occur at 20.0 mA. An energy management module is required.

Table 11 — Configuring Outdoor Air and Space Temperature Reset

MODE (RED LED)	KEYPAD ENTRY	SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY		ITEM EXPANSION	COMMENT
					Outdoor Air	Space		
CONFIGURATION	ENTER	DISP						
	▼	UNIT						
	▼	OPT1						
	▼	OPT2						
	▼	M.MST						
	▼	RSET	ENTER	CRST	2	4	COOLING RESET TYPE	2 = Outdoor-Air Temperature 4 = Space Temperature (Connect to LTV-21,22)
			▼	RM.NO*	85 °F	72 °F	REMOTE - NO RESET TEMP	Default: 125.0 F (51.7 C) Range: 0° to125 F (-17.7 to 51.7 C)
			▼	RM.F	55 °F	68 °F	REMOTE - FULL RESET TEMP	Default: 0.0° F (-17.7 C) Range: 0° to 125 F (-17.7 to 51.7 C)
			▼	RM.DG	15 °F	6 °F	REMOTE - DEGREES RESET	Default: 0° F (0° C) Range: –30 to 30 F (–34.4 to -1.1 °C)

*1 item skipped in this example.

Table 12 — Configuring Return Temperature Reset

MODE (RED LED)	KEYPAD ENTRY	SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
CONFIGURATION	ENTER	DISP					
	▼	UNIT					
	▼	CNN					
	▼	OPT1					
	▼	OPT2					
	▼	M.MST					
	▼	RSET	ENTER	CRST*	3	COOLING RESET TYPE	0 = No Reset 1 = 4 to 20 mA Input (EMM required) 2 = Outdoor-Air Temperature 3 = Return Air Temperature 4 = Space Temperature
			▼	RT.NO*	10° ΔF	RETURN - NO RESET TEMP	Default: 10° ΔF (5.6° ΔC) Range: 0° to 30 F ΔT (-17.7 to 16.7 C)
			▼	RT.F	0° ΔF	RETURN - FULL RESET TEMP	Default: 0° ΔF (–17.8° ΔC) Range: 0° to 10 F ΔT (-17.7 to –12.2 C)
			▼	RT.DG	5° ΔF	RETURN - DEGREES RESET	Default: 0° ΔF (0° ΔC) Range: –30 to 30°F (–16.7 to 16.7 C)

*4 items skipped in this example.

Demand Limit — Demand Limit is a feature that allows the unit capacity to be limited during periods of peak energy usage. There are 3 types of demand limiting that can be configured. The first type is through 2-stage switch control, which will reduce the maximum capacity to 2 user-configurable percentages. The second type is by 4 to 20 mA signal input which will reduce the maximum capacity linearly between 100% at a 4 mA input signal (no reduction) down to the user-configurable level at a 20 mA input signal. The third type uses the CCN loadshed module and has the ability to limit the current operating capacity to maximum and further reduce the capacity if required.

NOTE: The 2-stage switch control and 4 to 20 mA input signal types of demand limiting require the energy management module (EMM).

To use Demand Limit, select the type of demand limiting to use. Then configure the Demand Limit set points based on the type selected.

DEMAND LIMIT (2-Stage Switch Controlled) — To configure Demand Limit for 2-stage switch control, set the Demand Limit Select (***Configuration→RSET→DMDC***) to 1. Then configure the 2 Demand Limit Switch points (***Configuration→RSET→DLS1*** and ***DLS2***) to the desired capacity limit. See Table 13. Capacity steps are controlled by 2 relay switch inputs field wired to low voltage terminal (LVT) strip terminal 3-6. Refer to the unit wiring diagram for these connections.

For Demand Limit by 2-stage switch control, closing the first stage demand limit contact will put the unit on the first demand limit level. The unit will not exceed the percentage of capacity entered as Demand Limit Switch 1 set point. Closing contacts on the second demand limit switch prevents the unit from exceeding the capacity entered as Demand Limit Switch 2 set point. The demand limit stage that is set to the lowest demand takes priority if both demand limit inputs are closed. If the demand limit percentage does not match unit staging, the unit will limit capacity to the closest capacity stage.

To disable demand limit, configure the ***DMDC*** to 0. See Table 13.

EXTERNALLY POWERED DEMAND LIMIT (4 to 20 mA Controlled) — To configure Demand Limit for 4 to 20 mA control, set the Demand Limit Select (***Configuration→RSET→DMDC***) to 2. Then configure the Demand Limit at 20 mA (***Configuration→RSET→DM20***) to the maximum loadshed value desired. Connect the output from an externally powered 4 to 20 mA signal to terminal block LVT strip terminals 7 and 8. Refer to the unit wiring diagram for these connections to the optional/accessory energy management module and terminal block. The control will reduce allowable capacity to this level for the 20 mA signal. See Table 13 and Fig. 33.

⚠ CAUTION

Care should be taken when interfacing with other manufacturer's control systems, due to possible power supply differences, full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link™ controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used. Failure to comply could result in possible equipment damage.

Table 13 — Configuring Demand Limit

MODE	KEYPAD ENTRY	SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
CONFIGURATION	ENTER	DISP					
	▼	UNIT					
	▼	CCN					
	▼	OPT1					
	▼	OPT2					
	▼	M.MST					
	▼	RSET	ENTER	CRST	X	Cooling Reset Type	
			▼	DMDC*	X	Demand Limit Select	Default: 0 0 = None 1 = Switch 2 = 4 to 20 mA Input 3 = CCN Loadshed
			▼	DM20	XXX %	Demand Limit at 20 mA	Default: 100% Range: 0 to 100
			▼	SHNM	XXX	Loadshed Group Number	Default: 0 Range: 0 to 99
			▼	SHDL	XXX%	Loadshed Demand Delta	Default: 0% Range: 0 to 60%
			▼	SHTM	XXX MIN	Maximum Loadshed Time	Default: 60 min. Range: 0 to 120 min.
			▼	DLS1	XXX %	Demand Limit Switch 1	Default: 80% Range: 0 to 100%
			▼	DLS2	XXX %	Demand Limit Switch 2	Default: 50% Range: 0 to 100%

*Seven items skipped in this example.

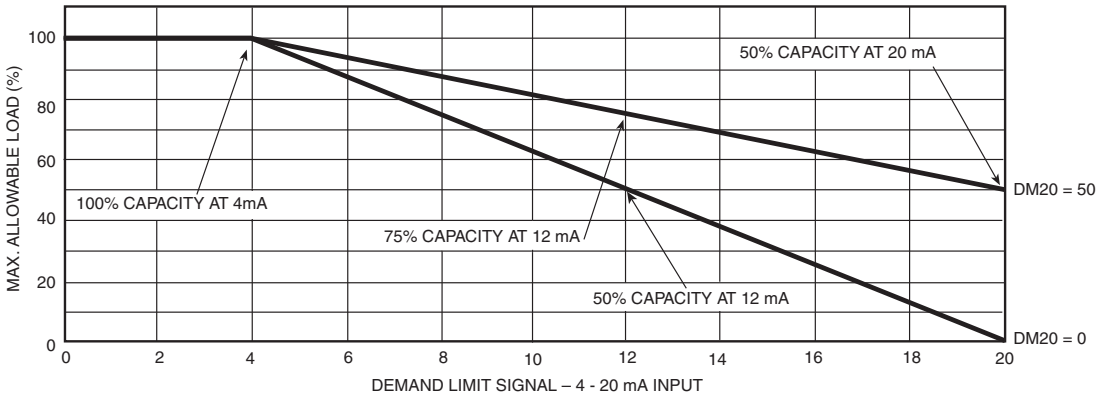


Fig. 33 — 4 to 20 mA Demand Limiting — Demand Limit Select (DMDC = 2)

DEMAND LIMIT (CCN Loadshed Controlled) — To configure Demand Limit for CCN Loadshed control, set the Demand Limit Select (***Configuration→RSET→DMDC***) to 3. Then configure the Loadshed Group Number (***Configuration→RSET→SHNM***), Loadshed Demand Delta (***Configuration→RSET→SHDL***), and Maximum Loadshed Time (***Configuration→RSET→SHTM***). See Table 13.

The Loadshed Group number is established by the CCN system designer. The *Comfort*Link controls will respond to a Redline command from the Loadshed control. When the Redline command is received, the current stage of capacity is set to the maximum stages available. Should the loadshed control send a Loadshed command, the *Comfort*Link controls will reduce the current stages by the value entered for Loadshed Demand delta. The maximum loadshed time is the maximum length of time that a loadshed condition is allowed to exist. The control will disable the Redline/Loadshed command if no Cancel command has been received within the configured maximum loadshed time limit.

Cooling Set Point (4 to 20 mA) — A field supplied and generated, externally powered 4 to 20 mA signal can be used to provide the leaving temperature set point. The energy management module (EMM) must be used for cooling set point control using a 4 to 20 mA signal. To use the 4 to 20 mA set point, the unit type must be configured for control type VAV set point (***Configuration→OPT2→C.TYP* = 9**). Once configured, the control will translate the input linearly with 4 mA equal to 40 F set point and 20 mA equal to 80 F set point. Connect the signal to LVT strip terminal 10,8 (+,-). See Table 14 for instructions to enable the function. Figure 34 shows how the 4 to 20 mA signal is linearly calculated.

Digital Scroll Option — The 38AP units have a factory-installed option for a digital scroll compressor which provides additional stages of unloading for the unit. The digital compressor is always installed in the A1 compressor location. When a digital compressor is installed, a digital unloader solenoid (DUS) is used on the digital compressor.

DIGITAL SCROLL OPERATION — A digital scroll operates in two stages - the "loaded state" when the solenoid valve is normally closed and the "unloaded state" when the solenoid valve is open. During the loaded state, the compressor operates like a standard scroll and delivers full capacity and mass flow.

However, during the unloaded state, there is no capacity and no mass flow through the compressor. The capacity of the system is varied by varying the time the compressor operates in an unloaded and loaded state during a 15-second period. If the DUS is energized for 7.5 seconds, the compressor will be operating at 50% capacity. If the DUS is energized for 11 seconds, the compressor will be operating at approximately 25% of its capacity. Capacity is the time averaged summation of loaded and unloaded states, and its range is continuous from 10% to 100%. Regardless of capacity, the compressor always rotates with constant speed. As the compressor transitions from a loaded to unloaded state, the discharge and suction pressures will fluctuate and the compressor sound will change.

The *Comfort*Link controller controls and integrates the operation of the DUS into the compressor staging routine to maintain temperature control. When a digital compressor is installed, an additional discharge gas thermistor (DTT) is installed along with the AUX board for control of the DUS.

DIGITAL COMPRESSOR CONFIGURATION — When a digital compressor is installed, the configuration parameter ***Configuration→Unit→A1.TY*** is configured to YES. There is also a maximum unload time configuration, ***Configuration →Unit→MAX.T***, that is set to 7 seconds, which indicates the maximum unloading for the digital compressor is 50%. This is done to optimize efficiency of the system.

Table 14 — Configuration VAV 4 to 20 mA Set Point

MODE (RED LED)	KEYPAD ENTRY	SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
CONFIGURATION	ENTER	DISP					
	▼	UNIT					
	▼	CCN					
	▼	OPT1					
	▼	OPT2	ENTER	C.TYP	4	Unit Options 2 Controls	
			ENTER	C.TYP	9	Machine Control Type	1 = VAV 3 = Tstat Multi 4 = Tstat 2 Stage 5 = SPT Multi 7 = PCT CAP 8 = Dual Stat 9 = VAV Set Point

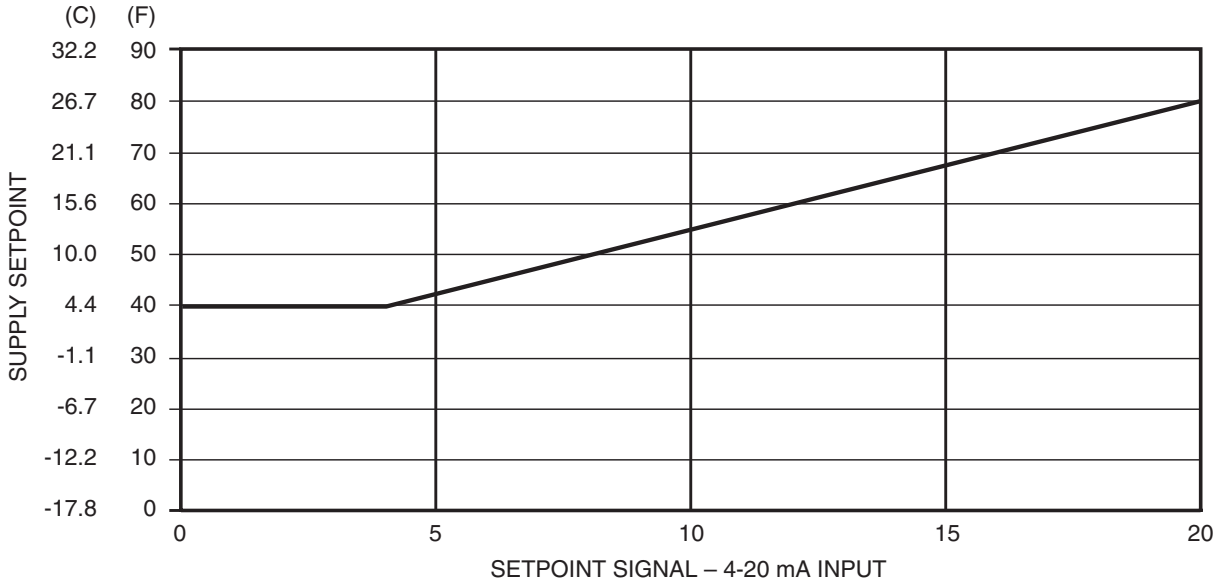


Fig. 34 — 4 to 20 mA Supply Set Point

PRE-START-UP

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

Do not attempt to start the air-conditioning system until the following checks have been completed.

System Check

1. Check all system components, including the air-handling equipment. Consult manufacturer's instructions. If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer to unit wiring diagrams.
2. Open liquid line and suction line service valves.
3. Check tightness of all electrical connections.
4. Oil should be visible in the compressor sight glasses. An acceptable oil level in the compressor is from $^1/_8$ to $^3/_8$ of sight glass. Adjust the oil level as required. No oil should be removed unless the crankcase heater has been energized for at least 24 hours. See Add Oil section on page 47, for Carrier-approved oils.
5. Electrical power source must agree with unit nameplate.
6. Crankcase heaters must be firmly attached to compressors, and must be on for 24 hours prior to start-up.
7. Fan motors are 3-phase. Check rotation of fans during first start-up check.

EVACUATION AND DEHYDRATION — Because the 38AP systems use polyolester (POE) oil, which can absorb moisture, it is important to minimize the amount of time that the system interior is left exposed to the atmosphere. Minimizing the exposure time of the oil to the atmosphere will minimize the amount of moisture that needs to be removed during evacuation.

Once all of the piping connections are complete, leak test the unit and then pull a deep dehydration vacuum. Connect the vacuum pump to the charging valve in the suction line and to the liquid line service valve. For best results, it is recommended that a vacuum of at least 500 microns (0.5 mm Hg) be obtained. Afterwards, to ensure that no moisture is present in the system, perform a standing vacuum-rise test.

With the unit in deep vacuum (500 microns or less), isolate the vacuum pump from the system. Observe the rate-of-rise of the vacuum in the system. If the vacuum rises by more than 50 microns in a 30-minute time period, then continue the dehydration process. Maintain a vacuum on the system until the standing vacuum requirement is met. This will ensure a dry system.

By following these evacuation and dehydration procedures, the amount of moisture present in the system will be minimized. It is required that liquid line filter driers be installed between the condenser(s) and the expansion devices to capture any foreign debris and provide additional moisture removal capacity.

START-UP

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

⚠ CAUTION

Crankcase heaters on all units are wired into the control circuit, so they are always operable as long as the main power supply disconnect is on (closed), even if any safety device is open. Compressor heaters must be on for 24 hours prior to the start-up of any compressor. Equipment damage could result if heaters are not energized for at least 24 hours prior to compressor start-up.

Compressor crankcase heaters must be on for 24 hours before start-up. To energize the crankcase heaters, close the field disconnect and turn on the fan circuit breakers. Leave the compressor circuit breakers off/open. The crankcase heaters are now energized.

Preliminary Charge — Refer to GTAC II (General Training Air Conditioning), Module 5, Charging, Recovery, Recycling, and Reclamation for charging procedures. Using the liquid charging method and charging by weight procedure, charge each circuit with the amount of Puron® refrigerant (R-410A) listed in Table 15.

Table 15 — Preliminary Puron Refrigerant (R-410A) Charge, lb (kg)

38AP UNIT SIZE	CIRCUIT A	CIRCUIT B
38APS025	24 (10.9)	—
38APD025	12 (5.6)	12 (5.6)
38APS027	26 (11.6)	—
38APD027	13 (6.0)	13 (6.0)
38APS030	29 (12.9)	—
38APD030	14 (6.5)	14 (6.5)
38APS040	39 (17.7)	—
38APD040	21 (9.5)	17 (7.8)
38APS050	48 (21.5)	—
38APD050	22 (9.9)	26 (11.6)
38APD060	27 (12.1)	29 (12.9)
38APD070	29 (12.9)	33 (15.1)
38APD080	29 (12.9)	46 (20.7)
38APD090	39 (17.7)	46 (20.7)
38APD100	46 (20.7)	46 (20.7)

NOTES:
1. Preliminary charge is based on 25 ft (7.6 m) of interconnecting liquid line piping between indoor and outdoor units.
2. For liquid line piping longer than 25 ft (7.6 m), use the following information:
   $^1/_2$ in. (12.7 mm) liquid line — 0.6 lb per 10 linear ft (0.27 kg per 3 m)
   $^5/_8$ in. (15.9 mm) liquid line — 1.0 lb per 10 linear ft (0.45 kg per 3 m)
   $^7/_8$ in. (22.2 mm) liquid line — 2.0 lb per 10 linear ft (0.91 kg per 3 m)
   $1^1/_8$ in. (28.6 mm) liquid line — 3.5 lb per 10 linear ft (1.59 kg per 3 m)

Adjust Refrigerant Charge

⚠ CAUTION

Never charge liquid into the low pressure side of system. Do not overcharge. During charging or removal of refrigeration, be sure indoor fan system is operating. Failure to comply could result in personal injury or equipment damage.

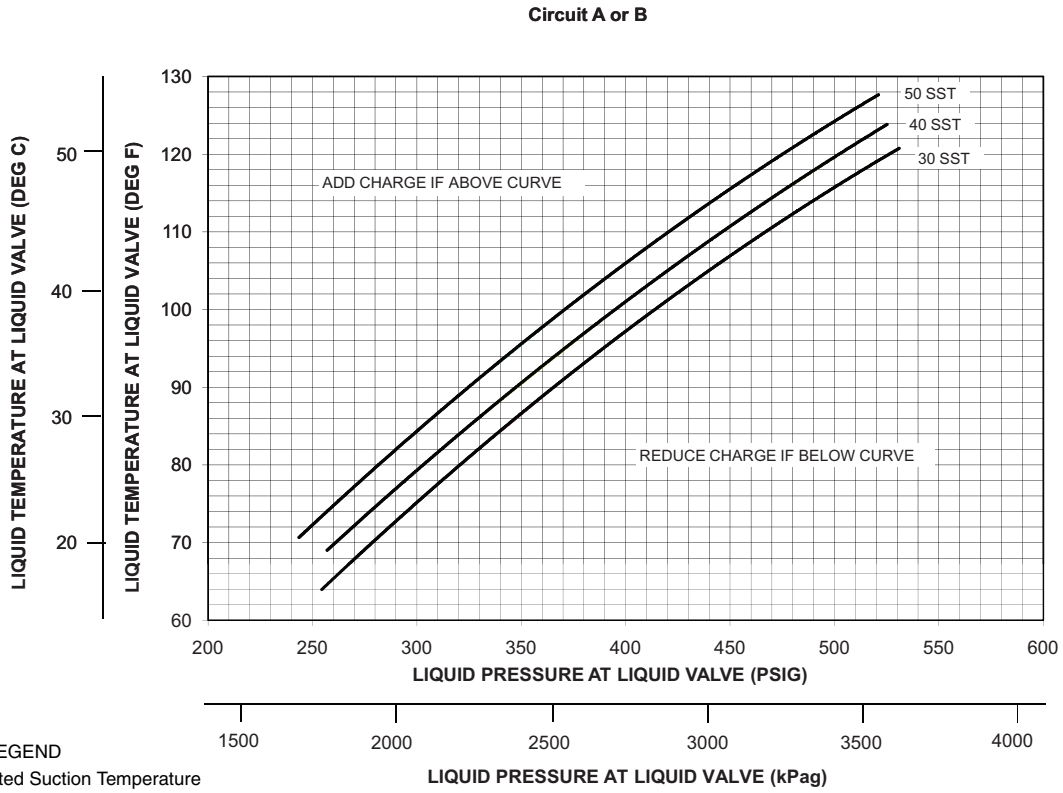
⚠ CAUTION

Charging procedures for MCHX (microchannel heat exchanger) units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in $^1/_4$ lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts. Failure to comply may result in equipment damage.

Due to the compact design of microchannel heat exchangers, refrigerant charge is reduced significantly. As a result, charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in $^1/_4$ lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts. If charging at low outdoor ambient, the condenser coil can be partially blocked in order to increase head pressure.

With all fans operating and all compressors on the circuit being serviced operating at full capacity, adjust the refrigerant charge in accordance with the unit charging charts in Fig. 35-56. Charge vapor into compressor low-side service port located on the suction service valve. Measure pressure at the liquid line service valve, making sure a Schrader depressor is used. Also, measure liquid line temperature as close to the liquid service valve as possible. Add charge until the pressure and temperature conditions of the charging chart curve are met. If liquid pressure and temperature point fall above curve, add charge. If liquid pressure and temperature point fall below curve, reduce the charge until the conditions match the curve.

If the sight glass is cloudy, check refrigerant charge again. See Fig. 57 and 58. Ensure all fans and compressors on the circuit being serviced are operating. Also ensure maximum allowable liquid lift has not been exceeded. If the sight glass is cloudy, a restriction could exist in the liquid line. Check for a plugged filter drier or partially open solenoid valve. Replace or repair, as needed.

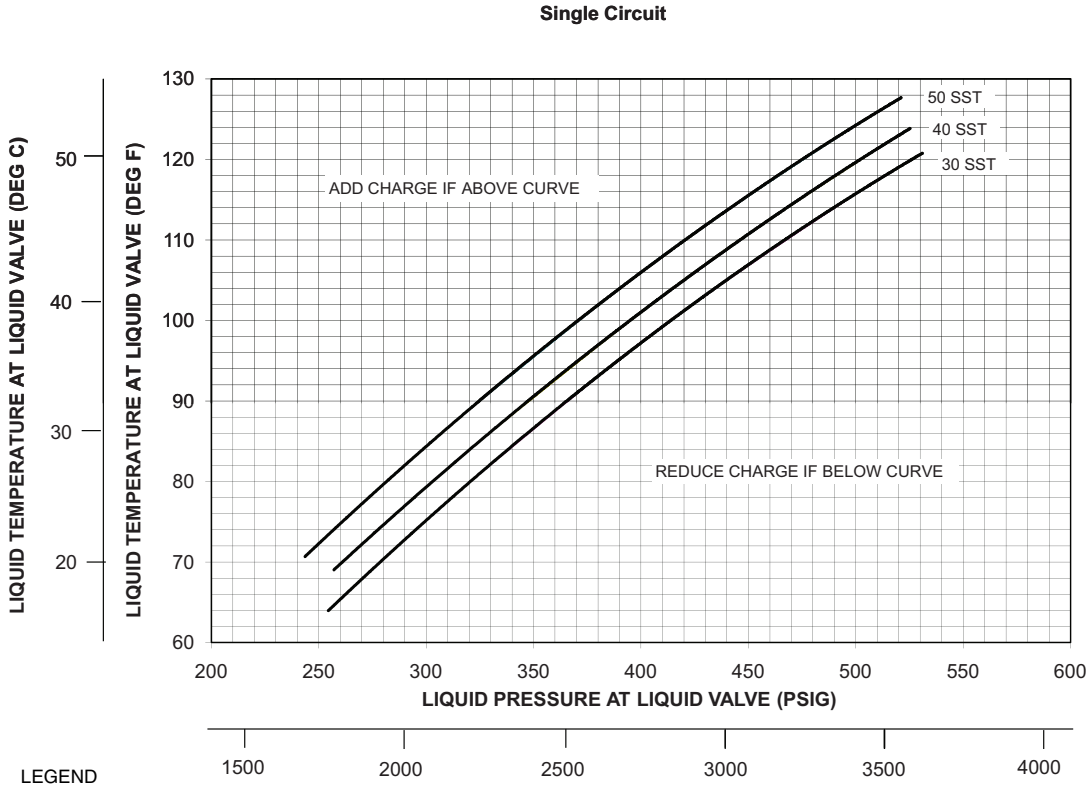


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 35 — Charging Chart — 38APD025, 50/60 Hz



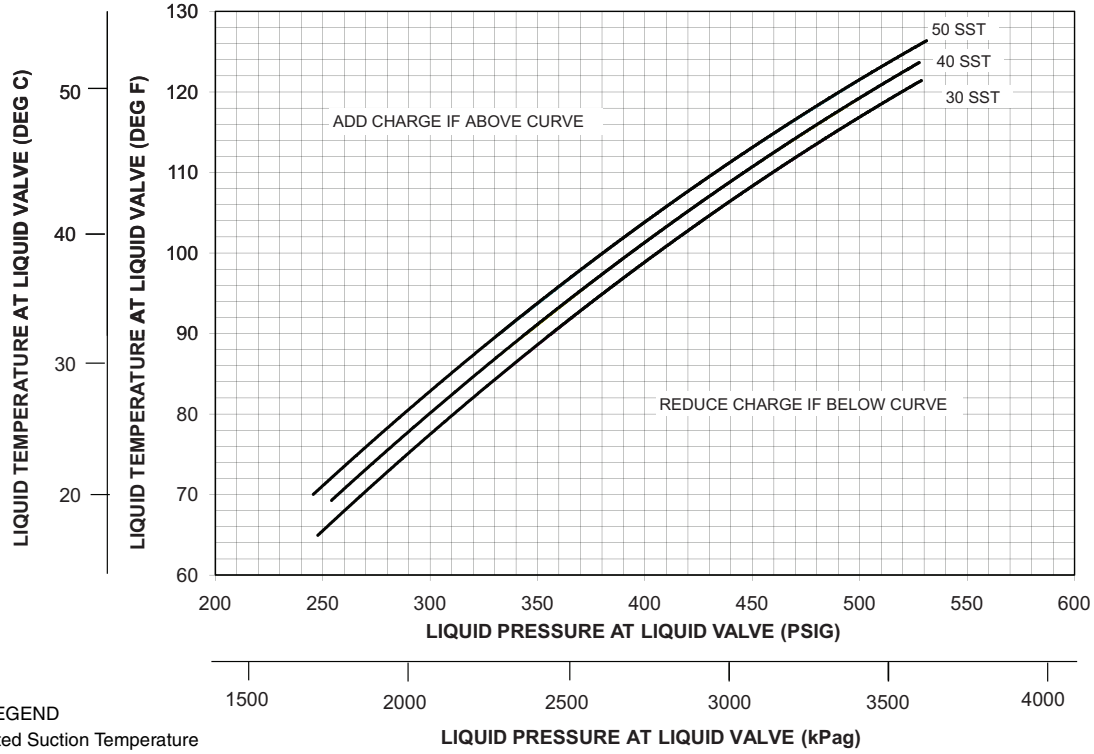
LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 36 — Charging Chart — 38APS025, 50/60 Hz

Circuit A or B



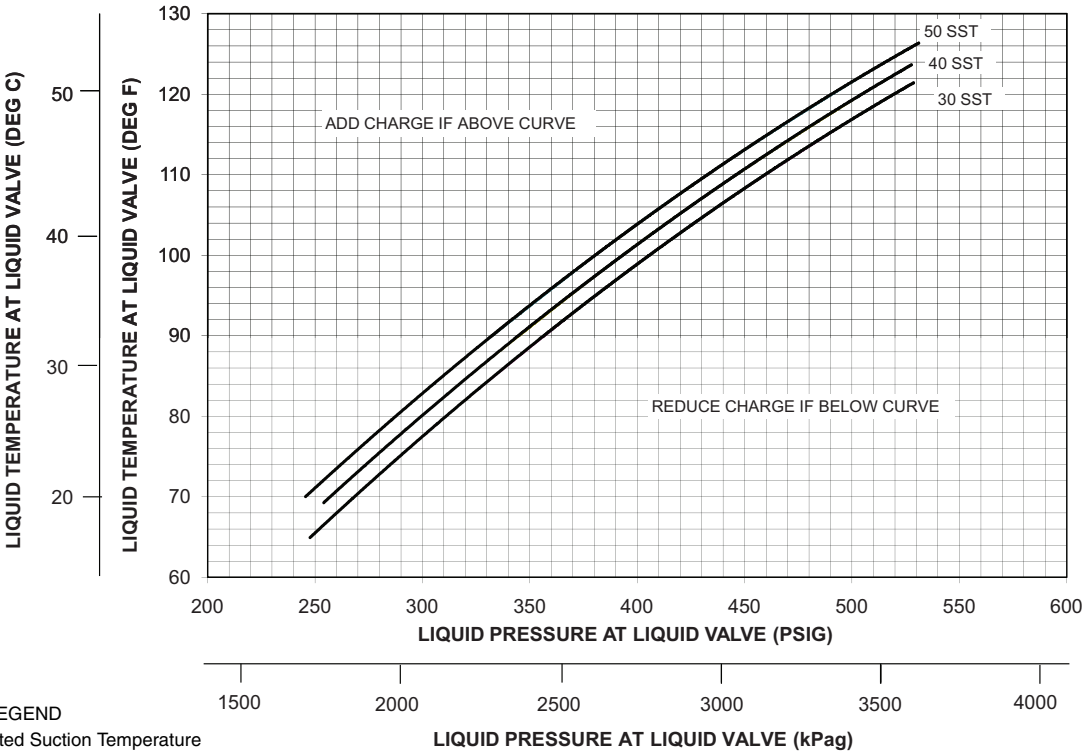
LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 37 — Charging Chart — 38APD027, 50/60 Hz

