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

CONTENTS

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CONTENTS (cont)

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.

⚠ WARNING

DO NOT USE TORCH to remove any component. System contains oil and refrigerant under pressure.

To remove a component, wear protective gloves and goggles and proceed as follows:

a. Shut off electrical power to unit.
b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
c. Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
d. Cut component connection tubing with tubing cutter and remove component from unit. 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 the system.
e. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Failure to follow these procedures may result in personal injury and death.

⚠ CAUTION

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations. DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed. Failure to follow these procedures may result in damage to the equipment.

⚠ 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.

⚠ 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.

Be aware of electrostatic discharge (static electricity) when handling or making contact with circuit boards or module connections. Always touch a chassis (grounded) part to dissipate body electrostatic charge before working inside control center.

Use extreme care when handling tools near boards and when connecting or disconnecting terminal plugs. Circuit boards can easily be damaged. Always hold boards by the edges and avoid touching components and connections.

This equipment uses, and can radiate, radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to International Standard in North America EN61000-2/3 which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Always store and transport replacement or defective boards in anti-static shipping bag.

GENERAL

This publication contains controls, start-up, service, operation, and troubleshooting information for the Gemini™ Select 38AP condensing units with *Comfort*Link controls. The 38AP air-cooled condensing units are intended for commercial comfort-cooling applications. Multiple scroll compressors are staged to provide capacity control. The units are shipped with a nitrogen holding charge and utilize Puron® refrigerant (R-410A) as the operating refrigerant. See Table 1 for unit size information.

Table 1 — Unit Sizes

UNIT SIZE	NOMINAL CAPACITY TONS (60 Hz)	NOMINAL CAPACITY kW (60 Hz)	NOMINAL CAPACITY TONS (50 Hz)	NOMINAL CAPACITY kW (50 Hz)
38APS025	24.0	84.3	20.0	70.3
38APD025	24.0	84.3	20.0	70.3
38APS027	26.6	93.4	22.2	78.1
38APD027	26.6	93.4	22.2	78.1
38APS030	31.1	109.2	26.0	91.4
38APD030	31.1	109.2	26.0	91.4
38APS040	39.8	139.8	32.8	115.3
38APD040	39.2	137.7	32.6	114.6
38APS050	48.1	168.9	39.5	138.9
38APD050	50.0	175.6	41.6	146.3
38APD060	58.3	204.7	48.0	168.8
38APS065	59.6	209.6	49.4	173.7
38APD070	67.3	236.4	58.5	205.7
38APD080	78.0	273.9	64.5	226.8
38APD090	87.4	306.9	71.9	252.8
38APD100	96.0	337.2	79.8	280.6
38APD115	110.4	388.3	90.8	319.3
38APD130	125.1	442.3	103.7	364.6

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.

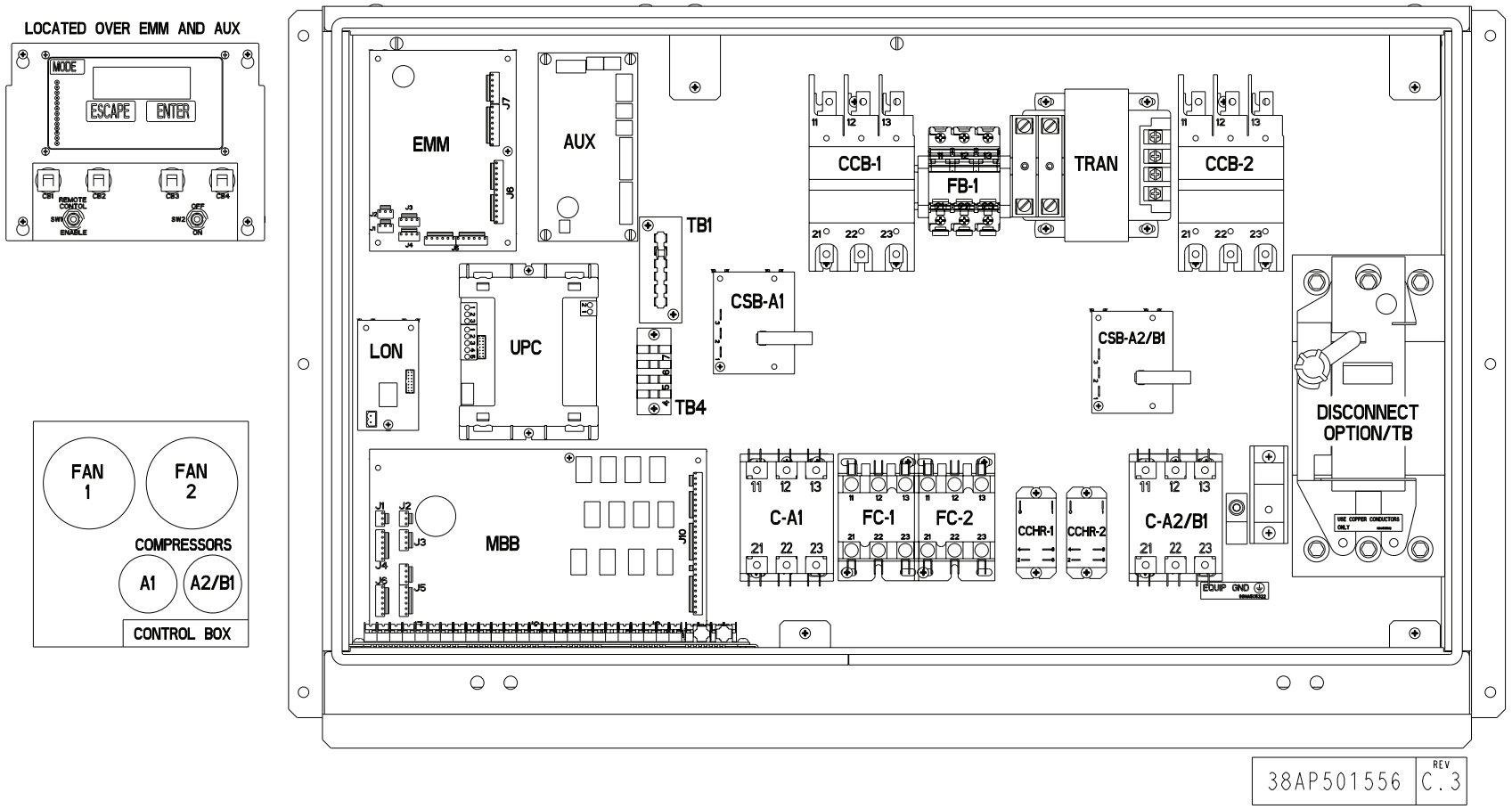
CONTROLS

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 described in this manual. See Fig. 1-4 for typical control box component arrangements. See Fig. 5-15 for typical power and control wiring. Table 2 lists the drawings by unit size.