Single Circuit

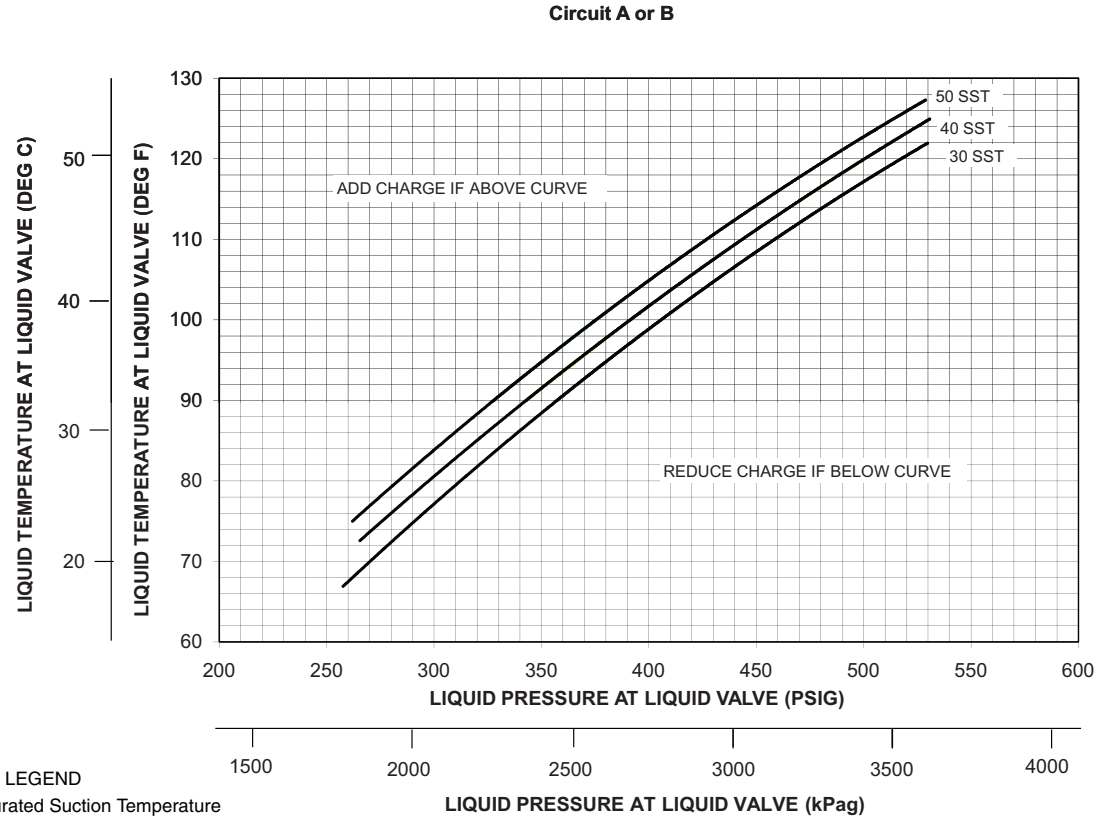


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 38 — Charging Chart — 38APS027, 50/60 Hz

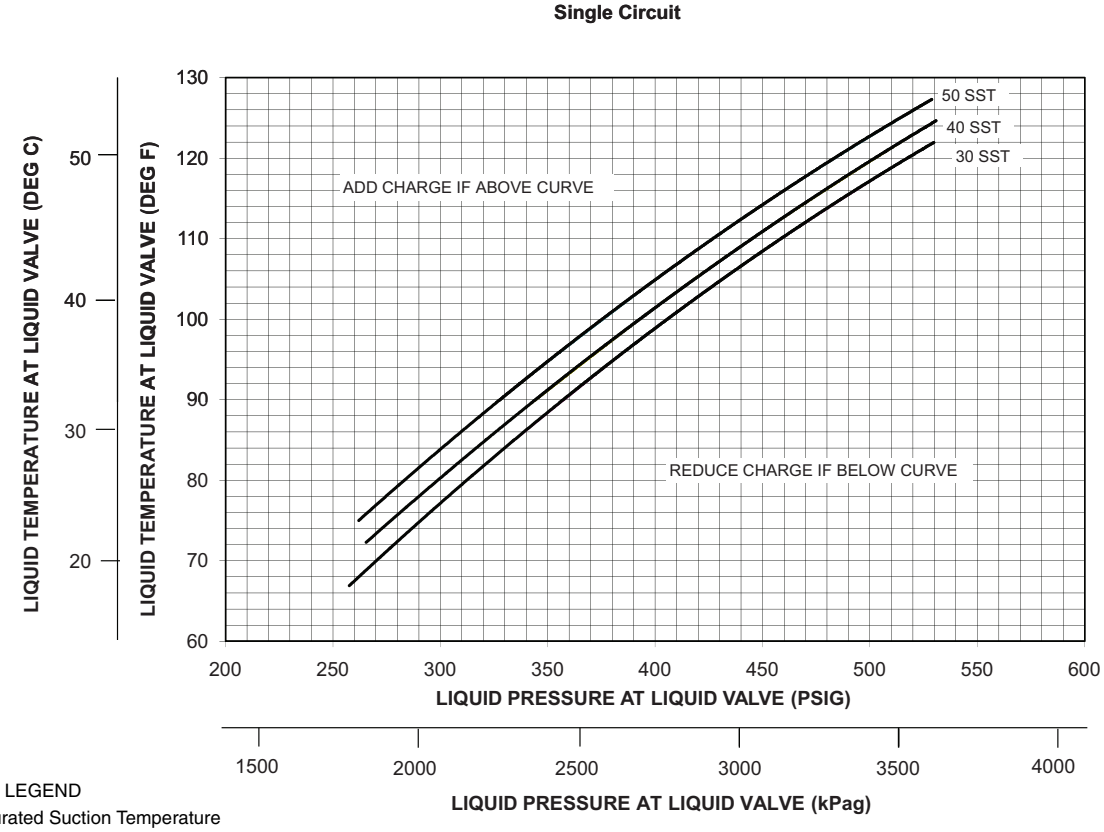


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 39 — Charging Chart — 38APD030, 50/60 Hz

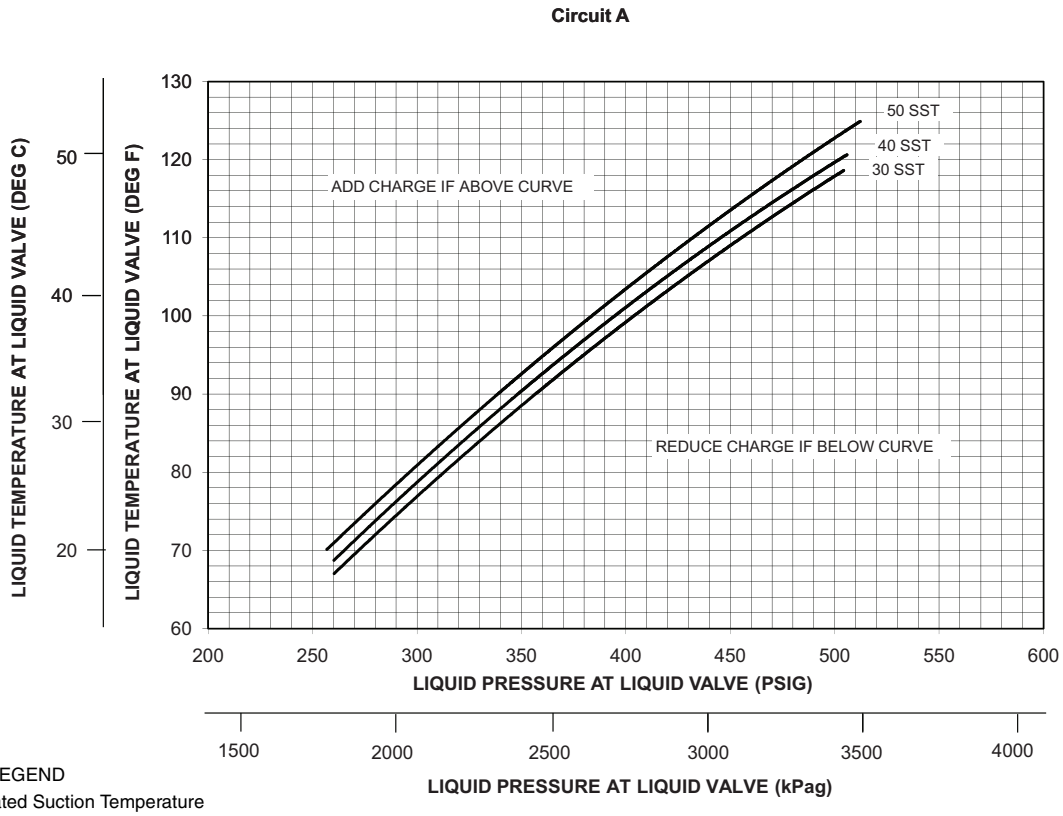


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 40 — Charging Chart — 38APS030, 50/60 Hz

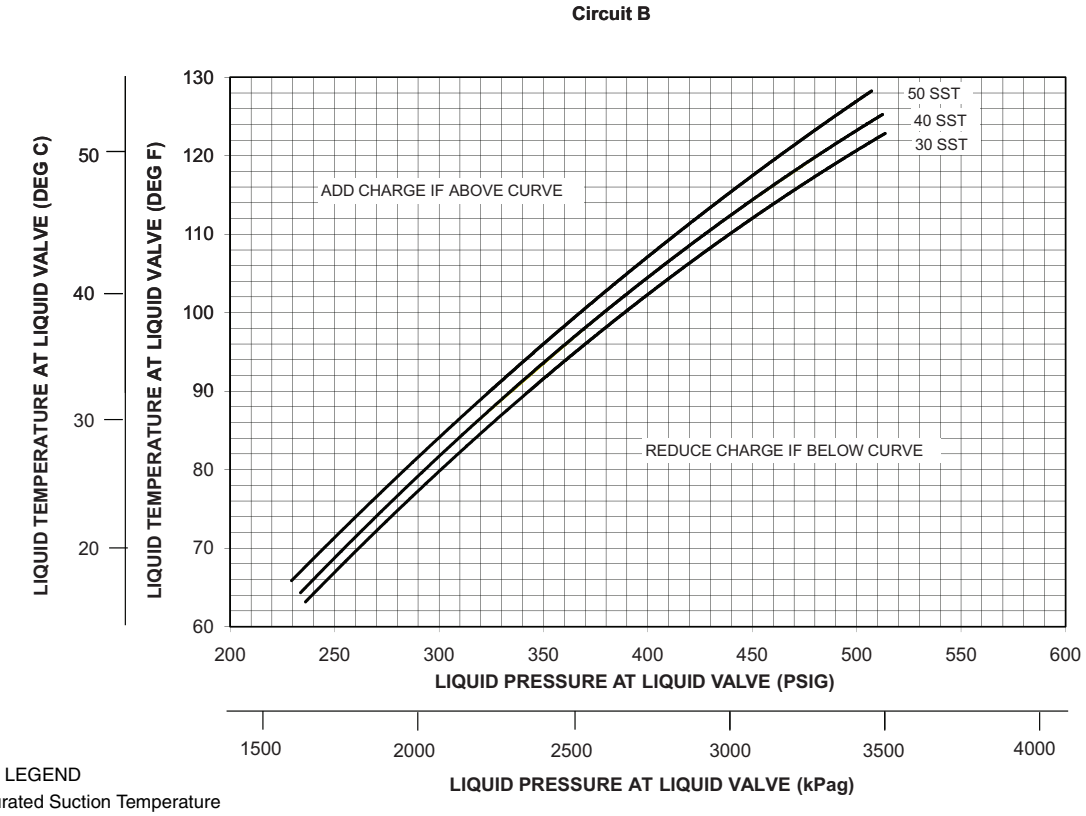


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 41 — Charging Chart — 38APD040 — Circuit A, 50/60 Hz

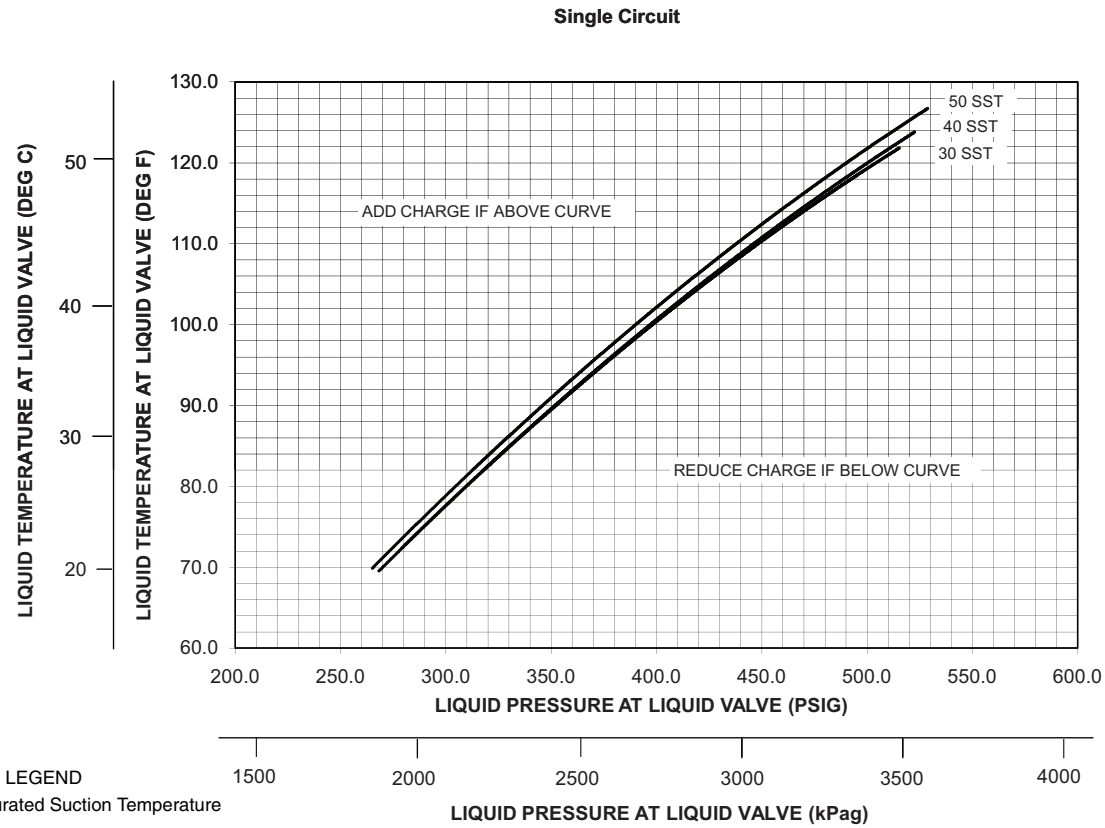


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 42 — Charging Chart — 38APD040 — Circuit B, 50/60 Hz

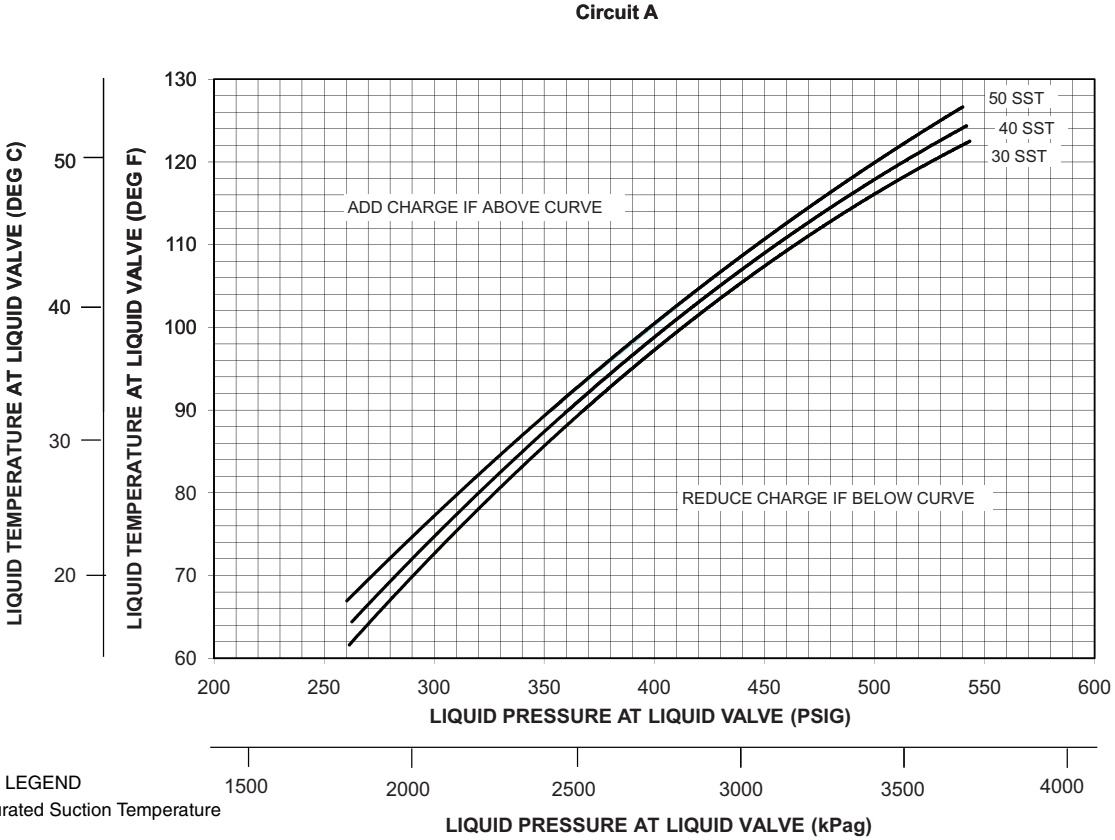


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 43 — Charging Chart — 38APS040, 50/60 Hz

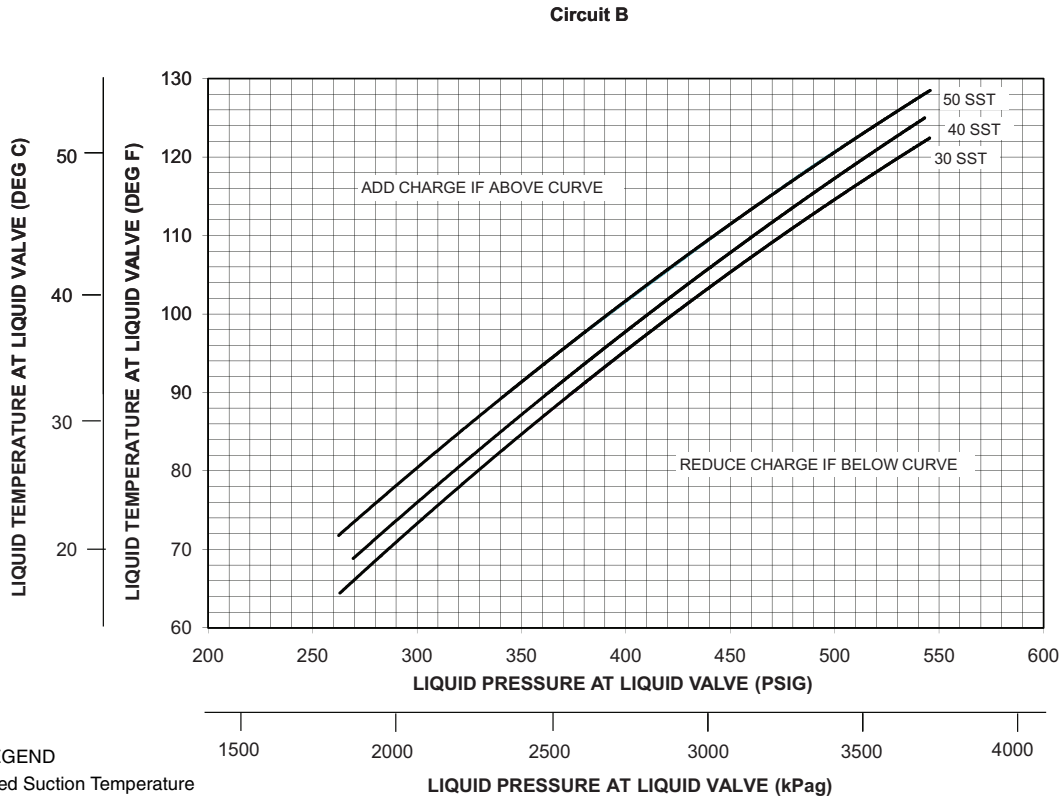


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 44 — Charging Chart — 38APD050 — Circuit A, 50/60 Hz

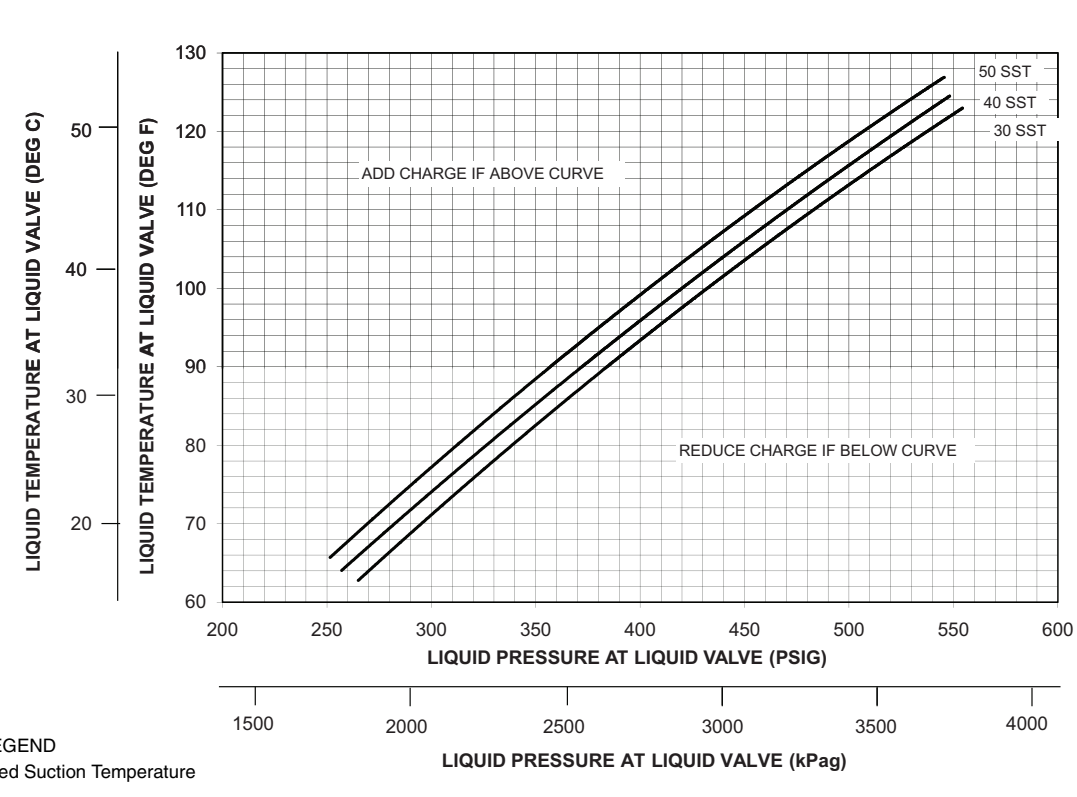


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 45 — Charging Chart — 38APD050 — Circuit B, 50/60 Hz

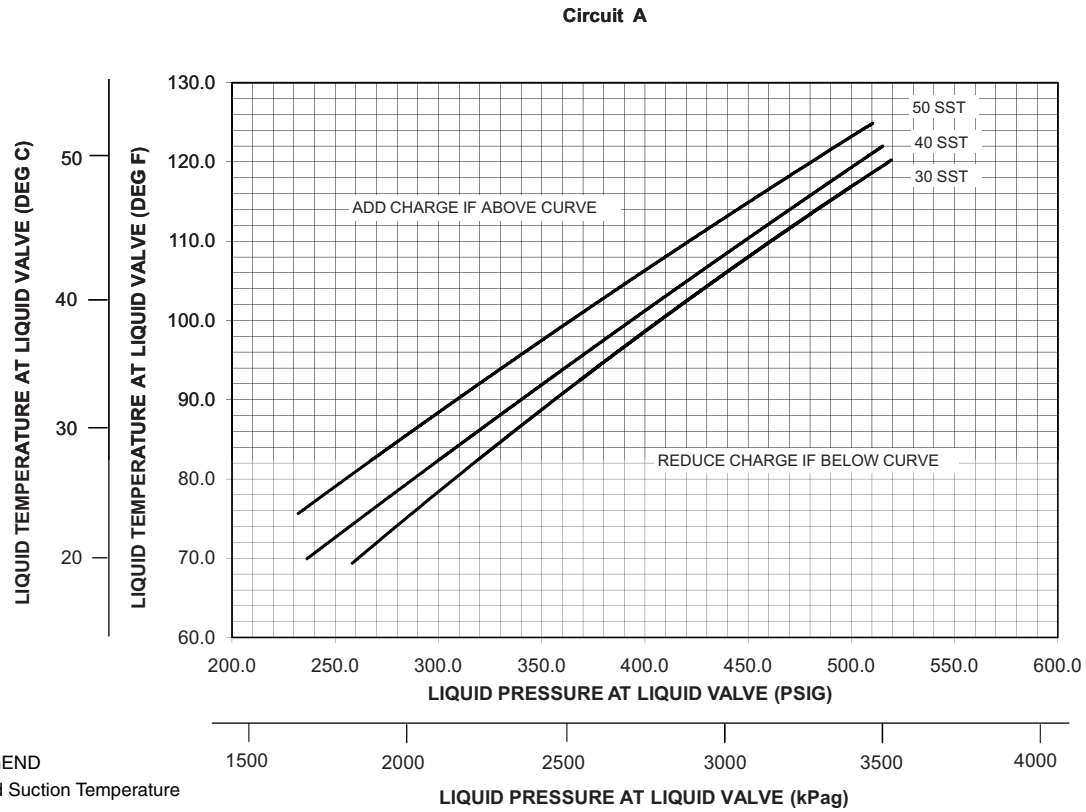


LEGEND

SST — Saturated Suction Temperature

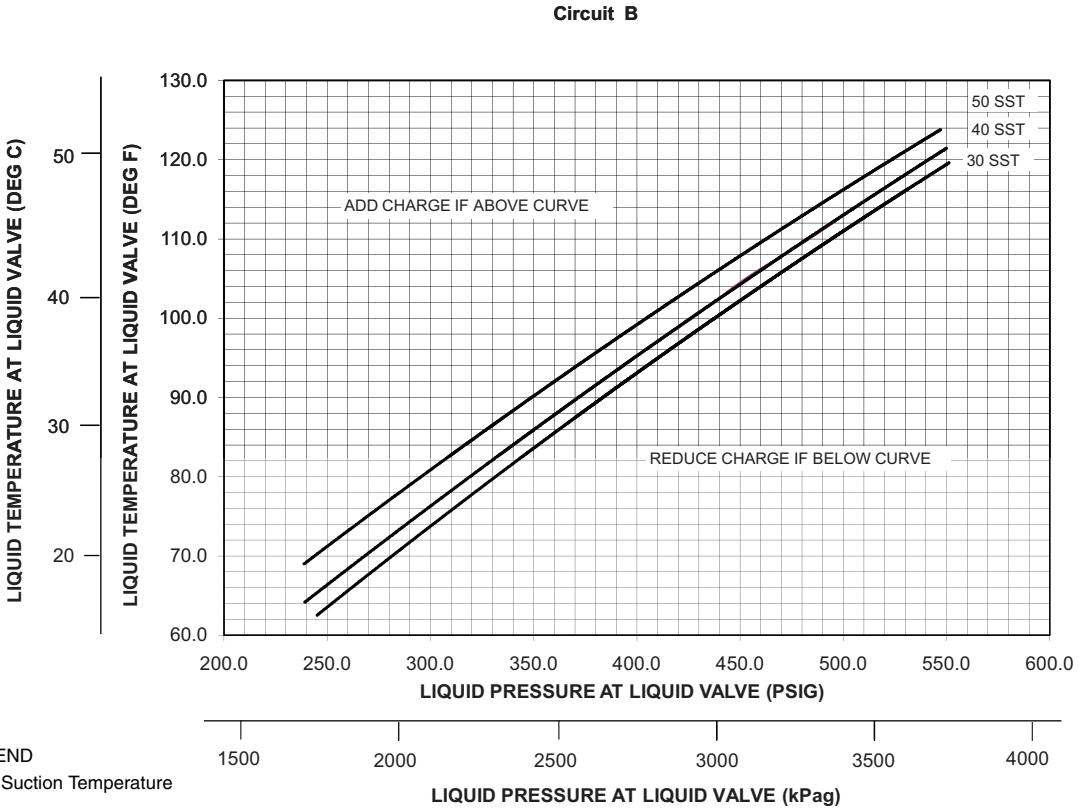
NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 46 — Charging Chart — 38APS050, 50/60 Hz