Table 2 — Component, Power, and Control Drawings

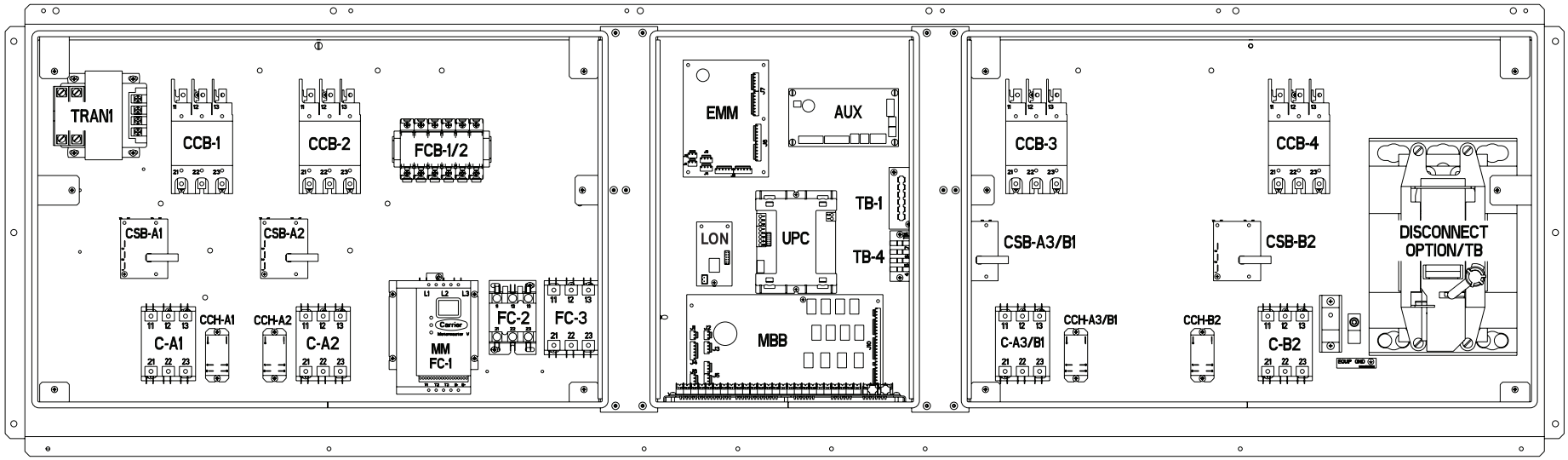
UNIT	DESCRIPTION	LOCATION
38APS025	Component Arrangement	Fig. 1, page 5
	Power Wiring Schematic	Fig. 5, page 9
	Control Wiring Schematic	Fig. 11, page 15
38APD025	Component Arrangement	Fig. 1, page 5
	Power Wiring Schematic	Fig. 5, page 9
	Control Wiring Schematic	Fig. 12, page 16
38APS027	Component Arrangement	Fig. 1, page 5
	Power Wiring Schematic	Fig. 5, page 9
	Control Wiring Schematic	Fig. 11, page 15
38APD027	Component Arrangement	Fig. 1, page 5
	Power Wiring Schematic	Fig. 5, page 9
	Control Wiring Schematic	Fig. 12, page 16
38APS030	Component Arrangement	Fig. 1, page 5
	Power Wiring Schematic	Fig. 5, page 9
	Control Wiring Schematic	Fig. 11, page 15
38APD030	Component Arrangement	Fig. 1, page 5
	Power Wiring Schematic	Fig. 5, page 9
	Control Wiring Schematic	Fig. 12, page 16
38APS040	Component Arrangement	Fig. 2, page 6
	Power Wiring Schematic	Fig. 6, page 10
	Control Wiring Schematic	Fig. 11, page 15
38APD040	Component Arrangement	Fig. 2, page 6
	Power Wiring Schematic	Fig. 7, page 11
	Control Wiring Schematic	Fig. 12, page 16
38APS050	Component Arrangement	Fig. 2, page 6
	Power Wiring Schematic	Fig. 6, page 10
	Control Wiring Schematic	Fig. 11, page 15
38APD050	Component Arrangement	Fig. 2, page 6
	Power Wiring Schematic	Fig. 7, page 11
	Control Wiring Schematic	Fig. 12, page 16
38APD060	Component Arrangement	Fig. 2, page 6
	Power Wiring Schematic	Fig. 7, page 11
	Control Wiring Schematic	Fig. 12, page 16
38APS065	Component Arrangement	Fig. 3, page 7
	Power Wiring Schematic	Fig. 8, page 12
	Control Wiring Schematic	Fig. 13, page 17
38APD070	Component Arrangement	Fig. 4, page 8
	Power Wiring Schematic	Fig. 9, page 13
	Control Wiring Schematic	Fig. 14, page 18
38APD080	Component Arrangement	Fig. 4, page 8
	Power Wiring Schematic	Fig. 9, page 13
	Control Wiring Schematic	Fig. 14, page 18
38APD090	Component Arrangement	Fig. 4, page 8
	Power Wiring Schematic	Fig. 9, page 13
	Control Wiring Schematic	Fig. 14, page 18
38APD100	Component Arrangement	Fig. 4, page 8
	Power Wiring Schematic	Fig. 9, page 13
	Control Wiring Schematic	Fig. 14, page 18
38APD115	Component Arrangement	Fig. 4, page 8
	Power Wiring Schematic	Fig. 10, page 14
	Control Wiring Schematic	Fig. 14, page 18
38APD130	Component Arrangement	Fig. 4, page 8
	Power Wiring Schematic	Fig. 10, page 14
	Control Wiring Schematic	Fig. 14, page 18

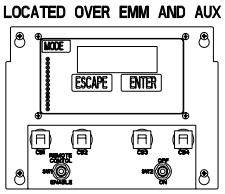


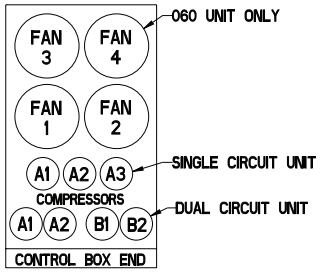
LEGEND

AUX	—	Auxiliary
C	—	Contactor
CCB	—	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 38APD,APS025-030