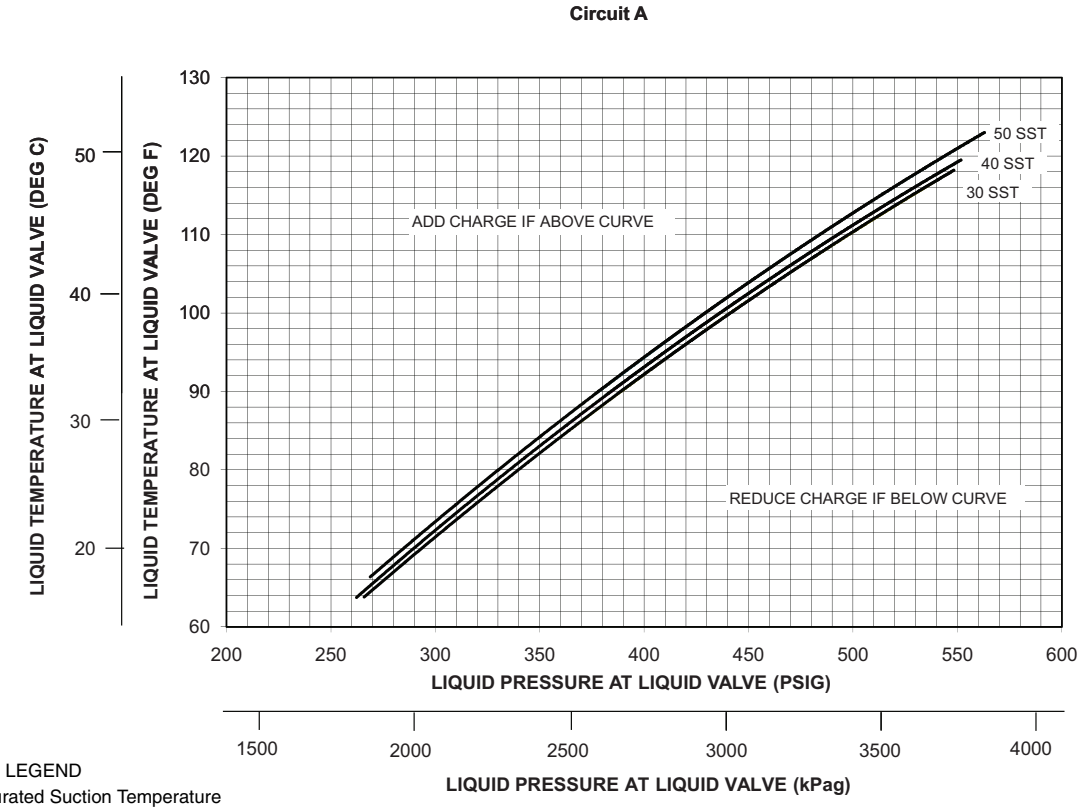
NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 47 — Charging Chart — 38APD060 — Circuit A, 50/60 Hz



NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 48 — Charging Chart — 38APD060 — Circuit B, 50/60 Hz

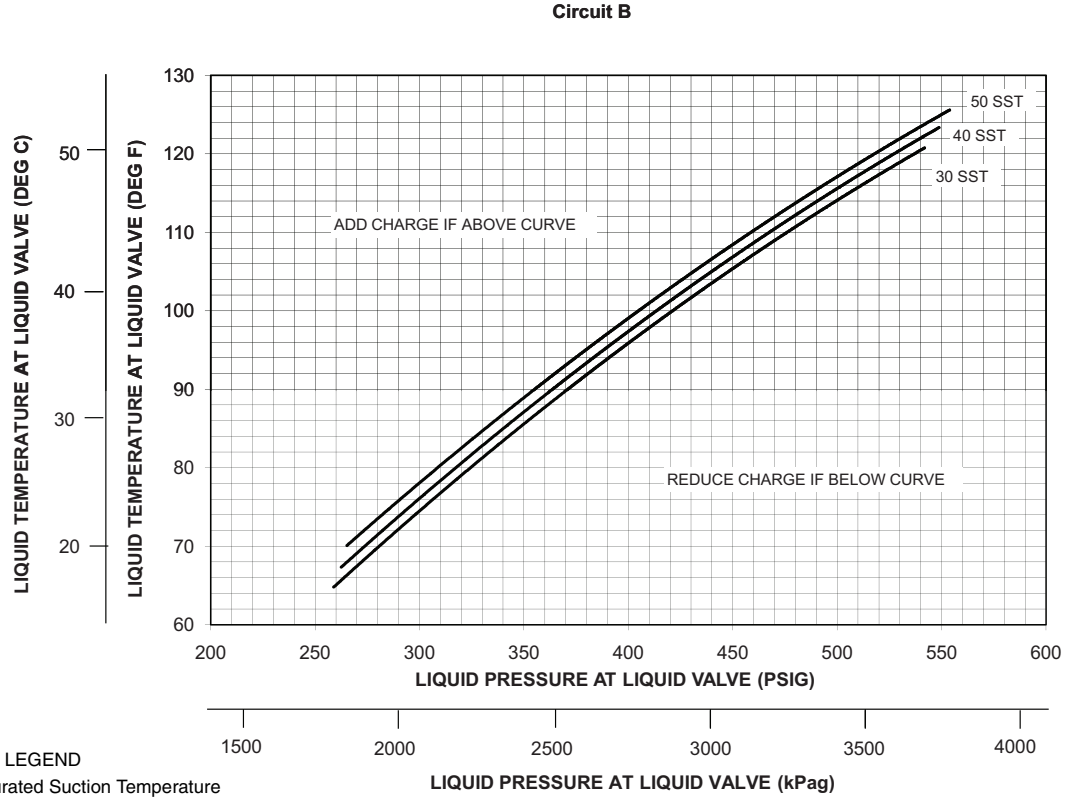


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 49 — Charging Chart — 38APD070 — Circuit A, 50/60 Hz

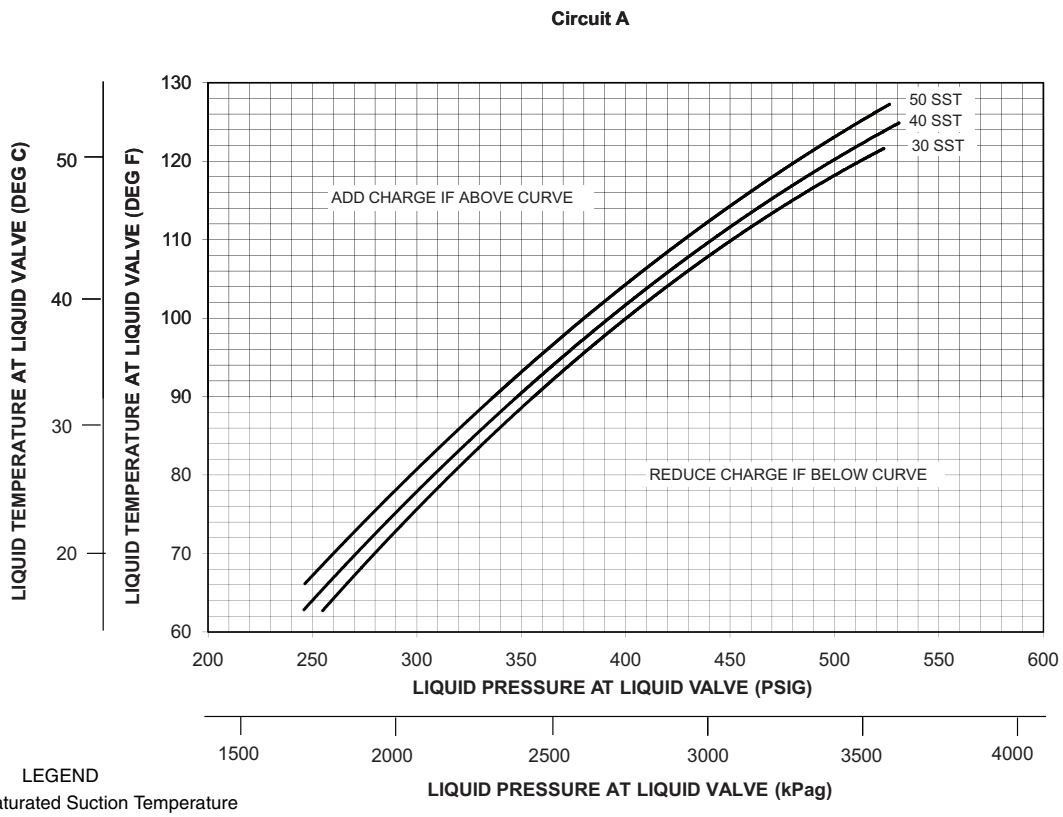


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 50 — Charging Chart — 38APD070 — Circuit B, 50/60 Hz

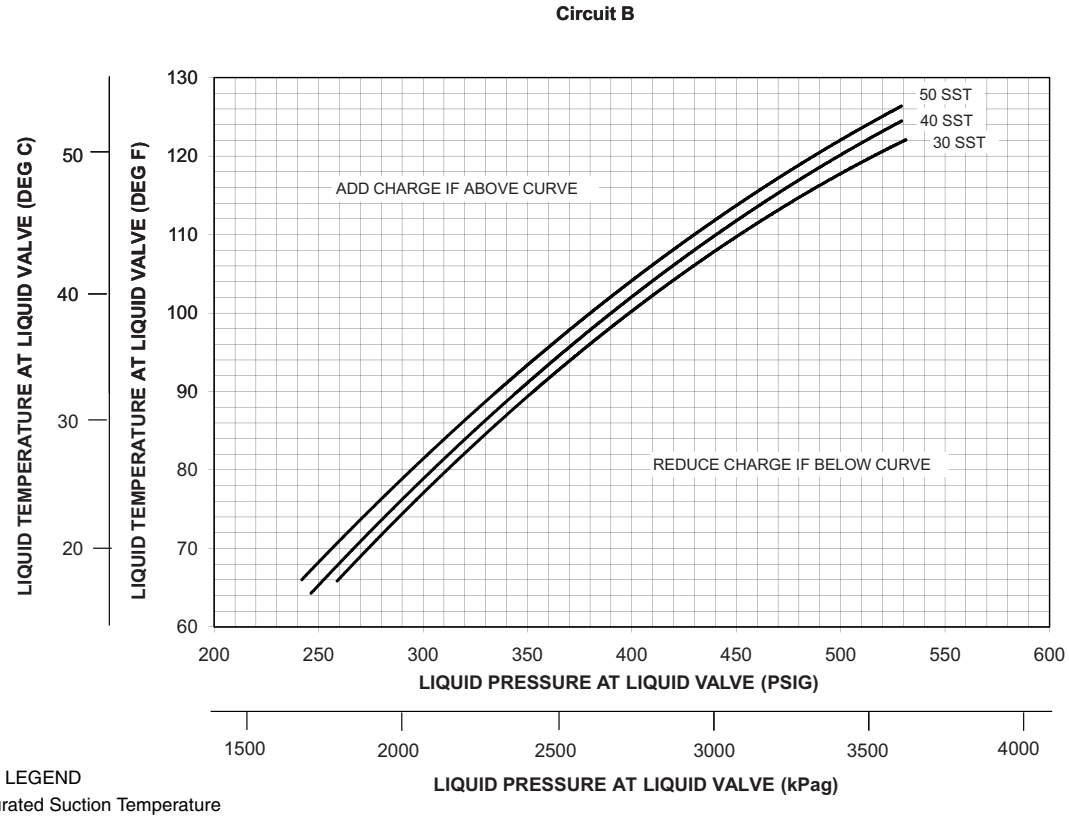


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 51 — Charging Chart — 38APD080 — Circuit A, 50/60 Hz

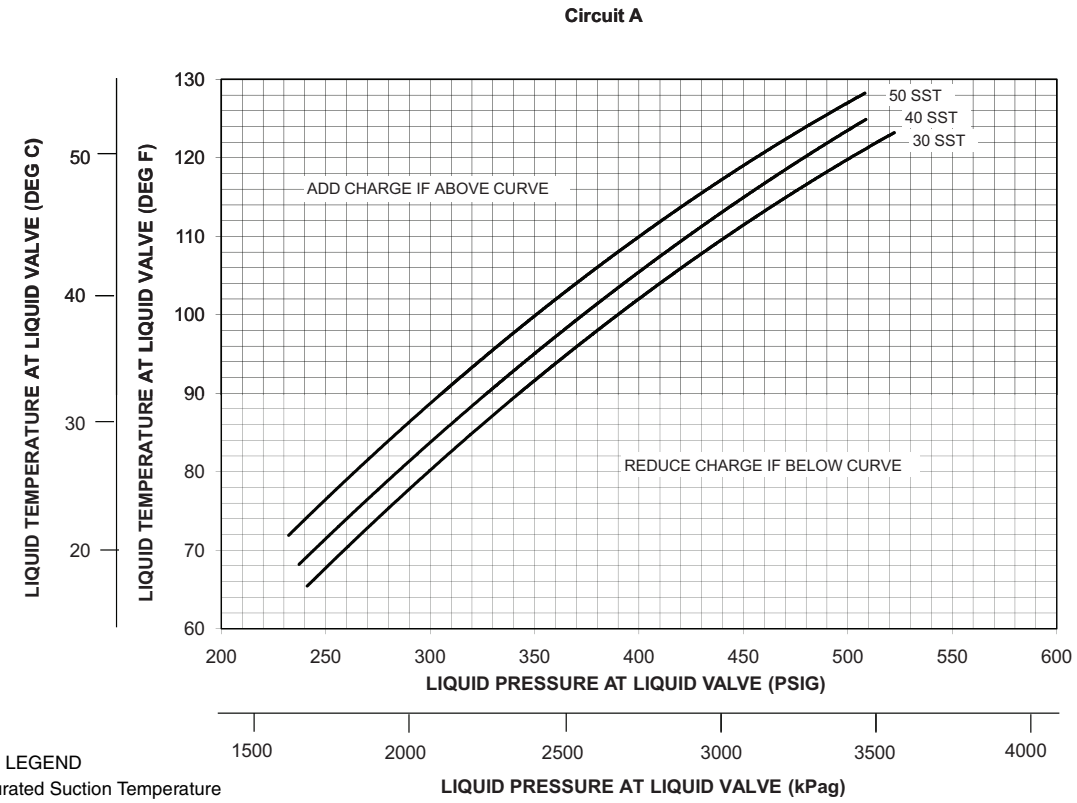


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 52 — Charging Chart — 38APD080 — Circuit B, 50/60 Hz

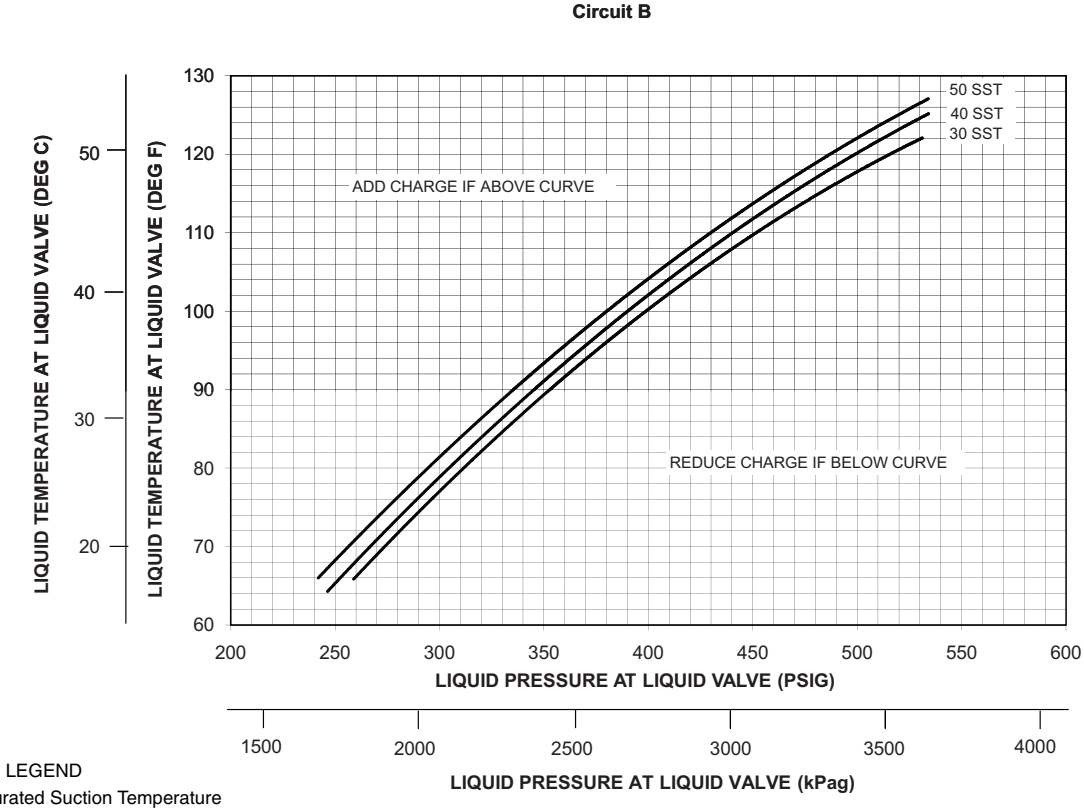


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 53 — Charging Chart — 38APD090 — Circuit A, 50/60 Hz

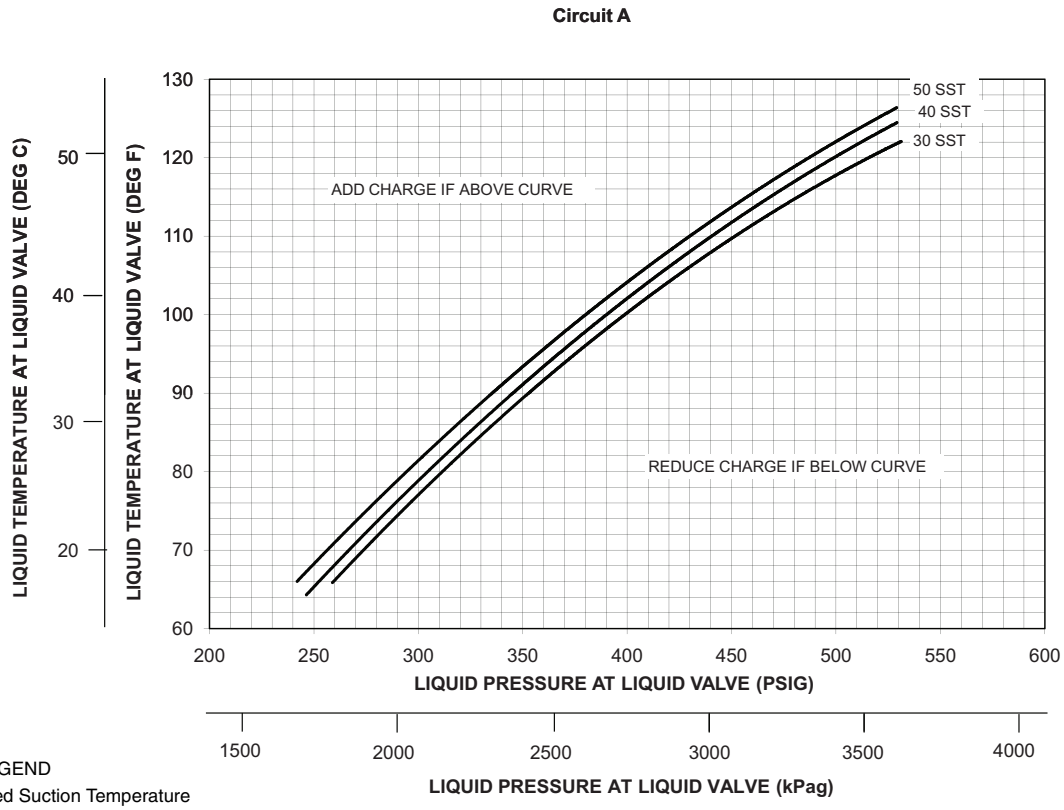


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 54 — Charging Chart — 38APD090 — Circuit B, 50/60 Hz

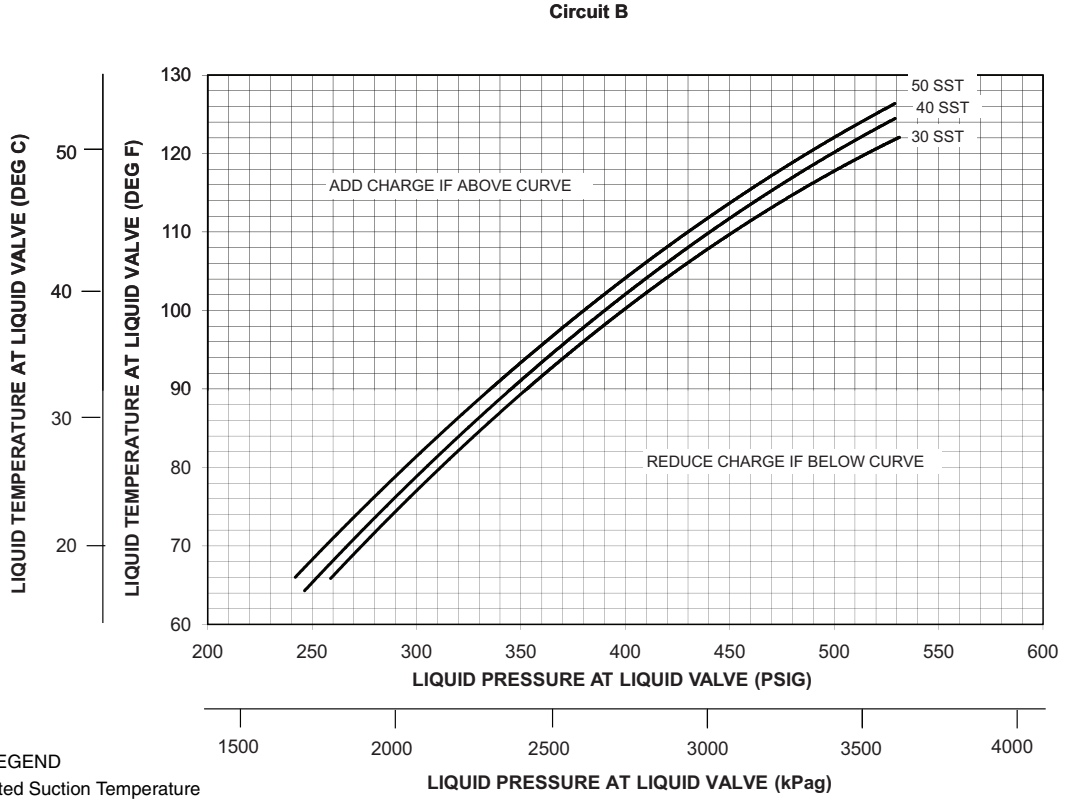


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 55 — Charging Chart — 38APD100 — Circuit A, 50/60 Hz

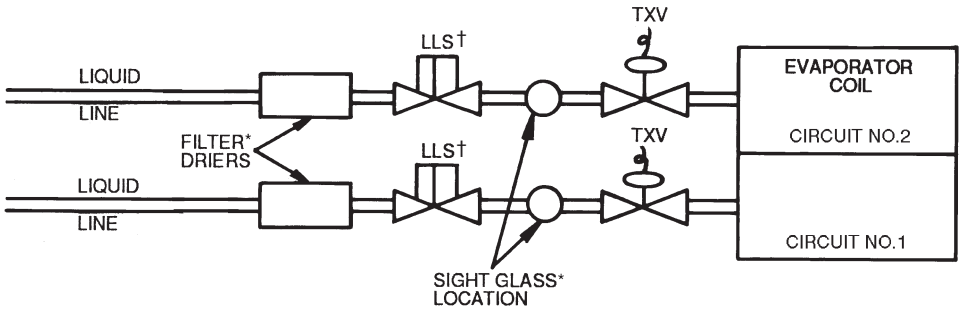


LEGEND

SST — Saturated Suction Temperature

NOTE: Charging procedures for MCHX units require very accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided, add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in 1/4 lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 56 — Charging Chart — 38APD100 — Circuit B, 50/60 Hz

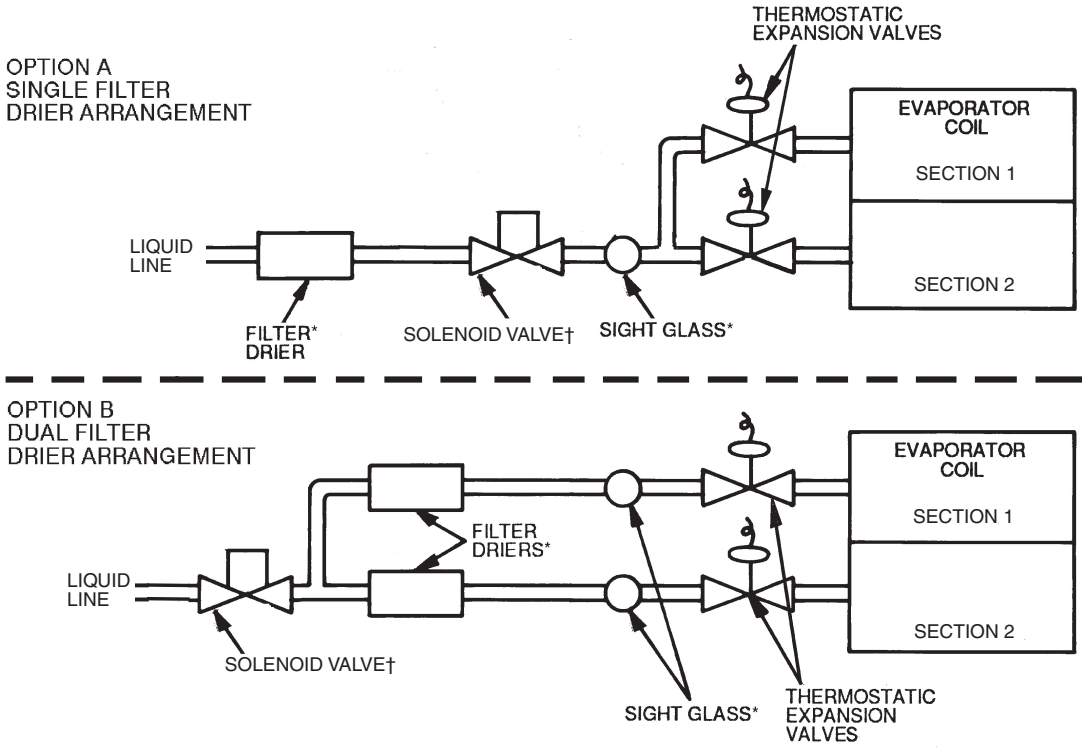


LEGEND

LLS — Liquid Line Solenoid
TXV — Thermostatic Expansion Valve

*Field-supplied.
†Field-supplied when required. Must be controlled by 38AP unit control.

Fig. 57 — Required Location of Solenoid Valves and Recommended Filter Drier and Sight Glass Locations for 38APD025-100 Dual-Circuit Units



*Field-supplied.
†Field-supplied when required. Must be controlled by 38AP unit control.

Fig. 58 — Required Location of Solenoid Valves and Recommended Filter Drier and Sight Glass Locations for 38APS025-050 Single-Circuit Units

Check Compressor Oil Level — After adjusting the refrigerant charge, allow each circuit to run fully loaded for 20 minutes. Stop the compressors and check the oil level. Oil level should be $^1/_8$ to $^3/_8$ up on the sight glass.

IMPORTANT: Oil level should only be checked when the compressors are off.

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

Final Checks — Ensure all safety controls are operating, control panel covers are on, and the service panels are in place.

Oil Charge

⚠ CAUTION

The compressor in a Puron® refigerant (R-410A) system uses a polyol ester (POE) oil. This is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere. Failure to do so could result in possible equipment damage.

Puron systems use a polyol ester (POE) oil. Use only Carrier approved compressor oil. Oil should be visible in compressor oil sight glass. An acceptable oil level is from $^1/_8$ to $^3/_8$ of sight glass. All compressors must be off when checking oil level. Recommended oil level adjustment method is as follows:

ADD OIL — Recover charge from the outdoor section of the unit and isolate the condensing unit using the liquid and suction service valves. Add oil to suction line Schrader valve on tandem compressors sets and the compressor Schrader on the trio and single compressor circuits. (See Fig. 59 and 60.) When oil can be seen at the bottom of the sight glass, add oil in 5 oz increments which is approximately $^1/_8$ in oil level. Run all compressors for 20 minutes then shut off to check oil level. Repeat procedure until acceptable oil level is present.

NOTE: Use only Carrier approved compressor oil. Approved sources are:

Totaline . . . . . .3MAF POE P903-1601
Mobil. . . . . .EAL Arctic 32-3MA
Uniqema RL32-3MAF

Do not reuse oil that has been drained out, or oil that has been exposed to atmosphere.

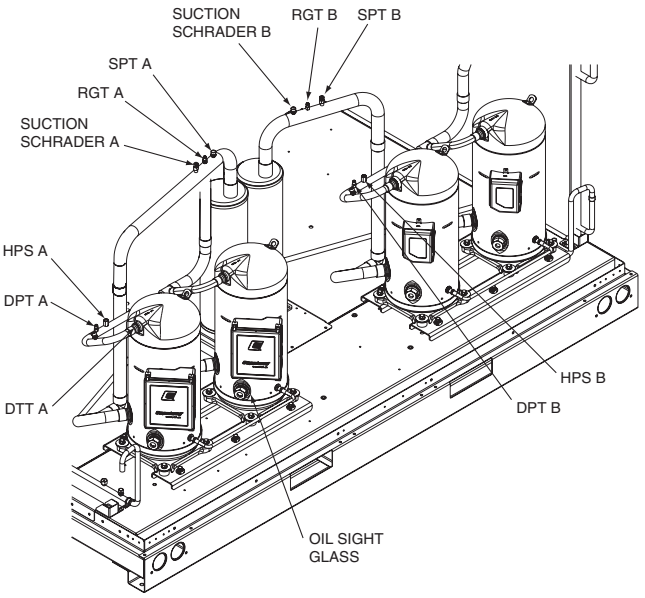
Actual Start-Up

NOTE: Refer to Start-Up Checklist on pages CL-1 to CL-5.

Actual start-up should be done only under supervision of a qualified refrigeration mechanic.

VAV APPLICATIONS — ***C.TYP* = 1** and **9**

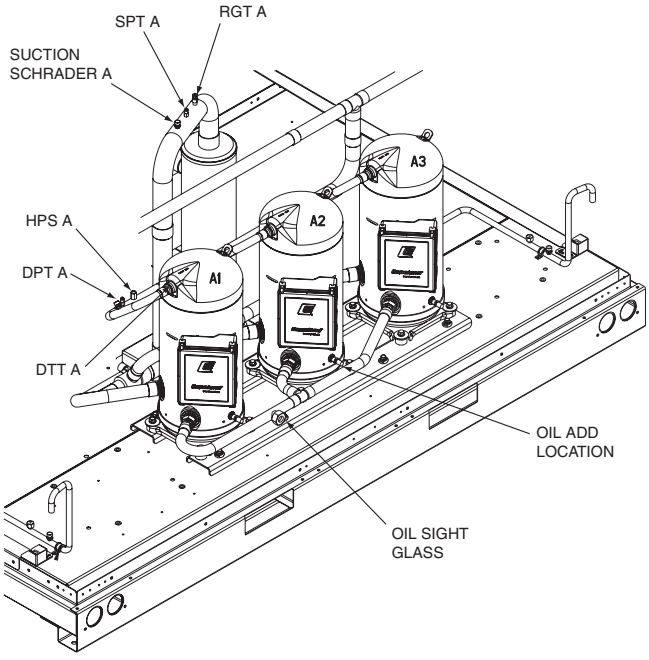
1. Start indoor fan motor.
2. Fan status switch input should close. Note the unit will not start unless the Fan Status input is closed.
3. Unit ***C.TYP* = 1**: Using the scrolling marquee display, set leaving set point (***Set Point→COOL→CSP.1***). Unit ***C.TYP* = 9**: Using the 4 to 20mA input, set the control point (***Run Status→VIEW→CTPT***) for leaving set point.



LEGEND

DPT — Discharge Pressure Transducer
DTT — Discharge Temperature Thermistor
HPS — High Pressure Switch
RGT — Return Gas Temperature Sensor
SPT — Space Temperature Sensor

Fig. 59 — Typical Tandem Compressor Assembly



LEGEND

DPT — Discharge Pressure Transducer
DTT — Discharge Temperature Thermistor
HPS — High Pressure Switch
RGT — Return Gas Temperature Sensor
SPT — Space Temperature Sensor

Fig. 60 — Typical Trio Compressor Assembly

4. Turn ENABLE/OFF/REMOTE CONTACT switch to ENABLE position.
5. If supply air temperature is greater than the control point the unit will start to stage up.

CV APPLICATION — ***C.TYP* = 4**

1. Start indoor fan motor.

2. Fan status switch input should close. Note the unit will not start unless the fan status input is closed.
3. Close Y1 input unit will stage up to 50 % capacity with 1 minute between stages.
4. Close Y2 input the unit will stage up to 100% capacity with 1 minute between stages.

CV APPLICATION — ***C.TYP* = 3**

1. Start indoor fan motor.
2. Fan status switch input should close. Note the unit will not start unless the fan status input is closed.
3. Close Y1 input unit. The control will control supply-air temperature to ***CSP1*** and stage capacity as required.
4. Close Y2 input. The unit will control supply-air temperature to ***CSP2*** and stage capacity as required.

CV APPLICATION — ***C.TYP* = 5**

1. Start indoor fan motor.
2. Fan status switch input should close. Note the unit will not start unless the fan status input is closed.
3. The control will use space temperature (***Temperatures →SPT***) vs space temperature set point (***Set Point→ COOL→SPS.P***) to decide to whether to control supply-air temperature to ***CSP1*** or ***CSP2***, and will stage capacity as required.

% CAPACITY INPUT — ***C.TYP* = 7**

1. Start indoor fan motor.
2. Fan status switch input should close. Note the unit will not start unless the fan status input is closed.
3. The control will adjust unit capacity based on the 4 to 20mA Cool mA (***INPUTS→4-20→CL.MA***).
4. Actual capacity and desired capacity may be different due to unit diagnostics.

OPERATION

Operating Limitations

AMBIENT LMITATIONS — See Table 16 for ambient limitations.

Table 16 — 38AP Unit Ambient Limitations

Single Circuit

38APS UNIT SIZE	MINIMUM LOW AMBIENT (Standard Unit)	MINIMUM LOW AMBIENT MOTORMASTER® CONTROL*	MAXIMUM AMBIENT†
025-050	45 F (7.2 C)	–20 F (–28.9 C)	122 F (50 C)

Dual Circuit

38APD UNIT SIZE	MINIMUM LOW AMBIENT (Standard Unit)	MINIMUM LOW AMBIENT MOTORMASTER CONTROL*	MAXIMUM AMBIENT†
025-040	32 F (0 C)	–20 F (–28.9 C)	122 F (50 C)
050-060	25 F (–3.9 C)	–20 F (–28.9 C)	122 F (50 C)
070-100	32 F (0 C)	–20 F(–28.9 C)	122 F (50 C)

* Factory-installed option or field-installed accessory.
†Operation above listed temperature depends on the saturated suction temperature the unit is operating at. Refer to ECAT for exact limitations.

VOLTAGE (ALL UNITS)

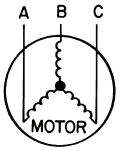
Main Power Supply — Minimum and maximum acceptable supply voltages are listed in the Installation Instructions.

Unbalanced 3-Phase Supply Voltage — Never operate a motor where a phase imbalance between phases is greater than 2%. To determine percent voltage imbalance:

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

The maximum voltage deviation is the largest difference between a voltage measurement across 2 legs and the average across all 3 legs.

Example: Supply voltage is 240-3-60.



AB = 243 v
BC = 236 v
AC = 238 v

1. Determine average voltage:

$$\text{Average voltage} = \frac{243 + 236 + 238}{3}$$

$$= \frac{717}{3}$$

$$= 239$$

2. Determine maximum deviation from average voltage:
   (AB) 243 – 239 = 4 v
   (BC) 239 – 236 = 3 v
   (AC) 239 – 238 = 1 v
   Maximum deviation is 4 v.
3. Determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{239}$$

$$= 1.7\%$$

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

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately. Do not operate unit until imbalance condition is corrected.

Control Circuit Power — Power for the control circuit is supplied from the main incoming power through a factory-installed control power transformer (TRAN1) for all models. Field wiring connections are made to LVT terminal board.

Operation Sequence — During unit off cycle, if power is maintained to the unit and the EMERGENCY ON/OFF switch is left in the OFF position, the compressor crankcase heaters will be energized.

The unit is started by putting the ENABLE/OFF/REMOTE CONTACT switch in the ENABLE or REMOTE CONTACT position. When the unit receives a call to run (either from the internal control, or CCN network command or remote contact closure), the unit stages up in capacity to maintain either supply air temperature or space temperature. The first compressor starts $1^1/_2$ to 3 minutes after the call for cooling.

The lead circuit can be specifically designated on all models or selected based on compressor run hours and starts depending on field configuration. The unit control will override this selection under certain starting conditions to properly maintain oil return to the compressors. The MBB controls fan stages to maintain the head pressure set point and will automatically adjust unit capacity as required to keep compressors from operating outside of the specified envelope. There are no pumpout or pumpdown sequences on these units.

The liquid line solenoid valve is energized anytime a compressor is operating in the circuit and also when the circuit is OFF and the OAT is less than the SST. The liquid line solenoid valve is de-energized 5 seconds after the circuit stops and also when the circuit is OFF and the OAT is greater than the SST plus 2° F. Each circuit operates independently.

For all units, if temperature reset is used, the unit controls to a higher leaving temperature as the building load reduces. If demand limit is used, the unit may temporarily be unable to maintain the desired leaving-air temperature because of imposed power limitations. Loading sequence for compressors is shown in Table 8.

SERVICE

⚠ WARNING

ELECTRIC SHOCK HAZARD: Turn off all power to unit before servicing. The ENABLE/OFF/REMOTE CONTACT switch on control panel does *not* shut off control power; *use field disconnect.* Failure to do so could result in personal injury.

Electronic Components

CONTROL COMPONENTS — Unit uses an advanced electronic control system that normally does not require service. For details on controls refer to Operating Data section.

Access to the compressors is through latched panels from beneath the control box on the unit sizes 025-060 and on each end of the unit on sizes 070-100. The front door(s) provide access to the compressor(s) and all components of the refrigeration system. For unit sizes 025-030, access to the controls is through the upper latched outer door above the compressor access door. Similarly, the upper center latched door on sizes 040-060 gives access to the controls. Inner panels are secured in place and should not be removed unless all power to the unit is off.

Thermistors — Electronic control uses up to 7 thermistors to sense temperatures used to control operation of the unit. The standard unit comes with return gas temperature (RGT) and outside air temperature (OAT) thermistors. These thermistors are 5 kΩ thermistors, identical in their temperature and voltage drop performance. Resistance at various temperatures is listed in Tables 17-21.

DISCHARGE TEMPERATURE THERMISTOR (DTT) — This sensor is only used on units with a digital compressor. The sensor is mounted on the discharge line close to the discharge of the digital compressor. It attaches to the discharge line using a spring clip and protects the system from high discharge gas temperature when the digital compressor is used. This sensor is a 86 kΩ thermistor connected to the AUX board.

RETURN GAS THERMISTORS (RGTA,B) — The RGTA,B thermistors are located in the suction line of the respective circuits and are used to monitor superheat entering the compressor and generate low superheat alarms.

OUTSIDE AIR THERMISTOR (OAT) — The OAT is located inside the base rail on unit sizes 025-060 and on the back of the control box on sizes 070-100. It is used to control fan cycling on the unit.

The remaining thermistors are installed in either the space, ductwork or air handler. These include the space temperature (SPT), supply air temperature (SAT) and return air temperature (RAT/EAT) thermistors.

SPACE TEMPERATURE THERMISTOR (SPT) — This sensor is a field-supplied accessory and is part of the T55 or T56 sensor package that can be used to control space temperature on constant volume (CV) units. The sensor is connected to the LVT. The SPT has a 10 kΩ input channel and has a different set of temperature vs. resistance and voltage drop performance than the 5 kΩ thermistors.

SUPPLY AIR THERMISTOR (SAT) — This sensor is field supplied and is used to measure the supply air temperature of the unit. The SAT thermistor is configurable to be either a 5 kΩ or 10 kΩ thermistor. Care should be taken to ensure the configuration matches the type of thermistor which is installed. This is configured under the Configuration menu ***OPT1***, ***SAT.T*** and by selecting 0 for 5 kΩ or 1 for 10 kΩ or 2 for none. The proper temperature vs. resistance and voltage drop performance tables should be followed based on the configuration.

RETURN AIR OR EVAPORATOR AIR THERMISTOR (RAT) — This sensor is field supplied and should be located directly upstream of the evaporator. The RAT is used to measure the evaporator entering or return air temperature of the unit. The RAT thermistor is configurable to be either a 5 kΩ or 10 kΩ thermistor. Care should be taken to ensure the configuration matches the type of thermistor which is installed. This is configured under the Configuration menu OPT1, RAT.T and by selecting 0 for 5 kΩ or 1 for 10 kΩ or 2 for none. The proper temperature vs. resistance and voltage drop performance tables should be followed based on configuration.

See Table 3 for thermistor pin connection points.

THERMISTOR/TEMPERATURE SENSOR CHECK — A high quality digital volt-ohmmeter is required to perform this check.

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J8 terminal strip on the main base board (see Fig. 61).
2. Using the voltage reading obtained, read the sensor temperature from Tables 17-21.
3. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, ± 5° F (3° C) if care was taken in applying thermocouple and taking readings.

If a more accurate check is required, unit must be shut down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J8 terminal, by determining the resistance with unit shut down and thermistor disconnected from J8. Compare the values determined with the value read by the control in the Temperatures mode using the scrolling marquee display.

REPLACING RETURN GAS THERMISTORS (RGTA,B) — Add a small amount of thermal conductive grease to the thermistor well and end of probe. Tighten the retaining nut $^1/_4$ turn past finger tight.

Table 17 — 5K Thermistor Temperatures (°F) vs. Resistance/Voltage Drop

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–25	3.699	98,010
–24	3.689	94,707
–23	3.679	91,522
–22	3.668	88,449
–21	3.658	85,486
–20	3.647	82,627
–19	3.636	79,871
–18	3.624	77,212
–17	3.613	74,648
–16	3.601	72,175
–15	3.588	69,790
–14	3.576	67,490
–13	3.563	65,272
–12	3.550	63,133
–11	3.536	61,070
–10	3.523	59,081
–9	3.509	57,162
–8	3.494	55,311
–7	3.480	53,526
–6	3.465	51,804
–5	3.450	50,143
–4	3.434	48,541
–3	3.418	46,996
–2	3.402	45,505
–1	3.386	44,066
0	3.369	42,679
1	3.352	41,339
2	3.335	40,047
3	3.317	38,800
4	3.299	37,596
5	3.281	36,435
6	3.262	35,313
7	3.243	34,231
8	3.224	33,185
9	3.205	32,176
10	3.185	31,202
11	3.165	30,260
12	3.145	29,351
13	3.124	28,473
14	3.103	27,624
15	3.082	26,804
16	3.060	26,011
17	3.038	25,245
18	3.016	24,505
19	2.994	23,789
20	2.972	23,096
21	2.949	22,427
22	2.926	21,779
23	2.903	21,153
24	2.879	20,547
25	2.856	19,960
26	2.832	19,393
27	2.808	18,843
28	2.784	18,311
29	2.759	17,796
30	2.735	17,297
31	2.710	16,814
32	2.685	16,346
33	2.660	15,892
34	2.634	15,453
35	2.609	15,027
36	2.583	14,614
37	2.558	14,214
38	2.532	13,826
39	2.506	13,449
40	2.480	13,084
41	2.454	12,730
42	2.428	12,387
43	2.402	12,053
44	2.376	11,730
45	2.349	11,416
46	2.323	11,112
47	2.296	10,816
48	2.270	10,529
49	2.244	10,250
50	2.217	9,979
51	2.191	9,717
52	2.165	9,461
53	2.138	9,213
54	2.112	8,973
55	2.086	8,739
56	2.060	8,511
57	2.034	8,291
58	2.008	8,076
59	1.982	7,686
60	1.956	7,665
61	1.930	7,468
62	1.905	7,277
63	1.879	7,091
64	1.854	6,911
65	1.829	6,735
66	1.804	6,564
67	1.779	6,399
68	1.754	6,238
69	1.729	6,081
70	1.705	5,929
71	1.681	5,781
72	1.656	5,637
73	1.632	5,497
74	1.609	5,361
75	1.585	5,229
76	1.562	5,101
77	1.538	4,976
78	1.516	4,855
79	1.493	4,737
80	1.470	4,622
81	1.448	4,511
82	1.426	4,403
83	1.404	4,298
84	1.382	4,196
85	1.361	4,096
86	1.340	4,000
87	1.319	3,906
88	1.298	3,814
89	1.278	3,726
90	1.257	3,640
91	1.237	3,556
92	1.217	3,474
93	1.198	3,395
94	1.179	3,318
95	1.160	3,243
96	1.141	3,170
97	1.122	3,099
98	1.104	3,031
99	1.086	2,964
100	1.068	2,898
101	1.051	2,835
102	1.033	2,773
103	1.016	2,713
104	0.999	2,655
105	0.983	2,597
106	0.966	2,542
107	0.950	2,488
108	0.934	2,436
109	0.918	2,385
110	0.903	2,335
111	0.888	2,286
112	0.873	2,239
113	0.858	2,192
114	0.843	2,147
115	0.829	2,103
116	0.815	2,060
117	0.801	2,018
118	0.787	1,977
119	0.774	1,937
120	0.761	1,898
121	0.748	1,860
122	0.735	1,822
123	0.723	1,786
124	0.710	1,750
125	0.698	1,715
126	0.686	1,680
127	0.674	1,647
128	0.663	1,614
129	0.651	1,582
130	0.640	1,550
131	0.629	1,519
132	0.618	1,489
133	0.608	1,459
134	0.597	1,430
135	0.587	1,401
136	0.577	1,373
137	0.567	1,345
138	0.557	1,318
139	0.548	1,291
140	0.538	1,265
141	0.529	1,240
142	0.520	1,214
143	0.511	1,190
144	0.502	1,165
145	0.494	1,141
146	0.485	1,118
147	0.477	1,095
148	0.469	1,072
149	0.461	1,050
150	0.453	1,029
151	0.445	1,007
152	0.438	986
153	0.430	965
154	0.423	945
155	0.416	925
156	0.408	906
157	0.402	887
158	0.395	868
159	0.388	850
160	0.381	832
161	0.375	815
162	0.369	798
163	0.362	782
164	0.356	765
165	0.350	750
166	0.344	734
167	0.339	719
168	0.333	705
169	0.327	690
170	0.322	677
171	0.317	663
172	0.311	650
173	0.306	638
174	0.301	626
175	0.296	614
176	0.291	602
177	0.286	591
178	0.282	581
179	0.277	570
180	0.272	561
181	0.268	551
182	0.264	542
183	0.259	533
184	0.255	524
185	0.251	516
186	0.247	508
187	0.243	501
188	0.239	494
189	0.235	487
190	0.231	480
191	0.228	473
192	0.224	467
193	0.220	461
194	0.217	456
195	0.213	450
196	0.210	445
197	0.206	439
198	0.203	434
199	0.200	429
200	0.197	424
201	0.194	419
202	0.191	415
203	0.188	410
204	0.185	405
205	0.182	401
206	0.179	396
207	0.176	391
208	0.173	386
209	0.171	382
210	0.168	377
211	0.165	372
212	0.163	367
213	0.160	361
214	0.158	356
215	0.155	350
216	0.153	344
217	0.151	338
218	0.148	332
219	0.146	325
220	0.144	318
221	0.142	311
222	0.140	304
223	0.138	297
224	0.135	289
225	0.133	282

Table 18 — 5K Thermistor Temperatures (°C) vs. Resistance/Voltage Drop

TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–32	3.705	100,260
–31	3.687	94,165
–30	3.668	88,480
–29	3.649	83,170
–28	3.629	78,125
–27	3.608	73,580
–26	3.586	69,250
–25	3.563	65,205
–24	3.539	61,420
–23	3.514	57,875
–22	3.489	54,555
–21	3.462	51,450
–20	3.434	48,536
–19	3.406	45,807
–18	3.376	43,247
–17	3.345	40,845
–16	3.313	38,592
–15	3.281	38,476
–14	3.247	34,489
–13	3.212	32,621
–12	3.177	30,866
–11	3.140	29,216
–10	3.103	27,633
–9	3.065	26,202
–8	3.025	24,827
–7	2.985	23,532
–6	2.945	22,313
–5	2.903	21,163
–4	2.860	20,079
–3	2.817	19,058
–2	2.774	18,094
–1	2.730	17,184
0	2.685	16,325
1	2.639	15,515
2	2.593	14,749
3	2.547	14,026
4	2.500	13,342
5	2.454	12,696
6	2.407	12,085
7	2.360	11,506
8	2.312	10,959
9	2.265	10,441
10	2.217	9,949
11	2.170	9,485
12	2.123	9,044
13	2.076	8,627
14	2.029	8,231
15	1.982	7,855
16	1.935	7,499
17	1.889	7,161
18	1.844	6,840
19	1.799	6,536
20	1.754	6,246
21	1.710	5,971
22	1.666	5,710
23	1.623	5,461
24	1.580	5,225
25	1.538	5,000
26	1.497	4,786
27	1.457	4,583
28	1.417	4,389
29	1.378	4,204
30	1.340	4,028
31	1.302	3,861
32	1.265	3,701
33	1.229	3,549
34	1.194	3,404
35	1.160	3,266
36	1.126	3,134
37	1.093	3,008
38	1.061	2,888
39	1.030	2,773
40	0.999	2,663
41	0.969	2,559
42	0.940	2,459
43	0.912	2,363
44	0.885	2,272
45	0.858	2,184
46	0.832	2,101
47	0.807	2,021
48	0.782	1,944
49	0.758	1,871
50	0.735	1,801
51	0.713	1,734
52	0.691	1,670
53	0.669	1,609
54	0.649	1,550
55	0.629	1,493
56	0.610	1,439
57	0.591	1,387
58	0.573	1,337
59	0.555	1,290
60	0.538	1,244
61	0.522	1,200
62	0.506	1,158
63	0.490	1,118
64	0.475	1,079
65	0.461	1,041
66	0.447	1,006
67	0.433	971
68	0.420	938
69	0.407	906
70	0.395	876
71	0.383	836
72	0.371	805
73	0.360	775
74	0.349	747
75	0.339	719
76	0.329	693
77	0.319	669
78	0.309	645
79	0.300	623
80	0.291	602
81	0.283	583
82	0.274	564
83	0.266	547
84	0.258	531
85	0.251	516
86	0.244	502
87	0.237	489
88	0.230	477
89	0.223	466
90	0.217	456
91	0.211	446
92	0.204	436
93	0.199	427
94	0.193	419
95	0.188	410
96	0.182	402
97	0.177	393
98	0.172	385
99	0.168	376
100	0.163	367
101	0.158	357
102	0.154	346
103	0.150	335
104	0.146	324
105	0.142	312
106	0.138	299
107	0.134	285

Table 19 — 10K Thermistor Temperature (°F) vs. Resistance/Voltage Drop

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–25	4.758	196,453
–24	4.750	189,692
–23	4.741	183,300
–22	4.733	177,000
–21	4.724	171,079
–20	4.715	165,238
–19	4.705	159,717
–18	4.696	154,344
–17	4.686	149,194
–16	4.676	144,250
–15	4.665	139,443
–14	4.655	134,891
–13	4.644	130,402
–12	4.633	126,183
–11	4.621	122,018
–10	4.609	118,076
–9	4.597	114,236
–8	4.585	110,549
–7	4.572	107,006
–6	4.560	103,558
–5	4.546	100,287
–4	4.533	97,060
–3	4.519	94,020
–2	4.505	91,019
–1	4.490	88,171
0	4.476	85,396
1	4.461	82,729
2	4.445	80,162
3	4.429	77,662
4	4.413	75,286
5	4.397	72,940
6	4.380	70,727
7	4.363	68,542
8	4.346	66,465
9	4.328	64,439
10	4.310	62,491
11	4.292	60,612
12	4.273	58,781
13	4.254	57,039
14	4.235	55,319
15	4.215	53,693
16	4.195	52,086
17	4.174	50,557
18	4.153	49,065
19	4.132	47,627
20	4.111	46,240
21	4.089	44,888
22	4.067	43,598
23	4.044	42,324
24	4.021	41,118
25	3.998	39,926
26	3.975	38,790
27	3.951	37,681
28	3.927	36,610
29	3.903	35,577
30	3.878	34,569
31	3.853	33,606
32	3.828	32,654
33	3.802	31,752
34	3.776	30,860
35	3.750	30,009
36	3.723	29,177
37	3.697	28,373
38	3.670	27,597
39	3.654	26,838
40	3.615	26,113
41	3.587	25,396
42	3.559	24,715
43	3.531	24,042
44	3.503	23,399
45	3.474	22,770
46	3.445	22,161
47	3.416	21,573
48	3.387	20,998
49	3.357	20,447
50	3.328	19,903
51	3.298	19,386
52	3.268	18,874
53	3.238	18,384
54	3.208	17,904
55	3.178	17,441
56	3.147	16,991
57	3.117	16,552
58	3.086	16,131
59	3.056	15,714
60	3.025	15,317
61	2.994	14,925
62	2.963	14,549
63	2.932	14,180
64	2.901	13,824
65	2.870	13,478
66	2.839	13,139
67	2.808	12,814
68	2.777	12,493
69	2.746	12,187
70	2.715	11,884
71	2.684	11,593
72	2.653	11,308
73	2.622	11,031
74	2.592	10,764
75	2.561	10,501
76	2.530	10,249
77	2.500	10,000
78	2.470	9,762
79	2.439	9,526
80	2.409	9,300
81	2.379	9,078
82	2.349	8,862
83	2.319	8,653
84	2.290	8,448
85	2.260	8,251
86	2.231	8,056
87	2.202	7,869
88	2.173	7,685
89	2.144	7,507
90	2.115	7,333
91	2.087	7,165
92	2.059	6,999
93	2.030	6,838
94	2.003	6,683
95	1.975	6,530
96	1.948	6,383
97	1.921	6,238
98	1.894	6,098
99	1.867	5,961
100	1.841	5,827
101	1.815	5,698
102	1.789	5,571
103	1.763	5,449
104	1.738	5,327
105	1.713	5,210
106	1.688	5,095
107	1.663	4,984
108	1.639	4,876
109	1.615	4,769
110	1.591	4,666
111	1.567	4,564
112	1.544	4,467
113	1.521	4,370
114	1.498	4,277
115	1.475	4,185
116	1.453	4,096
117	1.431	4,008
118	1.409	3,923
119	1.387	3,840
120	1.366	3,759
121	1.345	3,681
122	1.324	3,603
123	1.304	3,529
124	1.284	3,455
125	1.264	3,383
126	1.244	3,313
127	1.225	3,244
128	1.206	3,178
129	1.187	3,112
130	1.168	3,049
131	1.150	2,986
132	1.132	2,926
133	1.114	2,866
134	1.096	2,809
135	1.079	2,752
136	1.062	2,697
137	1.045	2,643
138	1.028	2,590
139	1.012	2,539
140	0.996	2,488
141	0.980	2,439
142	0.965	2,391
143	0.949	2,343
144	0.934	2,297
145	0.919	2,253
146	0.905	2,209
147	0.890	2,166
148	0.876	2,124
149	0.862	2,083
150	0.848	2,043
151	0.835	2,003
152	0.821	1,966
153	0.808	1,928
154	0.795	1,891
155	0.782	1,855
156	0.770	1,820
157	0.758	1,786
158	0.745	1,752
159	0.733	1,719
160	0.722	1,687
161	0.710	1,656
162	0.699	1,625
163	0.687	1,594
164	0.676	1,565
165	0.666	1,536
166	0.655	1,508
167	0.645	1,480
168	0.634	1,453
169	0.624	1,426
170	0.614	1,400
171	0.604	1,375
172	0.595	1,350
173	0.585	1,326
174	0.576	1,302
175	0.567	1,278
176	0.558	1,255
177	0.549	1,233
178	0.540	1,211
179	0.532	1,190
180	0.523	1,169
181	0.515	1,148
182	0.507	1,128
183	0.499	1,108
184	0.491	1,089
185	0.483	1,070
186	0.476	1,052
187	0.468	1,033
188	0.461	1,016
189	0.454	998
190	0.447	981
191	0.440	964
192	0.433	947
193	0.426	931
194	0.419	915
195	0.413	900
196	0.407	885
197	0.400	870
198	0.394	855
199	0.388	841
200	0.382	827
201	0.376	814
202	0.370	800
203	0.365	787
204	0.359	774
205	0.354	762
206	0.349	749
207	0.343	737
208	0.338	725
209	0.333	714
210	0.328	702
211	0.323	691
212	0.318	680
213	0.314	670
214	0.309	659
215	0.305	649
216	0.300	639
217	0.296	629
218	0.292	620
219	0.288	610
220	0.284	601
221	0.279	592
222	0.275	583
223	0.272	574
224	0.268	566
225	0.264	557

Table 20 — 10K Thermistor Temperature (°C) vs. Resistance/Voltage Drop

TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–32	4.762	200,510	**15**	3.056	15,714	**62**	0.940	2,315
–31	4.748	188,340	**16**	3.000	15,000	**63**	0.913	2,235
–30	4.733	177,000	**17**	2.944	14,323	**64**	0.887	2,157
–29	4.716	166,342	**18**	2.889	13,681	**65**	0.862	2,083
–28	4.700	156,404	**19**	2.833	13,071	**66**	0.837	2,011
–27	4.682	147,134	**20**	2.777	12,493	**67**	0.813	1,943
–26	4.663	138,482	**21**	2.721	11,942	**68**	0.790	1,876
–25	4.644	130,402	**22**	2.666	11,418	**69**	0.767	1,813
–24	4.624	122,807	**23**	2.610	10,921	**70**	0.745	1,752
–23	4.602	115,710	**24**	2.555	10,449	**71**	0.724	1,693
–22	4.580	109,075	**25**	2.500	10,000	**72**	0.703	1,637
–21	4.557	102,868	**26**	2.445	9,571	**73**	0.683	1,582
–20	4.533	97,060	**27**	2.391	9,164	**74**	0.663	1,530
–19	4.508	91,588	**28**	2.337	8,776	**75**	0.645	1,480
–18	4.482	86,463	**29**	2.284	8,407	**76**	0.626	1,431
–17	4.455	81,662	**30**	2.231	8,056	**77**	0.608	1,385
–16	4.426	77,162	**31**	2.178	7,720	**78**	0.591	1,340
–15	4.397	72,940	**32**	2.127	7,401	**79**	0.574	1,297
–14	4.367	68,957	**33**	2.075	7,096	**80**	0.558	1,255
–13	4.335	65,219	**34**	2.025	6,806	**81**	0.542	1,215
–12	4.303	61,711	**35**	1.975	6,530	**82**	0.527	1,177
–11	4.269	58,415	**36**	1.926	6,266	**83**	0.512	1,140
–10	4.235	55,319	**37**	1.878	6,014	**84**	0.497	1,104
–9	4.199	52,392	**38**	1.830	5,774	**85**	0.483	1,070
–8	4.162	49,640	**39**	1.784	5,546	**86**	0.470	1,037
–7	4.124	47,052	**40**	1.738	5,327	**87**	0.457	1,005
–6	4.085	44,617	**41**	1.692	5,117	**88**	0.444	974
–5	4.044	42,324	**42**	1.648	4,918	**89**	0.431	944
–4	4.003	40,153	**43**	1.605	4,727	**90**	0.419	915
–3	3.961	38,109	**44**	1.562	4,544	**91**	0.408	889
–2	3.917	36,182	**45**	1.521	4,370	**92**	0.396	861
–1	3.873	34,367	**46**	1.480	4,203	**93**	0.386	836
0	3.828	32,654	**47**	1.439	4,042	**94**	0.375	811
1	3.781	31,030	**48**	1.400	3,889	**95**	0.365	787
2	3.734	29,498	**49**	1.362	3,743	**96**	0.355	764
3	3.686	28,052	**50**	1.324	3,603	**97**	0.345	742
4	3.637	26,686	**51**	1.288	3,469	**98**	0.336	721
5	3.587	25,396	**52**	1.252	3,340	**99**	0.327	700
6	3.537	24,171	**53**	1.217	3,217	**100**	0.318	680
7	3.485	23,013	**54**	1.183	3,099	**101**	0.310	661
8	3.433	21,918	**55**	1.150	2,986	**102**	0.302	643
9	3.381	20,883	**56**	1.117	2,878	**103**	0.294	626
10	3.328	19,903	**57**	1.086	2,774	**104**	0.287	609
11	3.274	18,972	**58**	1.055	2,675	**105**	0.279	592
12	3.220	18,090	**59**	1.025	2,579	**106**	0.272	576
13	3.165	17,255	**60**	0.996	2,488	**107**	0.265	561
14	3.111	16,464	**61**	0.968	2,400			

Table 21 — 86K Thermistor vs Resistance (DTT)

TEMP (C)	TEMP (F)	RESISTANCE (Ohms)	TEMP (C)	TEMP (F)	RESISTANCE (Ohms)
-40	-40	2,889,600	75	167	12,730
-35	-31	2,087,220	80	176	10,790
-30	-22	1,522,200	85	185	9,200
-25	-13	1,121,440	90	194	7,870
-20	-4	834,720	95	203	6,770
-15	5	627,280	100	212	5,850
-10	14	475,740	105	221	5,090
-5	23	363,990	110	230	4,450
0	32	280,820	115	239	3,870
5	41	218,410	120	248	3,350
10	50	171,170	125	257	2,920
15	59	135,140	130	266	2,580
20	68	107,440	135	275	2,280
25	77	86,000	140	284	2,020
30	86	69,280	145	293	1,800
35	95	56,160	150	302	1,590
40	104	45,810	155	311	1,390
45	113	37,580	160	320	1,250
50	122	30,990	165	329	1,120
55	131	25,680	170	338	1,010
60	140	21,400	175	347	920
70	158	15,070	180	356	830

Pressure Transducers — The suction and discharge transducers are different part numbers and can be distinguished by the color of the transducer body, suction (yellow) and discharge (red). Figures 59 and 60 shows typical location of pressure transducers on each circuit. No pressure transducer calibration is required. The transducers operate on a 5 vdc supply, which is generated by the main base board (MBB). See Fig. 61 for transducer connections to the J8 connector on the MBB.