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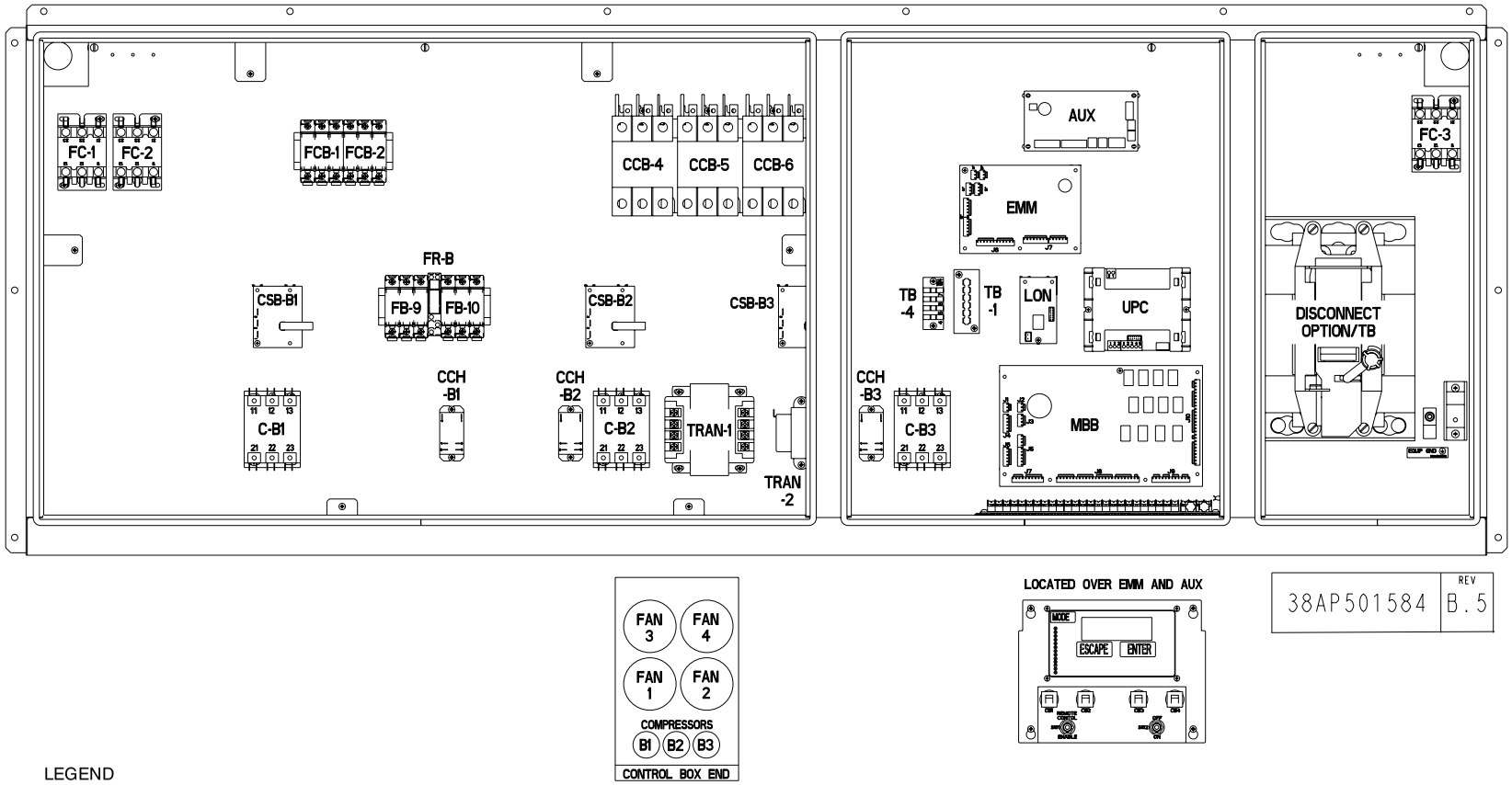
LEGEND

AUX	—	Auxiliary
C	—	Contactor
CB	—	Circuit Breaker
CCB	—	Compressor 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® Controller
SW	—	Switch
TB	—	Terminal Block
TRAN	—	Transformer
UPC	—	Unitary Protocol Converter