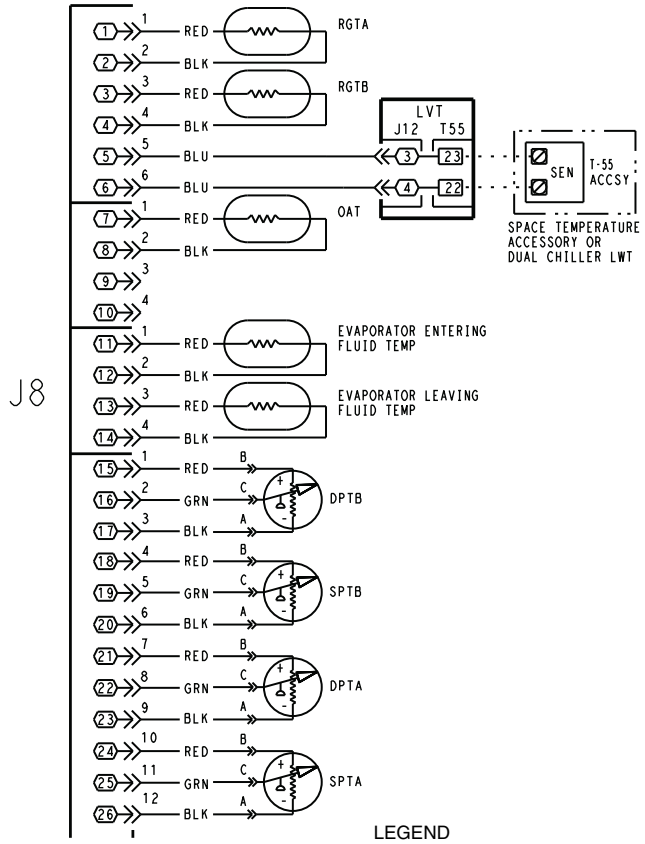


Fig. 61 — Thermistor Connections to Main Base Board, J8 Connector

TROUBLESHOOTING — If a transducer is suspected of being faulty, first check supply voltage to the transducer. Supply voltage should be 5 vdc ± 0.2 v. If supply voltage is correct, compare pressure reading displayed on the scrolling marquee display module against pressure shown on a calibrated pressure gauge. Pressure readings should be within ± 15 psig. If the two readings are not reasonably close, replace the pressure transducer.

Condenser Fans — Each fan is supported by a formed wire mount bolted to a fan deck and covered with a wire guard.

METAL FANS — The exposed end of fan motor shaft is protected from weather by grease and a rubber boot. If fan motor must be removed for service or replacement, be sure to regrease fan shaft and reinstall fan guard. For proper performance, fan web should be 0.32 in. (8 mm) below top of orifice on the fan deck to top of the fan hub. (See Fig. 62.) Tighten set screws to 15 ± 1 ft-lb (20 ± 1.3 N-m). Figure 62 shows the proper position of mounted fan.

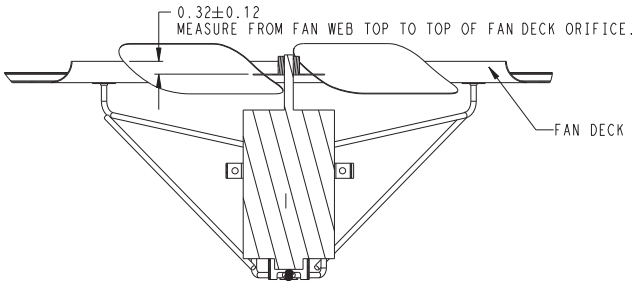


Fig. 62 — Mounted Fan Position

IMPORTANT: Check for proper fan rotation (clockwise when viewed from above). If necessary, switch any 2 power leads to reverse fan rotation.

LOW SOUND FAN — A shroud and a wire guard provide protection from the rotating fan. The exposed end of the fan motor shaft is protected from weather by grease. If fan motor must be removed for service or replacement, be sure to regrease fan shaft and reinstall fan guard. The fan motor has a step in the motor shaft. For proper performance, fan should be positioned such that it is securely seated on this step. Tighten the bolt to 15 ± 1 ft-lb (20 ± 1.3 N·m).

IMPORTANT: Check for proper fan rotation (counterclockwise when viewed from above). If necessary, switch any 2 power leads to reverse fan rotation.

Motormaster® V Controller — The optional or accessory Motormaster V controller uses an input signal from the AUX board. See Fig. 63. The controller is factory configured and requires no field programming. If a situation arises where the drive does not function properly, the information provided below and in Table 22 can be used to troubleshoot the drive.

⚠ WARNING

Hazard of electrical shock! Wait three minutes after disconnecting incoming power before servicing drive. Capacitors retain charge after power is removed. Drive assembly includes externally mounted current limiting resistors. Use extreme caution when servicing the drive. Failure to comply could result in possible personal injury.

⚠ WARNING

When configured as shown below, this equipment is designed to start when it receives line power. Ensure that all personnel are clear of fans and guards are installed before applying power. Failure to comply could result in possible personal injury.

⚠ CAUTION

If input power has not been applied to the drive for a period of time exceeding three years (due to storage, etc.), the electrolytic DC bus capacitors within the drive can change internally, resulting in excessive leakage current. This can result in premature failure of the capacitors if the drive is operated after such a long period of inactivity or storage. In order to reform the capacitors and prepare the drive for operation after a long period of inactivity, apply input power to the drive for 8 hours prior to actually operating the motor. Before attempting to operate the drive, motor, and driven equipment, be sure all procedures pertaining to installation and wiring have been properly followed. Failure to comply could result in equipment damage.

⚠ CAUTION

DO NOT connect incoming AC power to output terminals T1, T2, and T3! Severe damage to the drive will result. Do not continuously cycle input power to the drive more than once every two minutes. Damage to the drive will result.

GENERAL OPERATION — The speed varies in proportion to a 4 to 20 mA signal produced by the *Comfort*Link™ controls. The MMV output speed is displayed in Hz.

The *Comfort*Link controls must be configured for MMV operation in order for it to operate. This is configured under the Configuration menu ***M.MAST→MMR.S*** and selecting "YES". This configuration menu also contains the gains and minimum speed for the motormaster control logic.

CONFIGURATION — The MMV is configured for 1 of 12 operation modes based on the inputs to the control terminal block. The 38AP units use operating modes 5-8. In these configurations, the MMV follows a 4 to 20 mA speed reference signal present on terminals 25 (+) and 2 (-). One additional jumper is required to configure the drive for 50/60 Hz operation and input voltage. See Table 23 for proper inputs. Once the drive is powered, it will change to the mode selected according to the inputs. See Fig. 64.

DRIVE PROGRAMMING

⚠ CAUTION

It is strongly recommended that the user NOT change any programming without consulting Carrier service personnel. Unit damage may occur from improper programming.

To enter password and change program values:

1. Press **Mode.**
2. Upper right decimal point blinks.
3. Display reads "00". To enter the PROGRAM mode to access the parameters, press the **Mode** button. This will activate the PASSWORD prompt (if the password has not been disabled). The display will read "00" and the upper right-hand decimal point will be blinking. (See Fig. 63.)
4. Use the ▲ and ▼ buttons to scroll to the password value (the factory default password is "111") and press the **Mode** button. Once the correct password value is entered, the display will read "P01", which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu (P01 is the first parameter).

NOTE: If the display flashes "Er", the password was incorrect, and the process to enter the password must be repeated.

5. Press **Mode** to display present parameter number. Upper right decimal point blinks.

   Use the ▲ and ▼ buttons to scroll to the desired parameter number.

Once the desired parameter number is found, press the **Mode** button to display the present parameter setting. The upper right-hand decimal point will begin blinking, indicating that the present parameter setting is being displayed, and that it can be changed by using the up and down buttons. Use ▲ and ▼ to change setting. Press **Mode** to store new setting.

Pressing the **Mode** will store the new setting and also exit the PROGRAM mode. To change another parameter, press the **Mode** key again to re-enter the PROGRAM mode (the parameter menu will be accessed at the parameter that was last viewed or changed before exiting). If the **Mode** key is pressed within two minutes of exiting the PROGRAM mode, the password is not required to access the parameters. After two minutes, the password must be entered in order to access the parameters again.

To change password: first enter the current password then change parameter P44 to the desired password.

To disable automatic control mode and enter manual speed control mode:

1. Change P05 to '01- keypad'.
2. Push UP and DOWN arrow key to set manual speed.
3. Set P05 to '04 - 4-20mA control' to restore 4 to 20 mA control.

EPM CHIP — The drive uses a electronic programming module (EPM) chip to store the program parameters. This is an EEPROM memory chip and is accessible from the front of the VFD. It should not be removed with power applied to the VFD.

LOSS OF CCN COMMUNICATIONS — Carrier Comfort Network® (CCN) communications with external control systems can be affected by high frequency electrical noise generated by the Motormaster V control. Ensure unit is well grounded to eliminate ground currents along communication lines.

If communications are lost only while Motormaster V control is in operation, order a signal isolator (CEAS420876-2) and power supplies (CEAS221045-01, 2 required) for the CCN communication line.

Fault Codes — The drive is programmed to automatically restart after a fault and will attempt to restart three times after a fault (the drive will not restart after CF, cF, GF, F1, F2-F9, or Fo faults). If all three restart attempts are unsuccessful, the drive will trip into FAULT LOCKOUT (LC), which requires a manual reset.

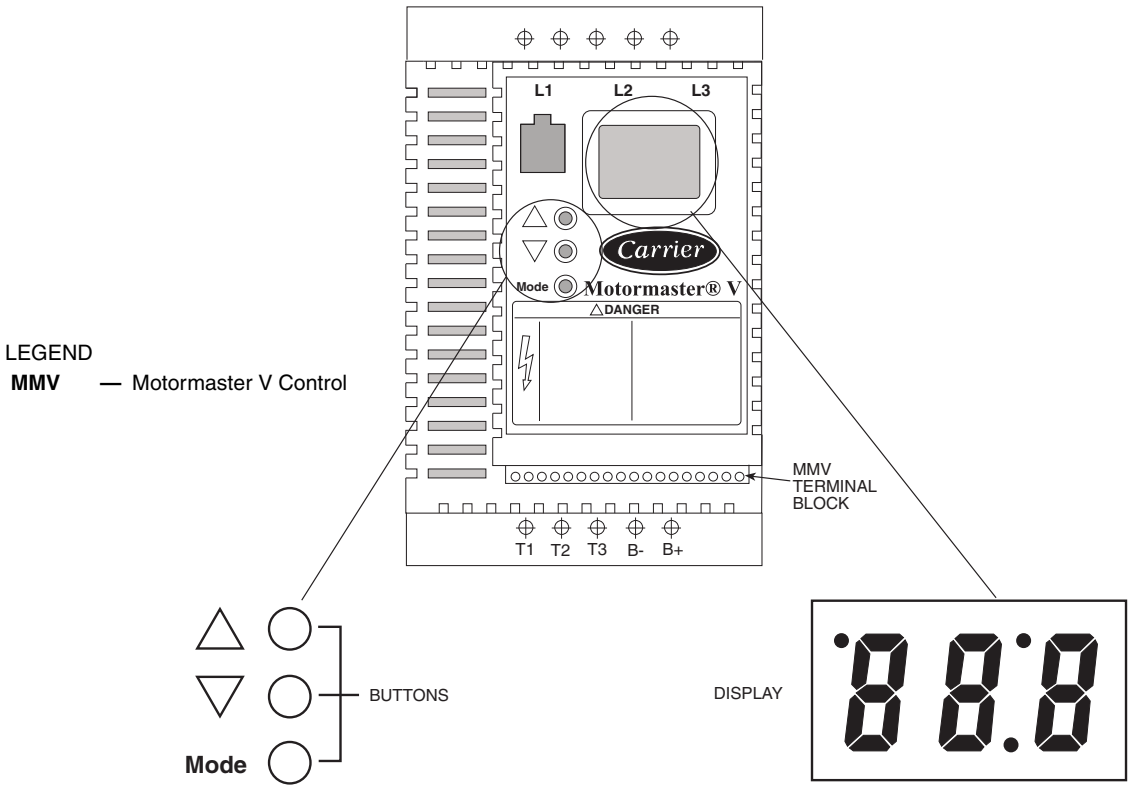
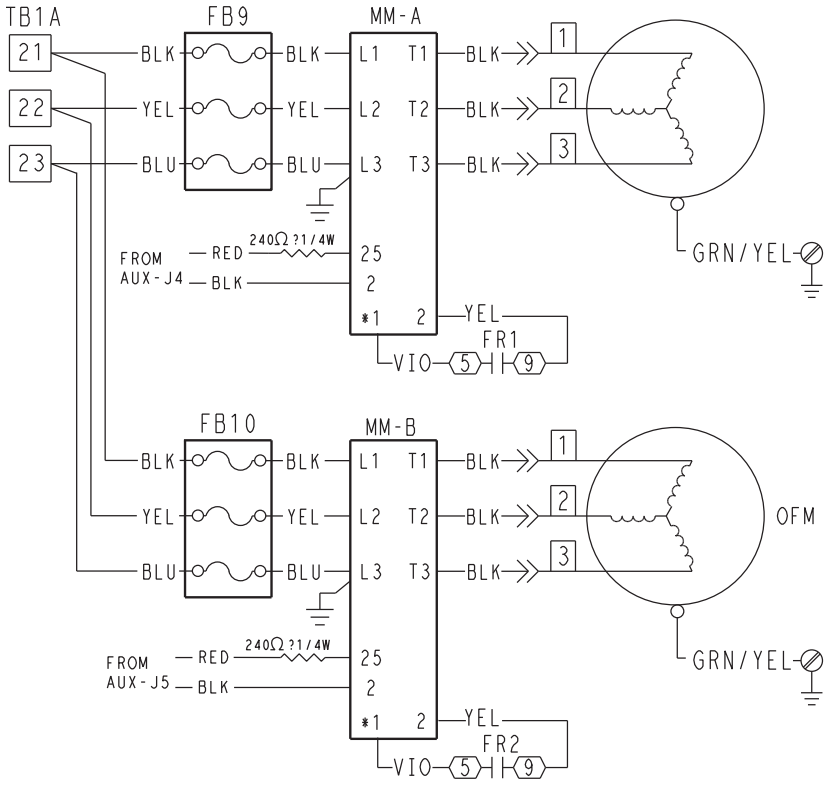


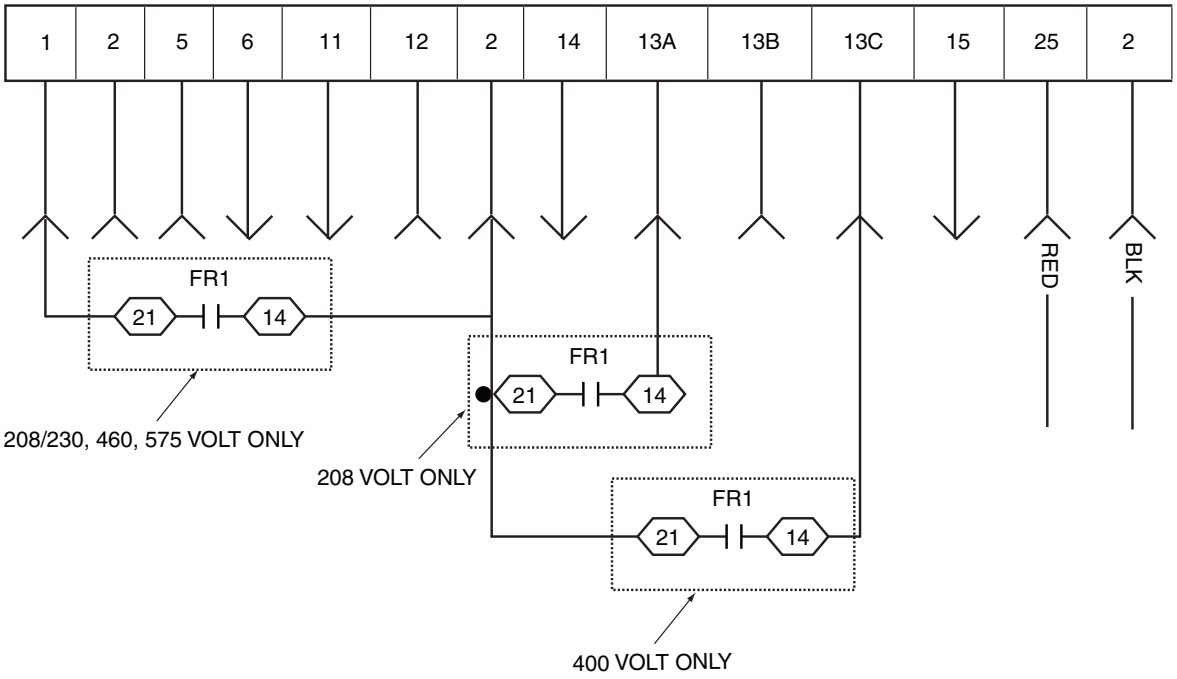
Fig. 63 — Motormaster® V Mode Buttons and Mode Display

Table 22 — Fault Codes

FAULT CODE	DESCRIPTION	SOLUTION
AF	High Temperature Fault: Ambient temperature is too high; Cooling fan has failed (if equipped).	Check cooling fan operation
CF	Control Fault: A blank EPM, or an EPM with corrupted data has been installed.	Perform a factory reset using Parameter 48 — PROGRAM SELECTION.
cF	Incompatibility Fault: An EPM with an incompatible parameter version has been installed.	Either remove the EPM or perform a factory reset (Parameter 48) to change the parameter version of the EPM to match the parameter version of the drive.
CL	CURRENT LIMIT: The output current has exceeded the CURRENT LIMIT setting (Parameter 25) and the drive is reducing the output frequency to reduce the output current. If the drive remains in CURRENT LIMIT too long, it can trip into a CURRENT OVERLOAD fault (PF).	Check for loose electrical connections. Check for faulty condenser fan motor. Check Parameter P25 from Table 23 is set correctly.
GF	Data Fault: User data and OEM defaults in the EPM are corrupted.	Restore factory defaults P48, see section above. If that does not work, replace EPM.
HF	High DC Bus Voltage Fault: Line voltage is too high; Deceleration rate is too fast; Overhauling load.	Check line voltage — set P01 appropriately
JF	Serial Fault: The watchdog timer has timed out, indicating that the serial link has been lost.	Check serial connection (computer) Check settings for PXX. Check settings in communication software to match PXX.
LF	Low DC Bus Voltage Fault: Line voltage is too low.	Check line voltage — set P01 appropriately
OF	Output Transistor Fault: Phase to phase or phase to ground short circuit on the output; Failed output transistor; Boost settings are too high; Acceleration rate is too fast.	Reduce boost or increase acceleration values. If unsuccessful, replace drive. Check for incorrect wiring T1, T2, T3.
PF	Current Overload Fault: VFD is undersized for the application; Mechanical problem with the driven equipment.	Check line voltage — set P01 appropriately Check for dirty coils Check for motor bearing failure
SF	Single-phase Fault: Single-phase input power has been applied to a three-phase drive.	Check input power phasing
F1	EPM Fault: The EPM is missing or damaged.	
F2-F9, Fo	Internal Faults: The control board has sensed a problem	Consult factory
Drive display = 60.0 even though it is cold outside and it should be running slower	Feedback signal is above set point	Check for proper set point Check liquid line pressure
Drive display = '---' even though drive should be running	Start jumper is missing	Replace start jumper. See section above
Drive display = 8.0 even though fan should be running faster	Feedback signal is below set point and fan is at minimum speed	Check for proper set point Check liquid line pressure
VFD flashes 57 and LCS	Feedback or speed signal lost. Drive will operate at 57 Hz until reset or loss of start command. Resetting requires cycling start command (or power).	In stand alone mode: Check transducer wiring and feedback voltage. Feedback voltage displayed on P-69. Pin 6 should be 5 v output. Pin 5 (feedback) should be somewhere between 0 and 5 v.



MOTORMASTER V TERMINAL BLOCK



LEGEND

AUX — Auxiliary
FB — Fuse Block
FR — Fan Relay
MM — Motormaster
OFM — Outdoor Fan Motor
TB — Terminal Block

Configuration Table

MODE	NOMINAL VOLTAGE	Hz	CONTROL INPUT (PINS 25, 2)	START JUMPER
5	208/230/460/575*	60	External control 4-20 mA	TB1-TB2
6	208/380	60	External control 4-20 mA	TB13A-TB2
7	230	50	External control 4-20 mA	TB13B-TB2
8	380/415	50	External control 4-20 mA	TB13C-TB2

*208-v can run in mode 5 or 6.

Fig. 64 — Typical Motormaster® Wiring

Table 23 — Motormaster® V Program Parameters for Operating Modes

PARAMETER	DESCRIPTION	MODE 5	MODE 6	MODE 7	MODE 8
P01	Line Voltage: 01 = low line, 02 = high line	01	02	01	02
P02	Carrier Freq: 01 = 4 kHz, 02 = 6 kHz, 03=8 kHz	01	01	01	01
P03	Start-up mode: flying restart	06	06	06	06
P04	Stop mode: coast to stop	01	01	01	01
P05	Standard Speed source: 04=4-20 mA, 05=R22, 06=R134a	04	04	04	04
P06	TB-14 output: 01 = none	01	01	01	01
P08	TB-30 output: 01 = none	01	01	01	01
P09	TB-31 Output: 01 = none	01	01	01	01
P10	TB-13A function sel: 01 = none	01	01	01	01
P11	TB-13B function sel: 01 = none	01	01	01	01
P12	TB-13C function sel: 01 = none	01	01	01	01
P13	TB-15 output: 01 = none	01	01	01	01
P14	Control: 01 = Terminal strip	01	01	01	01
P15	Serial link: 02 = enabled 9600,8,N,2 with timer	02	02	02	02
P16	Units editing: 02 = whole units	02	02	02	02
P17	Rotation: 01 = forward only, 03 = reverse only	01	01	01	01
P19	Acceleration time: 10 sec	10	10	10	10
P20	Deceleration time: 10 sec	10	10	10	10
P21	DC brake time: 0	0	0	0	0
P22	DC BRAKE VOLTAGE 0%	0	0	0	0
P23	Min freq = 8 Hz ~ 100 - 160 rpm	8	8	8	8
P24	Max freq	60	60	50	50
P25	Current limit:	125	125	110	110
P26	Motor overload: 100	100	100	100	100
P27	Base freq: 60 or 50 Hz	60	60	50	50
P28	Fixed boost: 0.5% at low frequencies	0.5	0.5	0.5	0.5
P29	Accel boost: 0%	0	0	0	0
P30	Slip compensation: 0%	0	0	0	0
P31	Preset spd #1: 0	57	57	47	47
P32	Preset spd #2: 0	0	0	0	0
P33	Preset spd #3: 0	0	0	0	0
P34	Preset spd 4 default – R22 setpoint. TB12-2 open	18.0	18.0	18.0	18.0
P35	Preset spd 5 default – R134a setpoint. TB12-2 closed	12.6	12.6	12.6	12.6
P36	Preset spd 6 default	0	0	0	0
P37	Preset spd 7 default	0	0	0	0
P38	Skip bandwidth	0	0	0	0
P39	Speed scaling	0	0	0	0
P40	Frequency scaling 50 or 60 Hz	60	60	50	50
P41	Load scaling: default (not used so NA)	200	200	200	200
P42	Accel/decel #2: default (not used so NA)	60	60	60	60
P43	Serial address	1	1	1	1
P44	Password:111	111	111	111	111
P45	Speed at min signal: 8 Hz used when PID disabled and 4-20 mA input	8	8	8	8
P46	Speed at max feedback: 60 or 50 Hz. Used when PID disabled and 4-20 mA input	60	60	50	50
P47	Clear history? 01 = maintain. (set to 00 to clear)	01	01	01	01
P48	Program selection: Mode 1 – 12	05	06	07	08
P61	PI Mode: 05= reverse, 0-5V, 01 = no PID	01	01	01	01
P62	Min feedback = 0 (0V *10)	0	0	0	0
P63	Max feedback = 50 (5V * 10)	50	50	50	50
P64	Proportional gain = 4%	4	4	4	4
P65	Integral gain = .2	.2	.2	.2	.2
P66	PI accel/decel (setpoint change filter) = 5	5	5	5	5
P67	Min alarm	0	0	0	0
P68	Max alarm	0	0	0	0

LEGEND

NA — Not Applicable
PID — Proportional Integral Derivative
TB — Terminal Block

TROUBLESHOOTING — Troubleshooting the Motormaster® V control requires a combination of observing system operation and VFD display information. The MMV should follow the 4 to 20 mA signal from the *Comfort*Link™ controls.

The speed command from the *Comfort*Link controls can be monitored in 2 ways:

1. Variables VH.PA, VH.PB in the "outputs" submenu of *Comfort*Link - given as a percentage of 4 to 20 mA range.
2. P56 in Motormaster V shows 4-20 mA input in percent of maximum input.

Refer to Table 24 for the variable definitions of each controller.

Table 24 — Controller Cross-Reference

CONTROL SIGNAL	VH.PA, VH.PB (*COMFORT*LINK)	4-20 mA INPUT (P56, MOTORMASTER V)	VFD SPEED (MOTORMASTER V)
4 mA	0%	20%	8 Hz
12 mA	50%	60%	26 Hz
20 mA	100%	100%	60 Hz

The MMV also provides real time monitoring of key inputs and outputs. The collective group is displayed through parameters 50-56 and all values are read only.

- **P50: FAULT HISTORY** — Last 8 faults
- **P51: SOFTWARE version**
- **P52: DC BUS VOLTAGE** — in percent of nominal. Usually rated input voltage x 1.4.
- **P54: LOAD** — in percent of drives rated output current rating
- **P55: VDC INPUT** — in percent of maximum input: 50 will indicate full scale which is 5 v
- **P56: 4-20 mA INPUT** — in percent of maximum input: 20% = 4 mA, 100% = 20 mA

REPLACING DEFECTIVE MODULES — The *Comfort*Link™ replacement modules are shown in Table 25. If the main base board (MBB) has been replaced, verify that all configuration data is correct. Follow the Configuration mode table and verify that all items under sub-modes ***UNIT***, ***OPT1*** and ***OPT2*** are correct. Any additional field-installed accessories or options (***RSET***, ***SLCT*** sub-modes) should also be verified as well as any specific time and maintenance schedules.

Refer to the Start-Up Checklist for 38AP units (completed at time of original start-up) found in the job folder. This information is needed later in this procedure. If the checklist does not exist, fill out the current information in the Configuration mode on a new checklist. Tailor the various options and configurations as needed for this particular installation.

⚠ CAUTION

Electrical shock can cause personal injury. Disconnect all electrical power before servicing.

1. Check that all power to unit is off. Carefully disconnect all wires from the defective module by unplugging its connectors.
2. Remove the defective module by removing its mounting screws with a Phillips screwdriver, and removing the module from the control box. Save the screws for later use.
3. Verify that the instance jumper (MBB) or address switches (all other modules) exactly match the settings of the defective module.

NOTE: Handle boards by mounting standoffs only to avoid electrostatic discharge.

4. Package the defective module in the carton of the new module for return to Carrier.
5. Mount the new module in the unit's control box using a Phillips screwdriver and the screws saved in Step 2.
6. Reinstall all module connectors. For accessory Navigator™ device replacement, make sure the plug is installed at LVT in the LEN connector.
7. Carefully check all wiring connections before restoring power.
8. Verify the ENABLE/OFF/REMOTE CONTACT switch is in the OFF position.
9. Restore control power. Verify that all module red LEDs blink in unison. Verify that all green LEDs are blinking and that the scrolling marquee or Navigator display is communicating correctly.
10. Verify all configuration information, settings, set points and schedules. Return the ENABLE/OFF/REMOTE CONTACT switch to its previous position.

Table 25 — Replacement Modules

MODULE	REPLACEMENT PART NO. (with Software)
Main Base Board (MBB)	38AP501672
Scrolling Marquee Display	HK50AA031
Energy Management Module (EMM)	30GT515218
Navigator Display	HK50AA033
Compressor Expansion Board	HK50AA027
Auxiliary Board	32GB500442EE

Compressors

⚠ WARNING

Do not supply power to unit with compressor cover removed. Failure to follow this warning can cause a fire, resulting in personal injury or death.

⚠ WARNING

Exercise extreme caution when reading compressor currents when high-voltage power is on. Correct any of the problems described below before installing and running a replacement compressor. Wear safety glasses and gloves when handling refrigerants. Failure to follow this warning can cause fire, resulting in personl injury or death.

⚠ CAUTION

Do not manually operate contactors. Serious damage to the machine may result.

COMPRESSOR REPLACEMENT — To change out a faulty compressor, refer to the compressor replacement procedure included with the new compressor.

OIL CHARGE — Compressors are factory charged with 110 oz of POE oil. Refer to Oil Charge section page 47 for proper oil and charge procedure.

MAINTENANCE

Recommended Maintenance Schedule — The following are only recommended guidelines. Jobsite conditions may dictate that maintenance schedule is performed more often than recommended.

Every month:

- Check condenser coils for debris, clean as necessary.
- Check moisture indicating sight glass for possible refrigerant loss and presence of moisture.

Every 3 months:

- Check refrigerant charge.
- Check all refrigerant joints and valves for refrigerant leaks, repair as necessary.
- Check fan status switch operation.
- Check condenser coils for debris.
- Check all condenser fans for proper operation.
- Check compressor oil level.
- Check crankcase heater operation.

Every 12 months:

- Check all electrical connections, tighten as necessary.
- Inspect all contactors and relays, replace as necessary.
- Check accuracy of thermistors, replace if greater than ± 2° F (1.2° C) variance from calibrated thermometer.
- Obtain and test an oil sample. Change oil only if necessary.
- Check refrigerant filter driers for excessive pressure drop, replace as necessary.
- Check condition of condenser fan blades and ensure they are securely fastened to the motor shaft.
- Perform service test to confirm operation of all components.

Microchannel Heat Exchanger (MCHX) Condenser Coil Maintenance and Cleaning Recommendations

⚠ CAUTION

Do not apply any chemical cleaners to MCHX condenser coils. These cleaners can accelerate corrosion and damage the coil.

Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit. The following steps should be taken to clean MCHX condenser coils:

1. Remove any foreign objects or debris attached to the coreface or trapped within the mounting frame and brackets.
2. Put on personal protective equipment including safety-glasses and/or face shield, waterproof clothing and gloves. It is recommended to use full coverage clothing.
3. Start high pressure water sprayer and purge any soap or industrial cleaners from sprayer before cleaning condenser coils. Only clean, potable water is authorized for cleaning condenser coils.
4. Clean condenser face by spraying the core steady and uniformly from top to bottom while directing the spray straight toward the core. Do not exceed 900 psig or 30 degree angle. The nozzle must be at least 12 in. from the core face. Reduce pressure and use caution to prevent damage to air centers.

⚠ CAUTION

Excessive water pressure will fracture the braze between air centers and refrigerant tubes.

TROUBLESHOOTING

Complete Unit Stoppage and Restart — Possible causes for unit stoppage and reset methods are shown below. (See Table 26 also.) Refer to Fig. 1-3 and 8-17 for component arrangement and control wiring diagrams.

GENERAL POWER FAILURE — After power is restored, restart is automatic through normal MBB start-up.

UNIT ENABLE-OFF-REMOTE CONTACT SWITCH IS OFF — When the switch is OFF, the unit will stop immediately. Place the switch in the ENABLE position for local switch control or in the REMOTE CONTACT position for control through remote contact closure.

FAN STATUS INPUT OPEN — After the problem causing the fan status input to be open has been corrected, reset is automatic by closing the fan status input.

OPEN 24-V CONTROL CIRCUIT BREAKER(S) — Determine the cause of the failure and correct. Reset circuit breaker(s). Restart is automatic after MBB start-up cycle is complete.

COOLING LOAD SATISFIED — Unit shuts down when cooling load has been satisfied. Unit restarts when required to satisfy set point.

THERMISTOR FAILURE — If a thermistor fails in either an open or shorted condition, the unit will be shut down. Replace SAT or RAT as required. Unit restarts automatically, but must be reset manually by resetting the alarm with the scrolling marquee as shown in Table 27.

⚠ CAUTION

If unit stoppage occurs more than once as a result of any of the safety devices listed, determine and correct cause before attempting another restart.

COMPRESSOR SAFETIES — The 38AP units with *Comfort*Link™ controls include a compressor protection board that protects the operation of each of the compressors. Each board senses the presence or absence of current to each compressor.

If there is a command for a compressor to run and there is no current, then one of the following safeties or conditions have turned the compressor off:

Compressor Overcurrent — All compressors have internal line breaks or a motor protection device located in the compressor electrical box.

Compressor Short Circuit — There will not be current if the compressor circuit breaker that provides short circuit protection has tripped.

Compressor Motor Over Temperature — The internal linebreak or over temperature switch has opened.

High-Pressure Switch Trip — The high pressure switch has opened. Below are the factory settings for the fixed high pressure switch.

38AP UNIT SIZE	CUTOUT		CUT-IN	
	psig	kPa	psig	kPa
025-100	650	4482	500	3447

ASTP Protection Trip — All non-digital Copeland compressors are equipped with an advanced scroll temperature protection (ASTP). A label located above the terminal box identifies models that contain this technology. See Fig. 65.

Fig. 65 — Advanced Scroll Temperature Protection Label

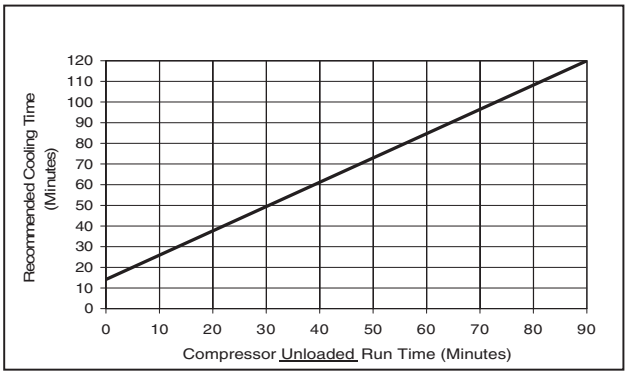
Advanced scroll temperature protection is a form of internal discharge temperature protection that unloads the scroll compressor when the internal temperature reaches approximately 300 F. At this temperature, an internal bi-metal disk valve opens and causes the scroll elements to separate, which stops compression. Suction and discharge pressures balance while the motor continues to run. The longer the compressor runs unloaded, the longer it must cool before the bi-metal disk resets. See Fig. 66 for approximate reset times.

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

Compressor Time Guards — For compressors, the control will use a Compressor Minimum OFF Time of 2 minutes or a Compressor Minimum ON Time of 3 minutes.

High Discharge Gas Temperature Protection — Units equipped with digital compressors have an additional thermistor located on the discharge line, If discharge temperature exceeds 265 F (129.4 C), the digital compressor will be shut off.

Alarms will also occur if the current sensor board malfunctions or is not properly connected to its assigned digital input. If the compressor is commanded OFF and the current sensor reads ON, an alert is generated. This will indicate that a compressor contactor has failed closed. In this case, a special mode, Compressor Stuck on Control, will be enabled and all other compressors will be turned off. An alarm will then be enabled to indicate that service is required. Outdoor fans will continue to operate. The first outdoor fan stage is turned on immediately. The other stages of fan will be turned on as required by SCT.



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

Fig. 66 — Recommended Minimum Cool Down Time After Compressor is Stopped*

Low Saturated Suction — Several conditions can lead to low saturated suction alarms. The controls have several override modes built in which will attempt to keep the unit from shutting down. Low airflow, low refrigerant charge and plugged filter driers are the main causes for this condition. To avoid permanent damage, do NOT repeatedly reset these alert and/or alarm conditions without identifying and correcting the cause(s).

Alarms and Alerts — These are warnings of abnormal or fault conditions, and may cause either one circuit or the whole unit to shut down. They are assigned code numbers as described in Table 26.

Automatic alarms will reset without operator intervention if the condition corrects itself. The following method must be used to reset manual alarms (refer to Table 27):

Before resetting any alarm, first determine the cause of the alarm and correct it. After determining and correcting the cause of the alarm, enter the Alarm mode indicated by the LED on the side of the scrolling marquee display. Press ENTER and ▼ until the sub-menu item RCRN "RESET ALL CURRENT ALARMS" is displayed. Press ENTER. The control will prompt the user for a password, by displaying PASS and WORD. Press ENTER to display the default password, 1111. Press ENTER for each character. If the password has been changed, use the arrow keys to change each individual character. Toggle the display to "YES" and press ENTER. The alarms will be reset.

DIAGNOSTIC ALERT CODES AND POSSIBLE CAUSES

T048 (Circuit A Compressor Availability Alert)

T049 (Circuit B Compressor Availability Alert) — Alert codes 048 and 049 are for circuits A and B respectively. These alerts occur when two compressors are unavailable to run on a 3 compressor circuit. This alert can only occur on single circuit unit sizes 040-060 and three compressor circuit unit sizes 70-100. The control ensures proper oil return by insuring a circuit does not operate with one compressor for longer than one hour of cumulative run time.

COMPRESSOR FAILURE ALERTS

T051, T052, T053 (Circuit A Compresser Failures)

T055, T056, T057 (Circuit B Compressor Failures) — Alert codes 051, 052, 053, 55, 56 and 057 are for compressors A1, A2, A3, B1, B2, and B3 respectively. These alerts occur when the current sensor (CS) does not detect compressor current during compressor operation. When this occurs, the control turns off the compressor.

If the current sensor board reads OFF while the compressor relay has been commanded ON, an alert is generated.

POSSIBLE CAUSES

Compressor Overload — Either the compressor internal overload protector is open or the external overload protector (Kriwan module) has activated. The external overload protector modules are mounted in the compressor wiring junction box. Temperature sensors embedded in the compressor motor windings are the inputs to the module. The module is powered with 24 vac from the units main control box. The module output is a normally closed contact that is wired in series with the compressor contactor coil. In a compressor motor overload condition, contact opens, deenergizing the compressor contactor.

Low Refrigerant Charge — If the compressor operates for an extended period of time with low refrigerant charge, the compressor ASTP device will open, which will cause the compressor to trip on its overload protection device.

Circuit Breaker Trip — The compressors are protected from short circuit by a breaker in the control box.

Wiring Error — A wiring error might not allow the compressor to start.

To check out alerts T051-T057:

1. Turn on the compressor in question using Service Test mode. If the compressor does not start, then most likely the problem is one of the following: HPS open, open internal protection, circuit breaker trip, incorrect safety wiring, or incorrect compressor wiring.
2. If the compressor does start, verify it is rotating in the correct direction.

IMPORTANT: Prolonged operation in the wrong direction can damage the compressor. Correct rotation can be verified by a gage set and looking for a differential pressure rise on start-up.

IMPORTANT: If the CS is always detecting current, verify that the compressor is on. If the compressor is on, check the contactor and the relay on the MBB. If the compressor is off and there is no current, verify the CS wiring and replace if necessary.

IMPORTANT: Return to Normal mode and observe compressor operation to verify that compressor current sensor is working and condenser fans are energized.

COMPRESSOR STUCK ON FAILURE ALARMS

Circuit A A051, A052, A053

Circuit B A055, A056, A057 — Alarm codes 051, 052, 053, 055, 056 and 057 are for compressors A1, A2, A3, B1, B2 and B3. These alarms occur when the current sensor (CS) detects current when the compressor should be off. When this occurs, the control turns off the compressor.

If the current sensor board reads ON while the compressor relay has been commanded OFF for a period of 4 continuous seconds, an alarm is generated. These alarms are only monitored for a period of 10 seconds after the compressor relay has been commanded OFF. This is done to facilitate a service technician forcing a relay to test a compressor.

In addition, if a compressor stuck failure occurs and the current sensor board reports the compressor and the request off, certain diagnostics will take place as follows:

1. If any of the compressors are diagnosed as stuck on and the current sensor board is on and the request is off, the control will command the condenser fans to maintain normal head pressure.
2. The control will shut off all other compressors.

   The possible causes include welded contactor or frozen compressor relay on the MBB.

To check out alarms A051-A057:

1. Place the unit in Service Test mode. All compressors should be off.
2. Verify that there is not 24-v at the contactor coil. If there is 24 v at the contactor, check relay on MBB and wiring.
3. Check for welded contactor.
4. Verify CS wiring.
5. Return to Normal mode and observe compressor operation to verify that compressor current sensor is working and condenser fans are energized.

A060 (Supply Air Thermistor Failure) — If the unit is required to use the supply air thermistor input (***C.TYP*** 1, 3, 5, and 9) and the sensor reading is outside the range of –40 to 245 F (–40 to 118 C) then the alarm will occur. The cause of the alarm is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection. If the supply temperature is being written to by CCN or a third party control, the supply-air temperature must be updated every 3 minutes. If it is not updated, then the alarm will be generated. Failure of this thermistor will shut down the entire unit.

A061 (Return Air Thermistor Failure) — If the unit is required to use the return air thermistor input (***C.TYP*** 1, 3, 5, and 9) and the sensor reading is outside the range of –40 to 245 F (–40 to118 C) then the alarm will occur. The cause of the alarm is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection. If the return temperature is being written to by CCN or a third party control, the return-air temperature must be updated every 3 minutes. If it is not updated, then the alarm will be generated. Failure of this thermistor will shut down the entire unit.

T068, T69 (Circuit A,B Compressor Return Gas Temperature Thermistor Failure) — This alert occurs when the compressor return gas temperature sensor is outside the range of –40 to 245 F (–40 to 118 C). Failure of this thermistor will disable any elements of the control which requires its use.

T073 (Outside Air Temperature Thermistor Failure) — This alert occurs when the outside air temperature sensor is outside the range of –40 to 245 F (–40 to 118 C). Failure of this thermistor will disable any elements of the control which requires its use.

T074 (Space Temperature Thermistor Failure) — This alert occurs when the space temperature sensor is outside the range of –40 to 245 F (–40 to 118 C). Failure of this thermistor will disable any elements of the control which requires its use. If the unit is configured for SPT 2 stage or SPT multi-stage operation and the sensor fails, no cooling mode may be chosen. The cause of the alert is usually a faulty thermistor in the T55, T56, or T58 device, a shorted or open thermistor caused by a wiring error, or a loose connection.

T090 (Circuit A Discharge Pressure Transducer Failure)

T091 (Circuit B Discharge Pressure Transducer Failure) — Alert codes 090 and 091 are for circuits A and B respectively. These alerts occur when the pressure is outside the range of 0.0 to 667.0 psig. A circuit cannot run when this alert is active. Use the scrolling marquee to reset the alert. The cause of the alert is usually a faulty transducer, faulty 5-v power supply, or a loose connection.

T092 (Circuit A Suction Pressure Transducer Failure)

T093 (Circuit B Suction Pressure Transducer Failure) — Alert codes 092 and 093 are for circuits A and B respectively. These alerts occur when the pressure is outside the range of 0.0 to 420.0 psig. A circuit cannot run when this alert is active. Use the scrolling marquee to reset the alert. The cause of the alert is usually a faulty transducer, faulty 5-v power supply, or a loose connection.

T094 (Discharge Gas Thermistor Failure) — This alert occurs for units which have the digital compressor installed on circuit A. If discharge gas temperature is open or shorted, the circuit will be shutoff. The alert will reset itself when discharge temperature is less than 250 F (121.1 C). The cause of the alert is usually low refrigerant charge or a faulty thermistor.

T110 (Circuit A Loss of Charge)

T111 (Circuit B Loss of Charge) — Alert codes 110 and 111 are for circuits A and B respectively. These alerts occur when the compressor is OFF and the suction pressure is less than 26 psig.

T112 (Circuit A High Saturated Suction Temperature)

T113 (Circuit B High Saturated Suction Temperature) — Alert codes 112 and 113 occur when compressors in a circuit have been running for at least 5 minutes and the circuit saturated suction temperature is greater than 70 F (21.1 C). The high saturated suction alert is generated and the circuit is shut down.

T114 (Circuit A Low Superheat)
T115 (Circuit B Low Superheat) — Alert codes 114 and 115 occur when the superheat of a circuit is less than 5 F (2.8 C) for 5 continuous minutes. The low superheat alert is generated and the circuit is shut down.

T118 (High Discharge Gas Temperature Alert)

A118 (High Discharge Gas Temperature Alarm) — This alert or alarm occurs for units which have the digital compressor installed on circuit A. If discharge gas temperature is greater than 268 F (131.1 C), the circuit will be shut off. The alert will reset itself when discharge temperature is less than 250 F (121.1 C). If this alert occurs 3 times within a day, the A118 alarm will be generated and the alarm must be reset manually. The cause of the alert is usually low refrigerant charge or a faulty thermistor.

P120 (Circuit A Low Saturated Suction Temperature — Compressor Shutdown)

T120 (Circuit A Low Saturated Suction Temperature Alert)

A120 (Circuit A Low Saturated Suction Temperature Alarm)

P121 (Circuit B Low Saturated Suction Temperature — Compressor B2 Shutdown)

T121 (Circuit B Low Saturated Suction Temperature Alert)

A121 (Circuit B Low Saturated Suction Temperature Alarm) — This alert or alarm is used to keep the evaporator from freezing and the saturated suction temperature above the low limit for the compressors.

When ***SSTA*** or ***SSTB*** is less than 20 F (–6.7 C) for 4 minutes, less than 10 F (–12.2 C) for 2 minutes, less than 0° F (–17.8 C) for 1 minute, or less than –20 F (–28.9 C) for 20 seconds continuously, one compressor of the affected circuit will be shut down with a local alert (P120, P121) and a 10-minute time guard will be added to the compressor. If saturated suction temperature continues to be less than 20 F (–6.7 C) for 4 minutes, less than 10 F (–12.2 C) for 2 minutes, less than 0° F (–17.8 C) for 1 minute, or less than –20 F (–28.9 C) for 20 seconds continuously, then another compressor will be shut down until the last compressor on the circuit is shut down at which time an alert or alarm will be issued (T120, T121, A120, A121).

This failure follows a 3 strike methodology whereby the first two times a circuit goes down entirely, an alert will be generated (T120, T121) which keeps the circuit off for 15 minutes before allowing the circuit to try again. The third time this happens, an alarm (A120, A121) will be generated which will necessitate a manual reset to get the circuit back running.

To recover from these alerts, a 10-minute hold off timer must elapse and the saturated suction temperature must rise above 29.32 F (–1.5 C). If recovery occurs, staging will be allowed on the circuit again. Therefore, it is possible that multiple P120 or P121 alerts may be stored in the alarm.

If there are 1 or 2 strikes on the circuit and the circuit recovers for a period of time, it is possible to clear out the strikes thereby resetting the strike counter automatically. The control must have saturated suction temperature greater than or equal to 34 F (1.1 C) for 60 minutes in order to reset the strike counters.

T122 (Circuit A High Pressure Trip)

T123 (Circuit B High Pressure Trip) — Alert codes 122 and 123 are for circuits A and B respectively.

T126 (Circuit A High Head Pressure)

T127 (Circuit B High Head Pressure) — Alert codes 126 and 127 are for circuits A and B respectively. These alerts occur when the appropriate saturated condensing temperature is greater than 150 F (65.6 C). Prior to the alert, the control will shut down one compressor on a circuit if that circuit's saturated condensing temperature is greater than 145 F (62.8 C). If SCT continues to rise to greater than 150 F (65.6 C), the alert will occur and the circuit's remaining compressor will shut down. The cause of the alarm is usually an overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high-pressure switch.

A140 (Reverse Rotation Detected) — A test is made once, on power up, for suction pressure change on the first activated circuit. The unit control determines failure as follows:

1. The suction pressure of both circuits is sampled 5 seconds before the compressor is brought on, right when the compressor is brought on and 5 seconds afterwards.
2. The rate of suction pressure change from 5 seconds before the compressor is brought on to when the compressor is brought on is calculated.
3. The rate of suction pressure change from when the compressor is brought on to 5 seconds afterwards is calculated.
4. With the above information, the test for reverse rotation is made. If the suction pressure change 5 seconds after compression is greater than the suction pressure change 5 seconds before compression – 1.25, then there is a reverse rotation error.

This alarm will disable mechanical cooling and will require manual reset. This alarm may be disabled once the reverse rotation check has been verified by setting ***REV.R*** = Yes.

A150 (Unit is in Emergency Stop) — If the CCN emergency stop command is received, the alarm is generated and the unit will be immediately stopped.

If the CCN point name "EMSTOP" in the system table is set to emergency stop, the unit will shut down immediately and broadcast an alarm back to the CCN, indicating that the unit is down. This alarm will clear when the variable is set back to "enable."

A151 (Illegal Configuration) — An A151 alarm indicates an invalid configuration has been entered. The following are illegal configurations.

- Invalid unit size has been entered.
- Dual thermostat configured for single-circuit unit.
- Dual thermostat and switch demand limit configure
- AUX board incorrect revision.
- Unit configuration set to invalid type.

A152 (Unit Down Due to Failure) — Both circuits are off due to alerts and/or alarms. Reset is automatic when all alarms are cleared. This alarm indicates the unit is at 0% capacity.

T153 (Real Time Clock Hardware Failure) — A problem has been detected with MBB real time clock hardware. Try resetting the power and check the indicator lights. If the alarm continues, the board should be replaced.

A154 (Serial EEPROM Hardware Failure) — A problem has been detected with the EEPROM on the MBB. Try resetting the power and check the indicator lights. If the alarm continues, the board should be replaced.

T155 (Serial EEPROM Storage Failure Error) — A problem has been detected with the EEPROM storage on the MBB. Try resetting the power and check the indicator lights. If the alert continues, the board should be replaced.

A156 (Critical Serial EEPROM Storage Failure Error) — A problem has been detected with the EEPROM storage on the MBB. Try resetting the power and check the indicator lights. If the alarm continues, the board should be replaced.

A157 (A/D Hardware Failure) — A problem has been detected with A/D conversion on the boards. Try resetting the power and check the indicator lights. If the alarm continues, the board should be replaced.

A170 (Loss of Communication with the Compressor Expansion Module) — This alarm indicates that there are communications problems with the compressor expansion, which is required for unit sizes 070 to 100. The alarm will automatically reset.

A173 (Energy Management Module Communication Failure) — This alarm indicates that there are communications problems with the energy management. All functions performed by the EMM will stop, which can include demand limit, reset and capacity input. The alarm will automatically reset.

T174 (4 to 20 mA Cooling Set point Input Failure) — This alert indicates a problem has been detected with cooling set point 4 to 20 mA input. The input value is either less than 2 mA or greater than 22 mA.

T176 (4 to 20 mA Reset Input Failure) — This alert indicates a problem has been detected with reset 4 to 20 mA input. The input value is either less than 2 mA or greater than 22 mA. The reset function will be disabled when this occurs.

T177 (4 to 20 mA Demand Limit Input Failure) — This alert indicates a problem has been detected with demand limit 4 to 20 mA input. The input value is either less than 2 mA or greater than 22 mA. The reset function will be disabled when this occurs.

A200 (Fan Status Switch 1 Failure)
T201 (Fan Status Switch 1 Failure)
T202 (Fan Status Switch 2 Failure) — This alarm or alert indicates the fan status input 1 or 2 is open when the unit is ON. The unit will be in an alert condition until the fan status switch is closed. The alarm or alert is an automatic reset when the fan status switch closes. The A200 alarm is for single circuit units.

T303 (Condenser Coil Maintenance Due) — Coil Service Countdown (C.L.DN) expired. Complete condenser coil cleaning and enter 'YES' for Coil Maintenance Done (***C.L.MN***) item.

T500, T501, T502 (Current Sensor Board Failure — A xx Circuit A)

T503, T504, T505 (Current Sensor Board Failure — B xx Circuit B) — Alert codes 500, 501, 502, 503, 504, and 505 are for compressors A1, A2, A3, B1, B2, and B3 respectively. These alerts occur when the output of the current sensor (CS) is a constant high value. These alerts reset automatically. If the problem cannot be resolved, the CS board must be replaced.

Table 26 — Alarm and Alert Codes

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD
T048	Alert	Circuit A Compressor Availability Alert	Two compressors on circuit failed	Circuit shut down	Manual
T049	Alert	Circuit B Compressor Availability Alert	Two compressors on circuit failed	Circuit shut down	Manual
T051, T052, T053	Alert	Circuit A Compressor A1,A2,A3 Failure	Respective current sensor board (CSB) feedback signal does not match relay state	Respective compressor shut down in Circuit A.	Manual
T055, T056, T057	Alert	Circuit B Compressor B1,B2,B3 Failure	Respective current sensor board (CSB) feedback signal does not match relay state	Respective compressor shut down in Circuit B.	Manual
A051, A052, A053	Alarm	Circuit A Compressor A1,A2,A3 Failure	Respective current sensor board (CSB) feedback signal is ON when the compressor should be off	Unit shut down	Manual
A055, A056, A057	Alarm	Circuit B Compressor B1,B2,B3 Failure	Respective current sensor board (CSB) feedback signal is ON when the compressor should be off	Unit shut down	Manual
A060	Alarm	Supply Air Thermistor Failure	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Unit shut down	Automatic
A060	Alarm	Supply Air Temperature Update not received	Temperature not updated during 3 minutes	Unit shut down	Automatic
A061	Alarm	Return Air Thermistor Failure	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Unit shut down	Automatic
A061	Alarm	Return Air Temperature Update not received	Temperature not updated during 3 minutes	Unit shut down	Automatic
T068	Alert	Circuit A Return Gas Thermistor Failure	Thermistor is outside range of –40 to 245 F (–40 to 118 C)	Circuit shut down	Automatic
T069	Alert	Circuit B Return Gas Thermistor Failure	Thermistor is outside range of –40 to 245 F (–40 to 118 C)	Circuit shut down	Automatic
T073	Alert	Outside Air Thermistor Failure	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Temperature reset disabled. Unit runs under normal control/set points.	Automatic
T074	Alert	Space Temperature Thermistor Failure	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Temperature reset disabled. Unit runs under normal control/set points.	Automatic
T090	Alert	Circuit A Discharge Pressure Transducer Failure	The pressure is outside the range of 0.0 to 667.0 psig	Circuit A shut down	Automatic
T091	Alert	Circuit B Discharge Pressure Transducer Failure	The pressure is outside the range of 0.0 to 667.0 psig	Circuit B shut down	Automatic
T092	Alert	Circuit A Suction Pressure Transducer Failure	The pressure is outside the range of 0.0 to 420.0 psig	Circuit A shut down	Automatic
T093	Alert	Circuit B Suction Pressure Transducer Failure	The pressure is outside the range of 0.0 to 420.0 psig	Circuit B shut down	Automatic
T094	Alert	Discharge Gas Thermistor Failure	Discharge thermistor (DTT) is either open or shorted	Digital compressor shut down.	Automatic

LEGEND

CCN — Carrier Comfort Network®
CSB — Current Sensor Board
CXB — Compressor Expansion Module
DTT — Discharge Temperature Thermistor
EEPROM — Electrically Erasable Programmable Read-Only Memory
EMM — Energy Management Module
LWT — Leaving Fluid Temperature
MBB — Main Base Board
SCT — Saturated Condensing Temperature
SST — Saturated Suction Temperature
TSTAT — Thermostat

Table 26 — Alarm and Alert Codes (cont)

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD
T110	Alert	Circuit A Loss of Charge	If the compressors are off and discharge pressure reading is less than 26 psig for 30 sec.	Circuit not allowed to start.	Manual
T111	Alert	Circuit B Loss of Charge	If the compressors are off and discharge pressure reading is less than 26 psig for 30 sec.	Circuit not allowed to start.	Manual
T112	Alert	Circuit A High Saturated Suction Temperature	Circuit is on and saturated suction temperature is greater than 70 F (15.6 C) for 5 minutes	Circuit shut down	Manual
T113	Alert	Circuit B High Saturated Suction Temperature	Circuit is on and saturated suction temperature is greater than 70 F (15.6 C) for 5 minutes	Circuit shut down	Manual
T114	Alert	Circuit A Low Suction Superheat	Suction superheat is less than 5 F (2.8 C) for 5 minutes.	Circuit A is shut down after pumpdown complete.	Automatic after first daily occurance, manual thereafter
T115	Alert	Circuit B Low Suction Superheat	Suction superheat is less than 5 F (2.8 C) for 5 minutes.	Circuit B is shut down after pumpdown complete.	Automatic after first daily occurance, manual thereafter
T118	Alert	High Discharge Gas Temperature	Discharge Thermistor (DTT) reading is greater than 250 F	Compressor A1 shut down	Automatic
A118	Alarm	High Discharge Gas Temperature	3 Discharge Gas Temperature alarms occur within a day	Compressor A1 shut down	Manual
P120	Alert	Circuit A Low Saturated Suction	SSTA is less than 20 F for 4 minutes, less than 10 F for 2 minutes, less than 0° F for 1 minute or less than –20 F for 20 seconds continuously	Circuit A will remove one compressor stage.	Automatic
T120	Alert	Circuit A Low Saturated Suction	SSTA is less than 20 F for 4 minutes, less than 10 F for 2 minutes, less than 0° F for 1 minute or less than –20 F for 20 seconds continuously	Circuit A shut down	Automatic unless 3rd strike.
A120	Alarm	Circuit A Low Saturated Suction	SSTA is less than 20 F for 4 minutes, less than 10 F for 2 minutes, less than 0° F for 1 minute or less than –20 F for 20 seconds continuously and only one compressor running	Circuit A shut down	Manual
P121	Alert	Circuit A Low Saturated Suction	SSTB is less than 20 F for 4 minutes, less than 10 F for 2 minutes, less than 0° F for 1 minute or less than –20 F for 20 seconds continuously	Circuit B will remove one compressor stage.	Automatic
T121	Alert	Circuit B Low Saturated Suction	SSTB is less than 20 F for 4 minutes, less than 10 F for 2 minutes, less than 0° F for 1 minute or less than –20 F for 20 seconds continuously and only one compressor running	Circuit B shut down	Automatic unless 3rd strike.
A121	Alarm	Circuit B Low Saturated Suction	SSTB is less than 20 F for 4 minutes, less than 10 F for 2 minutes, less than 0° F for 1 minute or less than –20 F for 20 seconds continuously and only one compressor running	Circuit B shut down	Manual
T122	Alert	High Pressure Switch Trip Circuit A	High Pressure A Switch Input opento MBB	Circuit shut down	Manual
T123	Alert	High Pressure Switch Trip Circuit B	High Pressure B Switch Input open to MBB	Circuit shut down	Manual
T126	Alert	Circuit A High Discharge Pressure	SCTA >150 F	Circuit shut down	Automatic, only after first 3 daily occurrences.
A126	Alarm	Circuit A High Discharge Pressure	SCTA >150 F	Circuit shut down	Manual
T127	Alert	Circuit B High Discharge Pressure	SCTB >150 F	Circuit shut down	Automatic, only after first 3 daily occurrences
A127	Alarm	Circuit B High Discharge Pressure	SCTB >150 F	Circuit shut down	Manual
A140	Alarm	Reverse Rotation Detected	Incoming unit power leads not phased correctly	Unit shut down.	Manual
A150	Alarm	Emergency Stop	CCN emergency stop command received	Unit shutdown without going through pumpdown.	Automatic once CCN command for EMSTOP returns to normal
A151	Alarm	Illegal Configuration	One or more illegal configurations exists.	Unit is not allowed to start.	Manual once configuration errors are corrected
A152	Alarm	Unit Down Due to Failure	Both circuits are down due to alarms/alerts.	Unit is unable to run.	Automatic once alarms/alerts are cleared that prevent the chiller from starting.