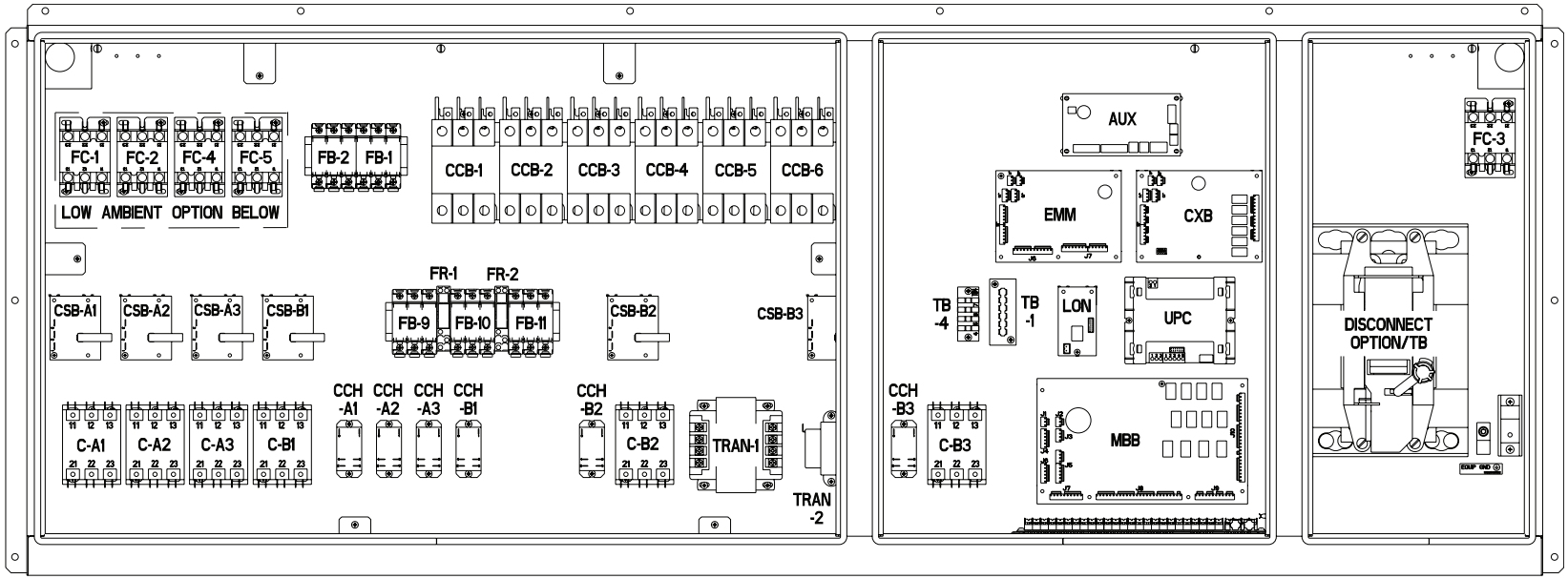
Fig. 2 — Component Arrangement — Unit Sizes 38APD040-060, 38APS040-050

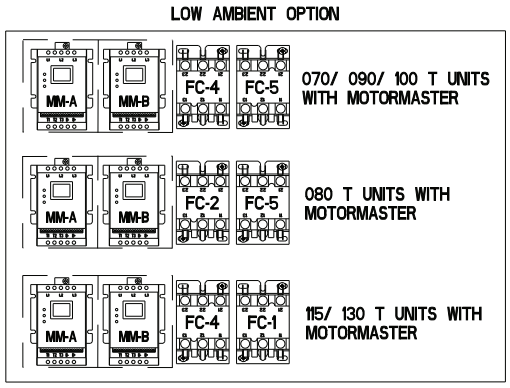


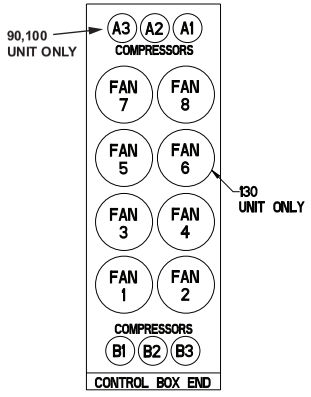
LEGEND

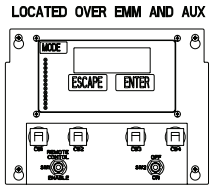
AUX	—	Auxiliary
C	—	Contactor
CB	—	Circuit Breaker
CCB	—	Compressor Circuit Breaker
CCH	—	Crankcase Heater Relay
CSB	—	Current Sensor Board
EMM	—	Energy Management Module
EQUIP GND	—	Equipment Ground
FC	—	Fan Contactor
FCB	—	Fan Circuit Breaker
LON	—	Local Operating Network
MBB	—	Main Base Board
SW	—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