LEGEND

CCN — Carrier Comfort Network®
CSB — Current Sensor Board
CXB — Compressor Expansion Module
DTT — Discharge Temperature Thermistor
EEPROM — Electrically Erasable Programmable Read-Only Memory
EMM — Energy Management Module
LWT — Leaving Fluid Temperature
MBB — Main Base Board
SCT — Saturated Condensing Temperature
SST — Saturated Suction Temperature
TSTAT — Thermostat

Table 26 — Alarm and Alert Codes (cont)

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD
T153	Alert	Real Time Clock Hardware Failure	Internal clock on MBB fails	Occupancy schedule will not be used. Unit defaults to Local On mode.	Automatic when correct clock control restarts.
A154	Alarm	Serial EEPROM Hardware Failure	Hardware failure with MBB	Unit is unable to run.	Manual
T155	Alert	Serial EEPROM Storage Failure	Configuration/storage failure with MBB	No action	Manual
A156	Alarm	Critical Serial EEPROM Storage Failure	Configuration/storage failure with MBB	Unit is not allowed to run.	Manual
A157	Alarm	A/D Hardware Failure	Hardware failure with peripheral device	Unit is not allowed to run.	Manual
A170	Alarm	Loss of Communication with CXB	MBB loses communication with CXB	CXB functions disabled	Automatic
A173	Alarm	Loss of Communication with EMM	MBB loses communication with EMM	4 to 20 mA temperature reset disabled. Demand Limit set to 100%. 4 to 20 mA set point disabled.	Automatic
T174	Alert	4 to 20 mA Cooling Set Point/Desired % Capacity Input Failure	If configured with EMM and input less than 2 mA or greater than 22 mA	Set point function/% capacity function disabled.	Automatic
T176	Alert	4 to 20 mA Temperature Reset Input Failure	If configured with EMM and input less than 2 mA or greater than 22 mA	Reset function disabled. Unit returns to normal set point control.	Automatic
T177	Alert	4 to 20 mA Demand Limit Input Failure	If configured with EMM and input less than 2 mA or greater than 22 mA	Demand limit function disabled. Unit returns to 100% demand limit control.	Automatic
A200	Alarm	Fan Status Switch 1 Open	Alarm is generated when fan status switch 1 is open when the unit is in an ON state	Unit not allowed to start	Automatic
T201	Alert	Fan Status Switch 1 is open with Dual TSTAT configuration	Alert is generated when fan status switch 1 is open when Y1 or Y2 are closed	Circuit A is not allowed to run	Automatic
T202	Alert	Fan Status Switch 2 is open with Dual TSTAT configuration	Alert is generated when fan status switch 1 is open when Y3 or Y4 are closed	Circuit B is not allowed to run	Automatic
T303	Alert	Condenser Coil Maintenance Due	Coil Service Countdown (C.L.DN) expired. Complete condenser coil cleaning and enter 'YES' for Coil Maintenance Done (C.L.MN) item.	None	Automatic
T500	Alert	Current Sensor Board A1 Failure	Alert occurs when CSB output is a constant high value	Compressor A1 shut down	Automatic
T501	Alert	Current Sensor Board A2 Failure	Alert occurs when CSB output is a constant high value	Compressor A2 shut down	Automatic
T502	Alert	Current Sensor Board A3 Failure	Alert occurs when CSB output is a constant high value	Compressor A3 shut down	Automatic
T503	Alert	Current Sensor Board B1 Failure	Alert occurs when CSB output is a constant high value	Compressor B1 shut down	Automatic
T504	Alert	Current Sensor Board B2 Failure	Alert occurs when CSB output is a constant high value	Compressor B2 shut down	Automatic
T505	Alert	Current Sensor Board B3 Failure	Alert occurs when CSB output is a constant high value	Compressor B3 shut down	Automatic

LEGEND

CCN — Carrier Comfort Network®
CSB — Current Sensor Board
CXB — Compressor Expansion Module
DTT — Discharge Temperature Thermistor
EEPROM — Electrically Erasable Programmable Read-Only Memory
EMM — Energy Management Module
LWT — Leaving Fluid Temperature
MBB — Main Base Board
SCT — Saturated Condensing Temperature
SST — Saturated Suction Temperature
TSTAT — Thermostat

Table 27 — Example of Reading and Clearing Alarms

SUB-MODE	KEYPAD ENTRY	ITEM	ITEM EXPANSION	COMMENT
CRNT	ENTER	AXXX or TXXX	CURRENTLY ACTIVE ALARMS	ACTIVE ALARMS (AXXX) OR ALERTS (TXXX) DISPLAYED.
CRNT	ESCAPE			
RCRN	▼	NO		Use to clear active alarms/alerts
	ENTER	NO		NO Flashes
	▲	YES		Select YES
	ENTER	NO		Alarms/alerts clear, YES changes to NO

APPENDIX A — DISPLAY TABLES

Run Status Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
VIEW	RAT	xxx.x ºF	Return Air Temperature	
	SAT	xxx.x ºF	Supply Air Temperature	
	SETP	xxx.x ºF	Active Set Point	
	CTPT	xxx.x ºF	Control Point	
	LOD.F	xxx	Load/Unload Factor	
	STAT		Control Mode	0=Service Test 1=Off Local 2=Off CCN 3=Off Time 4=Off Emrgcy 5=On Local 6=On CCN 7=On Time
	SPT.M		Space Temp Control Mode	0=COOL OFF 1=LO COOL 2=HI COOL 3=COOL ON
	OCC	YES/NO	Occupied	
	MODE	YES/NO	Override Modes in Effect	
	CAP	xxx	Percent Total Capacity	
	STGE	x	Requested Stage	
	ALRM	xxx	Current Alarms & Alerts	
	TIME	xx.xx	Time of Day	00:00-23:59
	MNTH	xx	Month of Year	1 - 12 (1 = January, 2 = February, etc.)
	DATE	xx	Day of Month	01-31
	YEAR	xx	Year of Century	
RUN	UNIT RUN HOUR AND START			
	HRS.U	xxxx HRS	Machine Operating Hours	
	STR.U	XXXX	Machine Starts	
HOUR	CIRC AND COMP RUN HOURS			
	HRS.A	xxxx HRS	Circuit A Run Hours	
	HRS.B	xxxx HRS	Circuit B Run Hours	
	HR.A1	xxxx HRS	Compressor A1 Run Hours	
	HR.A2	xxxx HRS	Compressor A2 Run Hours	
	HR.A3	xxxx HRS	Compressor A3 Run Hours	
	HR.B1	xxxx HRS	Compressor B1 Run Hours	
	HR.B2	xxxx HRS	Compressor B2 Run Hours	
	HR.B3	xxxx HRS	Compressor B3 Run Hours	

APPENDIX A — DISPLAY TABLES (cont)

Run Status Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
STRT	COMPRESSOR STARTS			
	ST.A1	XXXX	Compressor A1 Starts	
	ST.A2	XXXX	Compressor A2 Starts	
	ST.A3	XXXX	Compressor A3 Starts	
	ST.B1	XXXX	Compressor B1 Starts	
	ST.B2	XXXX	Compressor B2 Starts	
	ST.B3	XXXX	Compressor B3 Starts	
PM	PREVENTIVE MAINTENANCE			
	COIL	COIL MAINTENANCE		
	SI.CL	xxxx HRS	Coil Cleaning Srvc Int	
	C.L.DN	xxxx HRS	Coil Service Countdown	
	C.L.MN	YES/NO	Coil Cleaning Maint.Done	User Entry
	CL.DT	COIL MAINTENANCE DATES		
	C.L.M0		MM/DD/YY HH:MM	
	C.L.M1		MM/DD/YY HH:MM	
	C.L.M2		MM/DD/YY HH:MM	
	C.L.M3		MM/DD/YY HH:MM	
	C.L.M4		MM/DD/YY HH:MM	
VERS	SOFTWARE VERSION NUMBERS			
	MBB		CESR131279-XXXXX	
	AUX		CESR131333-XXXXX	
	CXB		CESR131173-XXXXX	
	EMM		CESR131174-XXXXX	
	MARQ		CESR131171-XXXXX	
	NAVI		CESR130227-XXXXX	

Service Test Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
TEST			Service Test Mode	To enable Service Test mode, move Enable/Off/Remote contact switch to OFF. Change TEST to ON. Move switch to ENABLE
OUTS	OUTPUTS			
	FAN1	ON/OFF	Fan 1 Relay	
	FAN2	ON/OFF	Fan 2 Relay	
	FAN3	ON/OFF	Fan 3 Relay	
	FAN4	ON/OFF	Fan 4 Relay	
	FAN5	ON/OFF	Fan 5 Relay	
	V.HPA	xx	Var Head Press % Cir A	
	V.HPB	xx	Var Head Press % Cir B	
	DIG.P	xx	Comp A1 Load Percent	
	LSV.A	ON/OFF	Liquid Line Solenoid A	
	LSV.B	ON/OFF	Liquid Line Solenoid B	
	RMT.A	ON/OFF	Remote Alarm Relay	
CMPA	CIRCUIT A COMPRESSOR TEST			
	CC.A1	ON/OFF	Compressor A1 Relay	
	UL.TM	xx	Comp A1 Unload Time	
	CC.A2	ON/OFF	Compressor A2 Relay	
	CC.A3	ON/OFF	Compressor A3 Relay	
	MLV	ON/OFF	Minimum Load Valve Relay	
CMPB	CIRCUIT B COMPRESSOR TEST			
	CC.B1	ON/OFF	Compressor B1 Relay	
	CC.B2	ON/OFF	Compressor B2 Relay	
	CC.B3	ON/OFF	Compressor B3 Relay	

APPENDIX A — DISPLAY TABLES (cont)

Temperature Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
UNIT	ENTERING AND LEAVING UNIT TEMPERATURES			
	RAT	xxx.x °F	Return Air Temperature	
	SAT	xxx.x °F	Supply Air Temperature	
	OAT	xxx.x °F	Outside Air Temperature	
	SPT	xxx.x °F	Space Temperature	
	SCT.D	xxx.x ΔF	Circuit SCT Difference	
CIR.A	TEMPERATURES CIRCUIT A			
	SCT.A	xxx.x °F	Saturated Condensing Tmp	
	SST.A	xxx.x °F	Saturated Suction Temp	
	RGT.A	xxx.x °F	Compr Return Gas Temp	
	D.GAS	xxx.x °F	Discharge Gas Temp	
	SH.A	xxx.x ΔF	Suction Superheat Temp	
CIR.B	TEMPERATURES CIRCUIT B			
	SCT.B	xxx.x °F	Saturated Condensing Tmp	
	SST.B	xxx.x °F	Saturated Suction Temp	
	RGT.B	xxx.x °F	Compr Return Gas Temp	
	SH.B	xxx.x ΔF	Suction Superheat Temp	

Pressures Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
PRC.A	PRESSURES CIRCUIT A			
	DP.A	XXX.XPSIG	Discharge Pressure	
	SP.A	XXX.XPSIG	Suction Pressure	
PRC.B	PRESSURES CIRCUIT B			
	DP.B	XXX.XPSIG	Discharge Pressure	
	SP.B	XXX.XPSIG	Suction Pressure	

Set Points Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	RANGE	COMMENT
COOL	COOLING SET POINTS				
	CSP.1	xxx.x °F	Cooling Set Point 1	40 to 80	Default: 55 F
	CSP.2	xxx.x °F	Cooling Set Point 2	40 to 80	Default: 50 F
	SPS.P	xxx.x °F	Space T Cool Set Point	65 to 80	Default: 78 F
	SPT.O	xx.x ΔF	Space Temperature Offset		
	STP.O	xxx.x °F	Space T SP Plus Offset		
	P.CAP	XXX	Percent CAP Requested		
	LCON	xx.x ΔF	Lo Cool On Set Point	–1 to 2	Default: 1
	HCON	xx.x ΔF	HI Cool On Set Point	0.5 to 20	Default: 3
	LCOF	xx.x ΔF	Lo Cool Off Set Point	0.5 to 2	Default: 0.5
HEAD	HEAD PRESSURE SET POINTS				
	H.SP	xxx.x °F	Head Set Point ON	85 to 120	Default: 110 F
	HSPF	xxx.x °F	Head Set Point OFF	45 to 90	Default: 72 F
	F.ON	xxx.x °F	Fan On Set Point		
	F.OFF	xxx.x °F	Fan Off Set Point		
	F.DLT	XX.X	Fan Stage Delta	0 to 50	
	F.TME	XXX	Fan Delta Active Time	0 to 300	

APPENDIX A — DISPLAY TABLES (cont)

Inputs Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
GEN.I	GENERAL INPUTS			
	STST	ON/OFF	Start/Stop Switch	
	IDFA	ON/OFF	Indoor Fan Status-CIRA	
	Y.1	ON/OFF	Y1 Thermostat Input	
	Y.2	ON/OFF	Y2 Thermostat Input	
	IDFB	ON/OFF	Indoor Fan Status-CIRB	
	Y.3	ON/OFF	Y3 Thermostat Input	
	Y.4	ON/OFF	Y4 Thermostat Input	
	DLS1	ON/OFF	Demand Limit Switch 1	
	DLS2	ON/OFF	Demand Limit Switch 2	
CRCT	CIRCUIT INPUTS			
	FKA1	ON/OFF	Compressor A1 Feedback	
	FKA2	ON/OFF	Compressor A2 Feedback	
	FKA3	ON/OFF	Compressor A3 Feedback	
	HPSA	ON/OFF	High Pressure Switch A	
	FKB1	ON/OFF	Compressor B1 Feedback	
	FKB2	ON/OFF	Compressor B2 Feedback	
	FKB3	ON/OFF	Compressor B3 Feedback	
	HPSB	ON/OFF	High Pressure Switch B	
4-20	4-20 MA INPUTS			
	DMND	XX.X	4-20 ma Demand Signal	
	RSET	XX.X	4-20 ma Reset Signal	
	CL.MA	XX.X	4-20 Cooling Demand	

Outputs Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
GEN.O	GENERAL OUTPUTS			
	FAN1	ON/OFF	Fan 1 Relay	
	FAN2	ON/OFF	Fan 2 Relay	
	FAN3	ON/OFF	Fan 3 Relay	
	FAN4	ON/OFF	Fan 4 Relay	
	FAN5	ON/OFF	Fan 5 Relay	
	MLV.R	ON/OFF	Minimum Load Valve Relay	
	V.HPA	XXX	Var Head Press Out Cir A	
	V.HPB	XXX	Var Head Press Out Cir B	
CIR.A	OUTPUTS CIRCUIT A			
	CC.A1	ON/OFF	Compressor A1 Relay	
	DPE.R	XXX	Comp A1 Load Percent	
	D.SOL	ON/OFF	Digital Scroll Solenoid	
	CC.A2	ON/OFF	Compressor A2 Relay	
	CC.A3	ON/OFF	Compressor A3 Relay	
	LSV.A	ON/OFF	Liquid Line Solenoid A	
CIR.B	OUTPUTS CIRCUIT B			
	CC.B1	ON/OFF	Compressor B1 Relay	
	CC.B2	ON/OFF	Compressor B2 Relay	
	CC.B3	ON/OFF	Compressor B3 Relay	
	LSV.B	ON/OFF	Liquid Line Solenoid B	

APPENDIX A — DISPLAY TABLES (cont)

Configuration Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
DISP	DISPLAY CONFIGURATION			
	TEST	ON/OFF	Test Display LEDs	
	METR	ON/OFF	Metric Display	Off = English On = Metric
	LANG	X	Language Selection	Default: 0 0 = English 1 = Espanol 2 = Francais 3 = Portuguese
	PAS.E	ENBL/DSBL	Password Enable	
	PASS	XXXX	Service Password	
UNIT	UNIT CONFIGURATION			
	SIZE		Unit Size	
	NCKT	X	Number of Refrigerant Circuits	
	SZ.A1	XX	Compressor A1 Size	
	SZ.A2	XX	Compressor A2 Size	
	SZ.A3	XX	Compressor A3 Size	
	SZ.B1	XX	Compressor B1 Size	
	SZ.B2	XX	Compressor B2 Size	
	SZ.B3	XX	Compressor B3 Size	
	FAN.S	XX	Fan Sequence Number	
	A1.TY	YES/NO	Compressor A1 Digital	
	MAX.T	XX	Maximum A1 Unload Time	
CCN	CCN NETWORK CONFIGS			
	CCNA	XXX	CCN Address	Default: 1 Range: 0 to 239
	CCNB	XXX	CCN Bus Number	Default: 1 Range: 0 to 239
	BAUD	X	CCN Baud Rate	Default: 3 1 = 2400 2 = 4800 3 = 9600 4 =19,200 5 =38,400
OPT1	UNIT OPTIONS 1 HARDWARE			
	MLV.S	YES/NO	Minimum Load Valve Select	
	CSB.E	ENBL/DSBL	CSB Boards Enable	
	SPT.S	ENBL/DSBL	Space Temp Sensor	
	SPOS	ENBL/DSBL	Space Temp Offset Enable	
	SPOR	XX	Space Temp Offset Range 1 to 10	
	RAT.T	X	RAT Thermistor Type	Default: 0 0 = 5 KΩ 1 = 10 KΩ 2 = None
	SAT.T	X	SAT Thermistor Type	Default: 0 0 = 5 KΩ 1 = 10 KΩ 2 = None
	EMM	YES/NO	EMM Module installed	
OPT2	UNIT OPTIONS 2 CONTROLS			
	C.TYP	X	Machine Control Type	Default: 4 1 = VAV 2 = Invalid 3 = TSTAT MULTI 4 = TSTAT 2 STG 5 = SPT MULTI 6 = Invalid 7 = PCT CAP 8 = DUAL TSTAT 9 = VAV SETPOINT
	CTRL	X	Control Method	Default: 0 0 = Enable/Off/Remote Switch 1 = Occupancy 2 = CCN Control
	LOAD	X	Loading Sequence Select	Default: 1 1 = Equal 2 = Staged
	LLCS	X	Lead/Lag Circuit Select	Default: 1 1 = Automatic 2 = Circuit A Leads 3 = Circuit B Leads
	DELY	XX	Minutes Off Time	Default: 0 Range: 0 to 15 Minutes

APPENDIX A — DISPLAY TABLES (cont)

Configuration Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
M.MST	MOTORMASTER			
	MMR.S	YES/NO	Motormaster Select	
	P.GAN	XX	Head Pressure P Gain	Default: 1 Range: 1 to 4
	I.GAN	XX.X	Head Pressure I Gain	Default: 0.1 Range: -20 to 20
	D.GAN	XX.X	Head Pressure D Gain	Default: 0.0 Range: -20 to 20
	MIN.S	XX	Minimum Fan Speed	
RSET	RESET COOL TEMP			
	CRST	X	Cooling Reset Type	Default: 0 0 = No Reset 1 = 4 to 20 mA Input 2 = Outdoor Air Temperature 3 = Return Temperature 4 = Space Temperature
	MA.DG	XX.XΔF	4-20 - Degrees Reset	Default: 0.0 ΔF Range: -30 to 30 ΔF
	RM.NO	XXX.X °F	Remote - No Reset Temp	Default: 125 F Range: 0º to125 F
	RM.F	XXX.X °F	Remote - Full Reset Temp	Default: 0 F Range: 0º to125 F
	RM.DG	XX.X °F	Remote - Degrees Reset	Default: 0.0 ΔF Range: -30 to 30 ΔF
	RT.NO	XXX.XΔF	Return - No Reset Temp	Default: 10.0 ΔF Range: 0º to125 F
	RT.F	XXX.XΔF	Return - Full Reset Temp	Default: 0 ΔF Range: 0º to125 F
	RT.DG	XX.X °F	Return - Degrees Reset	Default: 0.0 ΔF Range: -30 to 30 ΔF
	DMDC	X	Demand Limit Select	Default: 0 0 = None 1 = Switch 2 - 4 to 20 mA Input 3 = CCN Loadshed
	DM20	XXX%	Demand Limit at 20 mA	Default: 100% Range: 0 to 100%
	SHNM	XXX	Loadshed Group Number	Default: 0 Range: 0 to 99
	SHDL	XXX%	Loadshed Demand Delta	Default: 0% Range: 0 to 60%
	SHTM	XXX	Maximum Loadshed Time	Default: 60 minutes Range: 0 to 120 minutes
	DLS1	XXX%	Demand Limit Switch 1	Default: 80% Range: 0 to 100%
	DLS2	XXX%	Demand Limit Switch 2	Default: 50% Range: 0 to 100%
SLCT	SETPOINT AND RAMP LOAD			
	RL.S	ENBL/DSBL	Ramp Load Select	Default: Enable
	CRMP	ENBL/DSBL	Cooling Ramp Loading	Default: 1.0 Range: 0.3 to 2
	SCHD	XX	Schedule Number	Default: 1 Range: 1 to 99
	Z.GN	X.X	Deadband Multiplier	Default: 1 Range: 1 to 4
SERV	SERVICE CONFIGURATION			
	EN.A1	YES/NO	Enable Compressor A1	
	EN.A2	YES/NO	Enable Compressor A2	
	EN.A3	YES/NO	Enable Compressor A3	
	EN.B1	YES/NO	Enable Compressor B1	
	EN.B2	YES/NO	Enable Compressor B2	
	EN.B3	YES/NO	Enable Compressor B3	
	EN.FB	YES/NO	Enable Compressor FBack	
	REV.R	YES/NO	Reverse Rotation Enable	
BCST	BROADCAST CONFIGURATION			
	T.D.B	ON/OFF	CCN Time/Date Broadcast	
	OAT.B	ON/OFF	CCN OAT Broadcast	
	G.S.B	ON/OFF	Global Schedule Broadcst	
	BC.AK	ON/OFF	CCN Broadcast Ack'er	

APPENDIX A — DISPLAY TABLES (cont)

Time Clock Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
TIME	TIME OF DAY			
	HH.MM	XX.XX	Hour and Minute	Military (00:00 - 23:59)
DATE	MONTH, DATE, DAY, AND YEAR			
	MNTH	XX	Month of Year	1 - 12 (1 = January, 2 = February, etc.)
	DOM	XX	Day of Month	Range: 01 -31
	DAY	X	Day of Week	1 - 7 (1 = Sunday, 2 = Monday, etc.)
	YEAR	XXXX	Year of Century	
DST	DAYLIGHT SAVINGS TIME			
	STR.M	XX	Month	Default: 4 Range 1- 12
	STR.W	X	Week	Default: 1 Range 1- 5
	STR.D	X	Day	Default: 7 Range 1- 7
	MIN.A	XX	Minutes to Add	Default: 60 Range 0 - 99
	STP.M	XX	Month	Default: 10 Range 1- 12
	STP.W	XX	Week	Default: 5 Range 1- 5
	STP.D	XX	Day	Default: 7 Range 1- 7
	MIN.S	XX	Minutes to Subtract	Default: 60 Range 0 - 99
HOL.L	LOCAL HOLIDAY SCHEDULES			
HD.01	HOLIDAY SCHEDULE 01			
	MON	XX	Holiday Start Month	
	DAY	XX	Start Day	
	LEN	XX	Duration (days)	
HD.02	HOLIDAY SCHEDULE 02			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.03	HOLIDAY SCHEDULE 03			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.04	HOLIDAY SCHEDULE 04			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.05	HOLIDAY SCHEDULE 05			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.06	HOLIDAY SCHEDULE 06			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.07	HOLIDAY SCHEDULE 07			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.08	HOLIDAY SCHEDULE 08			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	

APPENDIX A — DISPLAY TABLES (cont)

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
HD.09	HOLIDAY SCHEDULE 09			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.10	HOLIDAY SCHEDULE 10			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.11	HOLIDAY SCHEDULE 11			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.12	HOLIDAY SCHEDULE 12			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.13	HOLIDAY SCHEDULE 13			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.14	HOLIDAY SCHEDULE 14			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.15	HOLIDAY SCHEDULE 15			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.16	HOLIDAY SCHEDULE 16			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.17	HOLIDAY SCHEDULE 17			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.18	HOLIDAY SCHEDULE 18			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.19	HOLIDAY SCHEDULE 19			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	

APPENDIX A — DISPLAY TABLES (cont)

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
HD.20	HOLIDAY SCHEDULE 20			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.21	HOLIDAY SCHEDULE 21			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.22	HOLIDAY SCHEDULE 22			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.23	HOLIDAY SCHEDULE 23			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.24	HOLIDAY SCHEDULE 24			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.25	HOLIDAY SCHEDULE 25			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.26	HOLIDAY SCHEDULE 26			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.27	HOLIDAY SCHEDULE 27			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.28	HOLIDAY SCHEDULE 28			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.29	HOLIDAY SCHEDULE 29			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	
HD.30	HOLIDAY SCHEDULE 30			
	MON	XX	Holiday Start Month	1 - 12 (1 = January, 2 = February, etc.)
	DAY	XX	Start Day	01-31
	LEN	XX	Duration (days)	

APPENDIX A — DISPLAY TABLES (cont)

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
SCH.N			Schedule Number 0	
SCH.L	LOCAL OCCUPANCY SCHEDULE			
	OCCUPANCY PERIOD 1			
	OCC.1	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.1	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.1	YES/NO	Monday In Period	
	TUE.1	YES/NO	Tuesday In Period	
PER.1	WED.1	YES/NO	Wednesday In Period	
	THU.1	YES/NO	Thursday In Period	
	FRI.1	YES/NO	Friday In Period	
	SAT.1	YES/NO	Saturday In Period	
	SUN.1	YES/NO	Sunday In Period	
	HOL.1	YES/NO	Holiday In Period	
	OCCUPANCY PERIOD 2			
	OCC.2	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.2	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.2	YES/NO	Monday In Period	
	TUE.2	YES/NO	Tuesday In Period	
PER.2	WED.2	YES/NO	Wednesday In Period	
	THU.2	YES/NO	Thursday In Period	
	FRI.2	YES/NO	Friday In Period	
	SAT.2	YES/NO	Saturday In Period	
	SUN.2	YES/NO	Sunday In Period	
	HOL.2	YES/NO	Holiday In Period	
	OCCUPANCY PERIOD 3			
	OCC.3	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.3	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.3	YES/NO	Monday In Period	
	TUE.3	YES/NO	Tuesday In Period	
PER.3	WED.3	YES/NO	Wednesday In Period	
	THU.3	YES/NO	Thursday In Period	
	FRI.3	YES/NO	Friday In Period	
	SAT.3	YES/NO	Saturday In Period	
	SUN.3	YES/NO	Sunday In Period	
	HOL.3	YES/NO	Holiday In Period	
	OCCUPANCY PERIOD 4			
	OCC.4	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.4	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.4	YES/NO	Monday In Period	
	TUE.4	YES/NO	Tuesday In Period	
PER.4	WED.4	YES/NO	Wednesday In Period	
	THU.4	YES/NO	Thursday In Period	
	FRI.4	YES/NO	Friday In Period	
	SAT.4	YES/NO	Saturday In Period	
	SUN.4	YES/NO	Sunday In Period	
	HOL.4	YES/NO	Holiday In Period	
	OCCUPANCY PERIOD 5			
	OCC.5	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.5	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.5	YES/NO	Monday In Period	
	TUE.5	YES/NO	Tuesday In Period	
PER.5	WED.5	YES/NO	Wednesday In Period	
	THU.5	YES/NO	Thursday In Period	
	FRI.5	YES/NO	Friday In Period	
	SAT.5	YES/NO	Saturday In Period	
	SUN.5	YES/NO	Sunday In Period	
	HOL.5	YES/NO	Holiday In Period	

APPENDIX A — DISPLAY TABLES (cont)

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
	OCCUPANCY PERIOD 6			
	OCC.6	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.6	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.6	YES/NO	Monday In Period	
	TUE.6	YES/NO	Tuesday In Period	
PER.6	WED.6	YES/NO	Wednesday In Period	
	THU.6	YES/NO	Thursday In Period	
	FRI.6	YES/NO	Friday In Period	
	SAT.6	YES/NO	Saturday In Period	
	SUN.6	YES/NO	Sunday In Period	
	HOL.6	YES/NO	Holiday In Period	
	OCCUPANCY PERIOD 7			
	OCC.7	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.7	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.7	YES/NO	Monday In Period	
	TUE.7	YES/NO	Tuesday In Period	
PER.7	WED.7	YES/NO	Wednesday In Period	
	THU.7	YES/NO	Thursday In Period	
	FRI.7	YES/NO	Friday In Period	
	SAT.7	YES/NO	Saturday In Period	
	SUN.7	YES/NO	Sunday In Period	
	HOL.7	YES/NO	Holiday In Period	
	OCCUPANCY PERIOD 8			
	OCC.8	XX:XX	Period Occupied Time	Military (00:00 - 23:59)
	UNC.8	XX:XX	Period Unoccupied Time	Military (00:00 - 23:59)
	MON.8	YES/NO	Monday In Period	
	TUE.8	YES/NO	Tuesday In Period	
PER.8	WED.8	YES/NO	Wednesday In Period	
	THU.8	YES/NO	Thursday In Period	
	FRI.8	YES/NO	Friday In Period	
	SAT.8	YES/NO	Saturday In Period	
	SUN.8	YES/NO	Sunday In Period	
	HOL.8	YES/NO	Holiday In Period	
	SCHEDULE OVERRIDE			
	OVR.T	X	Timed Override Hours	Default: 0 Range 0-4 hours
OVR	OVR.L	X	Override Time Limit	Default: 0 Range 0-4 hours
	SPT.O	XX.X	Space Temperature Offset	
	T.OVR	YES/NO	Timed Override	User Entry

APPENDIX A — DISPLAY TABLES (cont)

Operating Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
MODE	MODES CONTROLLING UNIT			
	MD05	ON/OFF	Ramp Load Limited	
	MD06	ON/OFF	Timed Override in effect	
	MD09	ON/OFF	Slow Change Override	
	MD10	ON/OFF	Minimum OFF time active	
	MD14	ON/OFF	Temperature Reset	
	MD15	ON/OFF	Demand Limited	
	MD17	ON/OFF	Low Temperature Cooling	
	MD18	ON/OFF	High Temperature Cooling	
	MDTG	ON/OFF	Time Guard Active	
	MD21	ON/OFF	High SCT Circuit A	
	MD22	ON/OFF	High SCT Circuit B	
	MD23	ON/OFF	Minimum Comp. On Time	
	MD25	ON/OFF	Low Sound Mode	
TSKS	TASK STATES			
	TKCA	X	Circuit A State	0 = OFF 1 = ALLOW TO RUN 2 = PRE START 3 = STARTING 4 = RUNNING 5 = STOPPING
	TKCB	X	Circuit B State	0 = OFF 1 = ALLOW TO RUN 2 = PRE START 3 = STARTING 4 = RUNNING 5 = STOPPING
	TKFA	X	Circuit A Fan State	0 = OFF 1 = PRE-START DETERMINATION 2 = PRE START 3 = NORMAL 4 = STOPPING
	TKFB	X	Circuit B Fan State	0 = OFF 1 = PRE-START DETERMINATION 2 = PRE START 3 = NORMAL 4 = STOPPING

Alarms Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
CRNT	CURRENTLY ACTIVE ALARMS			
	AXXX TXXX PXXX		Current Alarms 1-25	Alarms are hown as AXXX Alerts are shown as TXXX
RCRN	YES/NO		Reset All Current Alarms	
HIST	ALARM HISTORY			
	AXXX TXXX PXXX		Alarm History 1-20	Alarms are shown as AXXX Alerts are shown as TXXX

APPENDIX B — CCN TABLES

Status Tables

DESCRIPTION	VALUE	UNITS	POINT NAME
TSTAT_IN (Thermostat Input)			
Indoor Fan Status-CIRA	Off/On		IDFA_FS
Y1 Thermostat Input	Off/On		Y1
Y2 Thermostat Input	Off/On		Y2
Indoor Fan Status-CIRB	Off/On		IDFB_FS
Y3 Thermostat Input	Off/On		Y3
Y4 Thermostat Input	Off/On		Y4
A_UNIT (General Unit Parameters)			
Control Mode	10-char ASCII		STAT
Space Temp Control Mode	N		SPTMODE
Occupied	No/Yes		OCC
CCN Chiller	stop/start		CHIL_S_S
Alarm State	6-char ASCII		ALM
4-20 Cooling Demand	NN.n	milliAmps	COOL_MA
Active Demand Limit	NNN	%	DEM_LIM
Override Modes in Effect	No/Yes		MODE
Percent Total Capacity	NNN	%	CAP_T
Requested Stage	NN		STAGE
Active Set Point	NNN.n	degF	SP
Control Point	NNN.n	degF	CTRL_PNT
Return Air Temperature	NNN.n	degF	RETURN_T
Supply Air Temperature	NNN.n	degF	SUPPLY_T
Emergency Stop	Enable/EMStop		EMSTOP
Minutes Left for Start	5-char ASCII		MIN_LEFT
CIRCA_AN (Circuit A Analog Parameters)			
Percent Total Capacity	NNN	%	CAPA_T
Percent Available Capacity	NNN	%	CAPA_A
Discharge Pressure	NNN.n	PSIG	DP_A
Suction Pressure	NNN.n	PSIG	SP_A
Head Set Point ON	NNN.n	degF	HSP_ON
Head Set Point OFF	NNN.n	degF	HSP_OFF
Saturated Condensing Temperature	NNN.n	degF	SCTA
Saturated Suction Temperature	NNN.n	degF	SSTA
Variable Head Press Out Circuit A	NNN.n	%	VHPA_ACT
Compressor Return Gas Temperature	NNN.n	degF	RGTA
Discharge Gas Temperature	NNN.n	degF	DIGCMPDT
Suction Superheat Temperature	NNN.n	deltaF	SH_A
CIRCADIO (Circuit A Discrete Inputs/Outputs)			
CIRC.A DISCRETE OUTPUTS			
Compressor A1 Relay	Off/On		K_A1_RLY
Comp A1 Load Percent	NNN.n	%	DIGITAL%
Compressor A2 Relay	Off/On		K_A2_RLY
Compressor A3 Relay	Off/On		K_A3_RLY
Minimum Load Valve Relay	Off/On		MLV_RLY
Liquid Line Solenoid A	Off/On		LLSV_A
CIRC.A DISCRETE INPUTS			
Compressor A1 Feedback	Off/On		K_A1_FBK
Compressor A2 Feedback	Off/On		K_A2_FBK
Compressor A3 Feedback	Off/On		K_A3_FBK
High Pressure Switch A	Open/Close		HPSA

APPENDIX B — CCN TABLES (cont)

Status Tables (cont)

DESCRIPTION	VALUE	UNITS	POINT NAME
CIRCB_AN (Circuit B Analog Parameters)			
Percent Total Capacity	NNN	%	CAPB_T
Percent Available Capacity	NNN	%	CAPB_A
Discharge Pressure	NNN.n	PSIG	DP_B
Suction Pressure	NNN.n	PSIG	SP_B
Saturated Condensing Temperature	NNN.n	degF	SCTB
Saturated Suction Temperature	NNN.n	degF	SSTB
Variable Head Press Out Circuit B	NNN.n	%	VHPB_ACT
Compressor Return Gas Temperature	NNN.n	degF	RGTB
Suction Superheat Temperature	NNN.n	deltaF	SH_B
CIRCBDIO (Circuit B Discrete Inputs/Outputs)			
CIRC.B DISCRETE OUTPUTS			
Compressor B1 Relay	Off/On		K_B1_RLY
Compressor B2 Relay	Off/On		K_B2_RLY
Compressor B3 Relay	Off/On		K_B3_RLY
Minimum Load Valve Relay	Off/On		MLV_RLY
Liquid Line Solenoid B	Off/On		LLSV_B
CIRC.B DISCRETE INPUTS			
Compressor B1 Feedback	Off/On		K_B1_FBK
Compressor B2 Feedback	Off/On		K_B2_FBK
Compressor B3 Feedback	Off/On		K_B3_FBK
High Pressure Switch B	Open/Close		HPSB
OPTIONS (Unit Parameters)			
FANS			
Fan Stage Circuit A	NNN		FANSTGEA
Fan Stage Circuit B	NNN		FANSTGEB
Fan 1 Relay	Off/On		FAN_1
Fan 2 Relay	Off/On		FAN_2
Fan 3 Relay	Off/On		FAN_3
Fan 4 Relay	Off/On		FAN_4
Fan 5 Relay	Off/On		FAN_5
UNIT ANALOG VALUES			
Return Air Temperature	NNN.n	degF	RETURN_T
Supply Air Temperature	NNN.n	degF	SUPPLY_T
Circuit SCT Difference	NNN.n	deltaF	SCTDELTA
TEMPERATURE RESET			
4-20 ma Reset Signal	NN.n	milliAmps	RST_MA
Outside Air Temperature	NNN.n	degF	OAT
Space Temperature	NNN.n	degF	SPT
DEMAND LIMIT			
4-20 ma Demand Signal	NN.n	milliAmps	LMT_MA
Demand Limit Switch 1	Off/On		DMD_SW1
Demand Limit Switch 2	Off/On		DMD_SW2
CCN Loadshed Signal	N		DL_STAT
MISCELLANEOUS			
Supply Air Set Point	NNN.n	degF	SAT_SP

APPENDIX B — CCN TABLES (cont)

CCN Configuration Tables

DESCRIPTION	VALUE	UNITS	POINT NAME
UNIT (Unit Configuration)			
Unit Size	NNN	tons	SIZE
Number of Refrig Ckts	N		NUMCKTS
Compressor A1 Size	NNN	tons	SIZE_A1
Compressor A2 Size	NNN	tons	SIZE_A2
Compressor A3 Size	NNN	tons	SIZE_A3
Compressor B1 Size	NNN	tons	SIZE_B1
Compressor B2 Size	NNN	tons	SIZE_B2
Compressor B3 Size	NNN	tons	SIZE_B3
Fan Sequence Number	N		FAN_TYPE
Compressor A1 Digital	No/Yes		CPA1TYPE
Maximum A1 Unload Time	NN	secs	MAXULTME
OPTIONS1 (Options 1 Configuration)			
Motormaster Select	No/Yes		MM_SLCT
Minimum Load Valve Select	No/Yes		MLV_FLG
CSB Boards Enable	Disable/Enable		CSB_ENA
Space Temperature Sensor	Disable/Enable		SPTSENS
Space Temperature Offset Enable	Disable/Enable		SPTOSENS
Space Temperature Offset Range	NN	deltaF	SPTO_RNG
RAT Thermistor Type	N		RATTYPE
SAT Thermistor Type	N		SATTYPE
EMM Module Installed	No/Yes		EMM_BRD
OPTIONS2 (Options 2 Configuration)			
Machine Control Type	N		CTRLTYPE
Control Method	N		CONTROL
Loading Sequence Select	N		SEQ_TYPE
Lead/Lag Circuit Select	N		LEAD_TYP
Ramp Load Select	Disable/Enable		RAMP_EBL
Minutes Off Time	NN	mins	DELAY
Deadband Multiplier	N.n		Z_GAIN
SCHEDOVR (Timed Override Set Up)			
Schedule Number	NN		SCHEDNUM
Override Time Limit	N	hours	OTL
Timed Override Hours	N	hours	OVR_EXT
Timed Override	No/Yes		TIMEOVER
RESETCON (Temperature Reset and Demand Limit)			
COOLING RESET			
Cooling Reset Type	N		CRST_TYP
4-20 MA RESET			
4-20 - Degrees Reset	NNN.n	deltaF	420_DEG
REMOTE RESET			
Remote - No Reset Temperature	NNN.n	degF	REM_NO
Remote - Full Reset Temperature	NNN.n	degF	REM_FULL
Remote - Degrees Reset	NNN.n	deltaF	REM_DEG
RETURN TEMPERATURE RESET			
Return - No Reset Temperature	NNN.n	deltaF	RTN_NO
Return - Full Reset Temperature	NNN.n	deltaF	RTN_FULL
Return - Degrees Reset	NNN.n	deltaF	RTN_DEG
DEMAND LIMIT			
Demand Limit Select	N		DMD_CTRL
Demand Limit at 20 mA	NNN	%	DMT20MA
Loadshed Group Number	NN		SHED_NUM
Loadshed Demand Delta	NN	%	SHED_DEL
Maximum Loadshed Time	NNN	mins	SHED_TIM
Demand Limit Switch 1	NNN	%	DLSWSP1
Demand Limit Switch 2	NNN	%	DLSWSP2

APPENDIX B — CCN TABLES (cont)

CCN Configuration Tables (cont)

DESCRIPTION	VALUE	UNITS	POINT NAME
DISPLAY (Marquee Display Set Up)			
Service Password	NNNN		PASSWORD
Password Enable	Disable/Enable		PASS_EBL
Metric Display	Off/On		DISPUNIT
Language Selection	N		LANGUAGE
HPA (Head Pressure)			
SCT Delta for Compressor A1	NNN.n	deltaF	A1SCTDT
SCT Delta for Compressor A2	NNN.n	deltaF	A2SCTDT
HPB (Head Pressure)			
SCT Delta for Comp B1	NNN.n	deltaF	B1SCTDT
SCT Delta for Comp B2	NNN.n	deltaF	B2SCTDT
SERVICE			
Enable Compressor A1	Disable/Enable		ENABLEA1
Enable Compressor A2	Disable/Enable		ENABLEA2
Enable Compressor A3	Disable/Enable		ENABLEA3
Enable Compressor B1	Disable/Enable		ENABLEB1
Enable Compressor B2	Disable/Enable		ENABLEB2
Enable Compressor B3	Disable/Enable		ENABLEB3
SET POINT			
COOLING			
Cooling Set Point 1	NNN.n	degF	CSP1
Cooling Set Point 2	NNN.n	degF	CSP2
Space T Cool Set Point	NNN.n	degF	SPT_SP
Space Temperature Offset	NN.n	deltaF	SPTO
Space T SP Plus Offset	NN.n	degF	SPSP_PO
Lo Cool On Set Point	NN.n	deltaF	DMDLCON
HI Cool On Set Point	NN.n	deltaF	DMDHCON
Lo Cool Off Set Point	NN.n	deltaF	DMDLCOFF
RAMP LOADING			
Cooling Ramp Loading	N.n		CRAMP
Head Set Point ON	NNN.n	degF	HSP_ON
Head Set Point OFF	NNN.n	degF	HSP_OFF
Fan On Set Point	NNN.n	degF	FANONSP
Fan Off Set Point	NNN.n	degF	FANOFFSP
Fan Stage Delta	NNN.n	deltaF	FSTGDLTA
Fan Delta Active Time	NNN	secs	FANDLTTM
Unload Time Threshold	NN	secs	UTTHRESH

CCN Maintenance Tables

DESCRIPTION	VALUE	UNITS	POINT NAME
STRTHOUR (Maintenance Display)			
Machine Operating Hours	NNNNNN	hours	HR_MACH
Machine Starts	NNNNNN		CY_MACH
Circuit A Run Hours	NNNNNN	hours	HR_CIRA
Compressor A1 Run Hours	NNNNNN.n	hours	HR_A1
Compressor A2 Run Hours	NNNNNN.n	hours	HR_A2
Compressor A3 Run Hours	NNNNNN.n	hours	HR_A3
Circuit B Run Hours	NNNNNN	hours	HR_CIRB
Compressor B1 Run Hours	NNNNNN.n	hours	HR_B1
Compressor B2 Run Hours	NNNNNN.n	hours	HR_B2
Compressor B3 Run Hours	NNNNNN.n	hours	HR_B3
Circuit A Starts	NNNNNN		CY_CIRA
Compressor A1 Starts	NNNNNN		CY_A1
Compressor A2 Starts	NNNNNN		CY_A2
Compressor A3 Starts	NNNNNN		CY_A3
Circuit B Starts	NNNNNN		CY_CIRB
Compressor B1 Starts	NNNNNN		CY_B1
Compressor B2 Starts	NNNNNN		CY_B2
Compressor B3 Starts	NNNNNN		CY_B3

APPENDIX B — CCN TABLES (cont)

CCN Maintenance Tables (cont)

DESCRIPTION	VALUE	UNITS	POINT NAME
CURRMODS (Maintenance Display)			
Ramp Load Limited	Off/On		MODE_5
Timed Override in effect	Off/On		MODE_6
Slow Change Override	Off/On		MODE_9
Minimum OFF time active	Off/On		MODE_10
Temperature Reset	Off/On		MODE_14
Demand Limited	Off/On		MODE_15
Low Temperature Cooling	Off/On		MODE_17
High Temperature Cooling	Off/On		MODE_18
High SCT Circuit A	Off/On		MODE_21
High SCT Circuit B	Off/On		MODE_22
Minimum Comp. On Time	Off/On		MODE_23
Low Sound Mode	Off/On		MODE_25
Time Guard Active	Off/On		MODE_TG
Alarms (Maintenance Display)			
Active Alarm #1	4-char ASCII		ALARM01C
Active Alarm #2	4-char ASCII		ALARM02C
Active Alarm #3	4-char ASCII		ALARM03C
Active Alarm #4	4-char ASCII		ALARM04C
Active Alarm #5	4-char ASCII		ALARM05C
Active Alarm #6	4-char ASCII		ALARM06C
Active Alarm #7	4-char ASCII		ALARM07C
Active Alarm #8	4-char ASCII		ALARM08C
Active Alarm #9	4-char ASCII		ALARM09C
Active Alarm #10	4-char ASCII		ALARM10C
Active Alarm #11	4-char ASCII		ALARM11C
Active Alarm #12	4-char ASCII		ALARM12C
Active Alarm #13	4-char ASCII		ALARM13C
Active Alarm #14	4-char ASCII		ALARM14C
Active Alarm #15	4-char ASCII		ALARM15C
Active Alarm #16	4-char ASCII		ALARM16C
Active Alarm #17	4-char ASCII		ALARM17C
Active Alarm #18	4-char ASCII		ALARM18C
Active Alarm #19	4-char ASCII		ALARM19C
Active Alarm #20	4-char ASCII		ALARM20C
Active Alarm #21	4-char ASCII		ALARM21C
Active Alarm #22	4-char ASCII		ALARM22C
Active Alarm #23	4-char ASCII		ALARM23C
Active Alarm #24	4-char ASCII		ALARM24C
Active Alarm #25	4-char ASCII		ALARM25C
Versions (Software Versions)			
MBB CESR131279-	5-char ASCII		
AUX CESR131333-	5-char ASCII		
CXB CESR131173-	5-char ASCII		
EMM CESR131174-	5-char ASCII		
MARQUEE CESR131171-	5-char ASCII		
NAVIGATOR CESR130227-	5-char ASCII		
LOADFACT (Maintenance Display)			
Load/Unload Factor	NNN		SMZ
Control Point	NNN.n	degF	CTRL_PNT
Return Air Temperature	NNN.n	degF	RETURN_T
Supply Air Temperature	NNN.n	degF	SUPPLY_T
Ramp Load Limited	Off/On		MODE_5
Slow Change Override	Off/On		MODE_9
Low Temperature Cooling	Off/On		MODE_17
High Temperature Cooling	Off/On		MODE_18
Minimum Comp. On Time	Off/On		MODE_23
LEARNFNS (Maintenance Display)			
SCT Delta for Comp A1	NNN.n	deltaF	A1SCTDT
SCT Delta for Comp A2	NNN.n	deltaF	A2SCTDT
SCT Delta for Comp B1	NNN.n	deltaF	B1SCTDT
SCT Delta for Comp B2	NNN.n	deltaF	B2SCTDT

APPENDIX B — CCN TABLES (cont)

CCN Maintenance Tables (cont)

DESCRIPTION	VALUE	UNITS	POINT NAME
PM-COIL (Maintenance Display)			
Coil Cleaning Srvc Inter	NNNNN	hours	SI_COIL
Coil Service Countdown	NNNNN	hours	CL_CDOWN
Coil Cleaning Maint.Done	No/Yes		CL_MAINT
Coil Cleaning Maint.Date	15-char ASCII		COIL_PM0
Coil Cleaning Maint.Date	15-char ASCII		COIL_PM1
Coil Cleaning Maint.Date	15-char ASCII		COIL_PM2
Coil Cleaning Maint.Date	15-char ASCII		COIL_PM3
Coil Cleaning Maint.Date	15-char ASCII		COIL_PM4
TESTMODE (Maintenance Display)			
Service Test Mode	Off/On		NET_CTRL
Compressor A1 Relay	Off/On		S_A1_RLY
Compressor A2 Relay	Off/On		S_A2_RLY
Compressor A3 Relay	Off/On		S_A3_RLY
Compressor B1 Relay	Off/On		S_B1_RLY
Compressor B2 Relay	Off/On		S_B2_RLY
Compressor B3 Relay	Off/On		S_B3_RLY
Fan 1 Relay	Off/On		S_FAN_1
Fan 2 Relay	Off/On		S_FAN_2
Fan 3 Relay	Off/On		S_FAN_3
Fan 4 Relay	Off/On		S_FAN_4
Fan 5 Relay	Off/On		S_FAN_5
Liquid Line Solenoid A	Off/On		S_LLSV_A
Liquid Line Solenoid B	Off/On		S_LLSV_B
Comp A1 Unload Time	NN	secs	S_A1ULTM
Minimum Load Valve Relay	Off/On		S_MLV
Remote Alarm Relay	Off/On		S_ALM
RUNTEST (Maintenance Display)			
Percent Total Capacity	NNN	%	CAPA_T
Percent Available Capacity	NNN	%	CAPA_A
Discharge Pressure	NNN.n	PSIG	DP_A
Suction Pressure	NNN.n	PSIG	SP_A
Head Set Point ON	NNN.n	degF	HSP_ON
Head Set Point OFF	NNN.n	degF	HSP_OFF
Saturated Condensing Temperature	NNN.n	degF	SCTA
Saturated Suction Temperature	NNN.n	degF	SSTA
Compr Return Gas Temperature	NNN.n	degF	RGTA
Discharge Gas Temperature	NNN.n	degF	DIGCMPDT
Suction Superheat Temperature	NNN.n	deltaF	SH_A
Compressor A1 Relay	Off/On		K_A1_RLY
Compressor A2 Relay	Off/On		K_A2_RLY
Compressor A3 Relay	Off/On		K_A3_RLY
Minimum Load Valve Relay	Off/On		MLV_RLY
Compressor A1 Feedback	Off/On		K_A1_FBK
Compressor A2 Feedback	Off/On		K_A2_FBK
Compressor A3 Feedback	Off/On		K_A3_FBK
Percent Total Capacity	NNN	%	CAPB_T
Percent Available Capacity	NNN	%	CAPB_A
Discharge Pressure	NNN.n	PSIG	DP_B
Suction Pressure	NNN.n	PSIG	SP_B
Head Set Point ON	NNN.n	degF	HSP_ON
Head Set Point OFF	NNN.n	degF	HSP_OFF
Saturated Condensing Temperature	NNN.n	degF	SCTB
Saturated Suction Temperature	NNN.n	degF	SSTB
Compr Return Gas Temperature	NNN.n	degF	RGTB
Suction Superheat Temperature	NNN.n	deltaF	SH_B
Compressor B1 Relay	Off/On		K_B1_RLY
Compressor B2 Relay	Off/On		K_B2_RLY
Compressor B3 Relay	Off/On		K_B3_RLY
Minimum Load Valve Relay	Off/On		MLV_RLY

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

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START-UP CHECKLIST FOR 38AP SPLIT SYSTEM CONDENSING UNIT
(Remove and use for Job File)

I. Project Information

JOB NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP_____

INSTALLING CONTRACTOR _____

SALES OFFICE _____

START-UP PERFORMED BY _____

Design Information

CAPACITY	OAT	SUPPLY AIR TEMPERATURE	RETURN AIR TEMPERATURE	COIL SIZE (sq ft)	COIL CIRCUITING	CFM

SUCTION LINE DIAMETER	LIQUID LINE DIAMETER	LINE LENGTH	DOUBLE RISER (Y/N)	CV/VAV	CONTROL TYPE (1-9)	ELEVATION DELTA BETWEEN INDOOR/OUTDOOR

UNIT MODEL _____ SERIAL _____

II. Preliminary Equipment Check

IS THERE ANY PHYSICAL DAMAGE? ☐ YES ☐ NO

DESCRIPTION _____

_____

1. UNIT IS INSTALLED LEVEL AS PER THE INSTALLATION INSTRUCTIONS. ☐ YES ☐ NO
2. POWER SUPPLY AGREES WITH THE UNIT NAMEPLATE. ☐ YES ☐ NO
3. ELECTRICAL POWER WIRING IS INSTALLED PROPERLY. ☐ YES ☐ NO
4. UNIT IS PROPERLY GROUNDED. ☐ YES ☐ NO
5. ELECTRICAL CIRCUIT PROTECTION HAS BEEN SIZED AND INSTALLED PROPERLY. ☐ YES ☐ NO
6. ALL TERMINALS ARE TIGHT. ☐ YES ☐ NO
7. ALL PLUG ASSEMBLIES ARE TIGHT. ☐ YES ☐ NO
8. ALL CABLES AND THERMISTORS HAVE BEEN INSPECTED FOR CROSSED WIRES. ☐ YES ☐ NO
9. ALL THERMISTORS ARE FULLY INSERTED INTO WELLS. ☐ YES ☐ NO
10. MOTORMASTER IS INSTALLED ON FAN 1. ☐ YES ☐ NO
11. SENSORS (RAT, SAT, SPT) FOR CONTROL TYPES 3, 4, AND 5 ARE INSTALLED. ☐ YES ☐ NO
12. LONG LINE OPTION KIT IS INSTALLED, IF NEED. ☐ YES ☐ NO

Refrigeration System Check

1. ALL SERVICE VALVES ARE OPEN. ☐ YES ☐ NO
2. ONLY BLEED TXV(S) ARE INSTALLED. ☐ YES ☐ NO
3. ALL PIPING IS CONNECTED PROPERLY. ☐ YES ☐ NO
4. FILTER DRIERS AND SIGHT GLASSES ARE INSTALLED NEAR THE TXV(S). ☐ YES ☐ NO
5. THE SYSTEM HAS BEEN EVACUATED. ☐ YES ☐ NO
6. THE SYSTEM HAS BEEN CHARGED WITH THE APPROPRIATE INITIAL CHARGE. ☐ YES ☐ NO
7. EVAPORATOR FANS ARE TURNING IN THE CORRECT DIRECTION. ☐ YES ☐ NO
8. EVAPORATOR FAN STATUS SWITCH IS OPERATIONAL. ☐ YES ☐ NO
9. CRANKCASE HEATERS ARE OPERATIONAL AND HAVE BEEN ENERGIZED TO REMOVE ANY LIQUID FROM THE COMPRESSORS. ☐ YES ☐ NO
10. WATER HAS BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE. ☐ YES ☐ NO
11. THE PROPER FILTERS HAVE BEEN INSTALLED. ☐ YES ☐ NO
12. THE FAN AND MOTOR PULLEYS OF THE INDOOR FAN HAVE BEEN CHAECKED FOR PROPER ALIGNMENT ☐ YES ☐ NO
13. THE INDOOR FAN BELTS HAVE THE PROPER TENSION. ☐ YES ☐ NO
14. THE CORRECT FAN ROTATION ON BOTH INDOOR AND OUTDOOR UNITS HAS BEEND VERIFIED. ☐ YES ☐ NO
15. THE LIQUID SOLENOID VALVES, IF INSTALLED, ARE NEAR THE EVAPORATOR. ☐ YES ☐ NO
16. THE PIPING HAS BEEN CHECKED FOR LEAKS WITH A LEAK DETECTOR. ☐ YES ☐ NO

    LOCATE, REPAIR, AND REPORT ANY LEAKS_____

17. OIL IS VISABLE APPROXIMATELY $^1/_2$ WAY IN THE SIGHT GLASS(ES) OF THE COMPRESSOR. ☐ YES ☐ NO

    RECORD THE OIL LEVEL(S) _____

III. Unit Start-Up

1. COMPRESSOR OIL LEVEL IS CORRECT. ☐ YES ☐ NO
2. VERIFY COMPRESSOR MOUNTING BOLT TORQUE IS 10-14 FT-LB. (13.5-18.9 N-M). ☐ YES ☐ NO
3. LEAK CHECK UNIT. LOCATE, REPAIR AND REPORT ANY REFRIGERANT LEAKS. ☐ YES ☐ NO
4. VOLTAGE IS WITHIN UNIT NAMEPLATE RANGE. ☐ YES ☐ NO
5. CONTROL TRANSFORMER PRIMARY CONNECTION SET FOR PROPER VOLTAGE. ☐ YES ☐ NO
6. CONTROL TRANSFORMER SECONDARY VOLTAGE = _____v
7. CHECK VOLTAGE IMBALANCE: A-B _____ A-C _____ B-C _____
   AVERAGE VOLTAGE = _____ (A-B + A-C + B-C)/3
   MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____
   VOLTAGE IMBALANCE = _____% (MAX. DEVIATION/AVERAGE VOLTAGE) X 100
   VOLTAGE IMBALANCE LESS THAN 2%. ☐ YES ☐ NO
   (DO NOT START UNIT IF VOLTAGE IMBALANCE IS GREATER THAN 2%.
   CONTACT LOCAL UTILITY FOR ASSISTANCE.)
8. VERIFY EVAPORATOR FAN CFM. ☐ YES ☐ NO

Start and Operate Machine. Complete the Following:

1. COMPLETE COMPONENT TEST. ☐ YES ☐ NO
2. CHECK REFRIGERANT AND OIL CHARGE. ☐ YES ☐ NO
3. FINISH CHARGING ACCORDING TO THE CHARGING CHART PROVIDED. ☐ YES ☐ NO
4. RECORD COMPRESSOR MOTOR CURRENT. ☐ YES ☐ NO
5. RECORD CONFIGURATION SETTINGS. ☐ YES ☐ NO
6. RECORD OPERATING TEMPERATURES AND PRESSURES. ☐ YES ☐ NO
7. PROVIDE OPERATING INSTRUCTIONS TO OWNER'S PERSONNEL. ☐ YES ☐ NO
   Instruction Time _____ hours.
8. RECORD COMPRESSOR OIL LEVELS AFTER INITIAL RUN. _____
9. OIL LEVELS ARE STILL WITHIN SIGHT GLASS(ES). ☐ YES ☐ NO

OPERATING DATA:

RECORD THE FOLLOWING INFORMATION FROM THE PRESSURES AND TEMPERATURES MODES WHEN MACHINE IS IN A STABLE OPERATING CONDITION:

PRESSURE/TEMPERATURE

	CIRCUIT A	CIRCUIT B
DISCHARGE PRESSURE	DP.A	DP.B
SUCTION PRESSURE	SP.A	SP.B
SATURATED CONDENSING TEMP	SCT.A	SCT.B
SATURATED SUCTION TEMP	SST.A	SST.B
LIQUID LINE TEMPERATURE*		
LIQUID LINE PRESSURE		
DISCHARGE LINE TEMPERATURE*		
RETURN GAS TEMPERATURE	RGT.A	RGT.B
RETURN AIR TEMPERATURE*	RAT	
SUPPLY AIR TEMPERATURE*	SAT	
OUTDOOR-AIR TEMPERATURE	OAT	
CONTROL POINT	CTPT	
PERCENT TOTAL CAPACITY	CAP.T	

*Readings taken with a digital thermometer.

Compressor Running Current — All readings taken at full load.

COMPRESSOR MOTOR CURRENT	L1	L2	L3
COMPRESSOR A1			
COMPRESSOR A2			
COMPRESSOR A3			
COMPRESSOR B1			
COMPRESSOR B2			
COMPRESSOR B3			

CONDENSER FAN MOTOR CURRENT	L1	L2	L3
FAN MOTOR 1			
FAN MOTOR 2			
FAN MOTOR 3			
FAN MOTOR 4			
FAN MOTOR 5			
FAN MOTOR 6			

	L1	L2	L3
EVAPORATOR MOTOR CURRENT			

Record Software Versions
MODE — RUN STATUS

SUB-MODE	ITEM	DISPLAY	ITEM EXPANSION
VERS	MBB		CESR-131279- _ _-_ _
	MARQ		CESR-131171- _ _-_ _
	EMM		CESR-131174- _ _-_ _
	NAVI		CESR-131227- _ _-_ _
	AUX		CESR-131333- _ _-_ _
	CXB		CESR-131173- _ _-_ _

(PRESS ENTER & ESCAPE SIMULTANEOUSLY TO OBTAIN SOFTWARE VERSIONS)

COMMENTS:

SIGNATURES:

START-UP TECHNICIAN _____

DATE _____

CUSTOMER REPRESENTATIVE _____

DATE _____

CUT ALONG DOTTED LINE

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

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