Fig. 3 — Component Arrangement — Unit Size 38APS065









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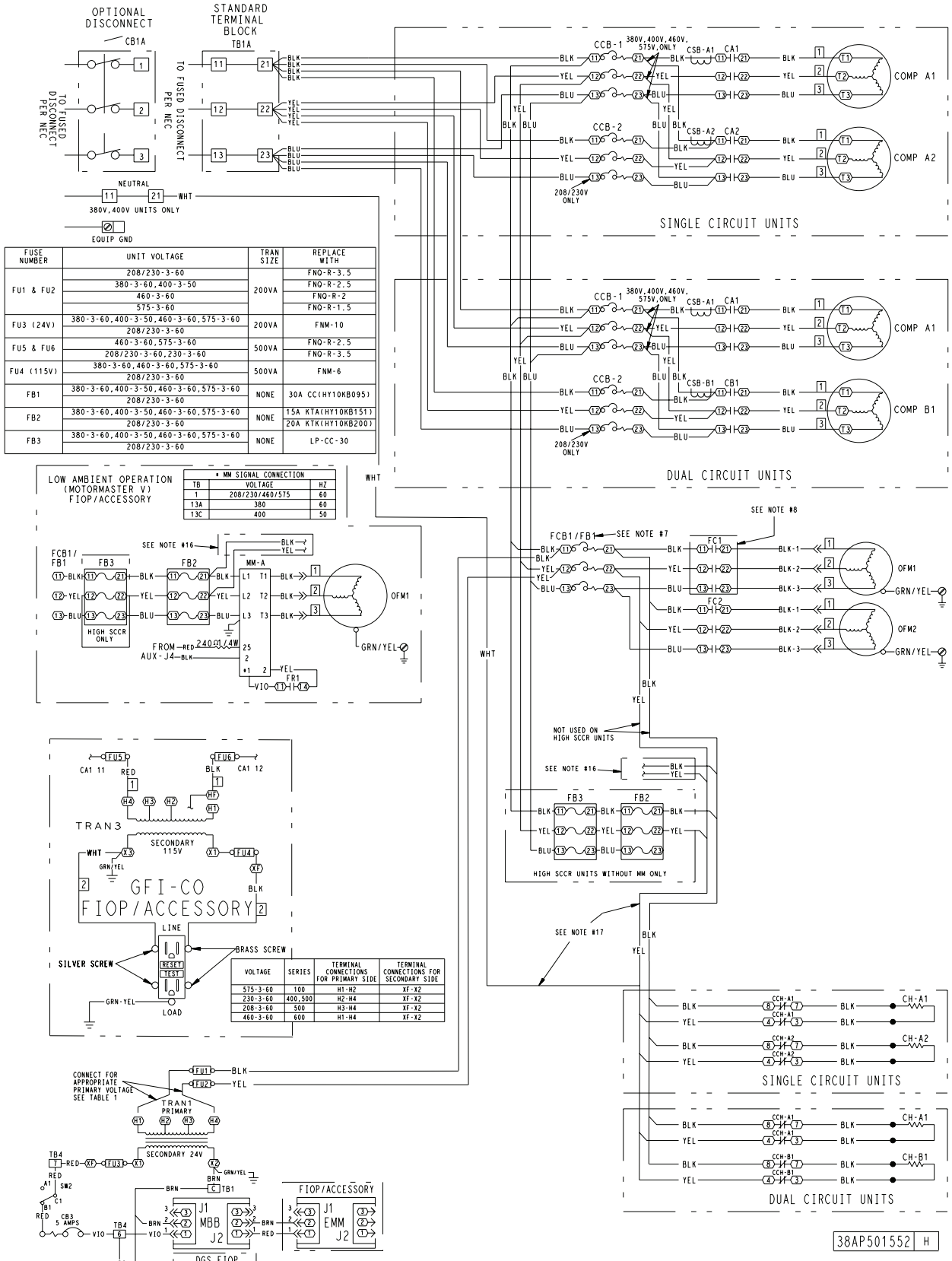
LEGEND

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

Fig. 4 — Component Arrangement — Unit Sizes 38APD070-130



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		
FU5 & FU6	460-3-60,575-3-60	500VA	FNQ-R-2.5
	208/230-3-60,230-3-60		FNQ-R-3.5
FU4 (115V)	380-3-60,460-3-60,575-3-60	500VA	FNM-6
	208/230-3-60		
FB1	380-3-60,400-3-50,460-3-60,575-3-60	NONE	30A CC(HY10KB095)
	208/230-3-60		
FB2	380-3-60,400-3-50,460-3-60,575-3-60	NONE	15A KTA(HY10KB151)
	208/230-3-60		20A KTK(HY10KB200)
FB3	380-3-60,400-3-50,460-3-60,575-3-60	NONE	LP-CC-30
	208/230-3-60		

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

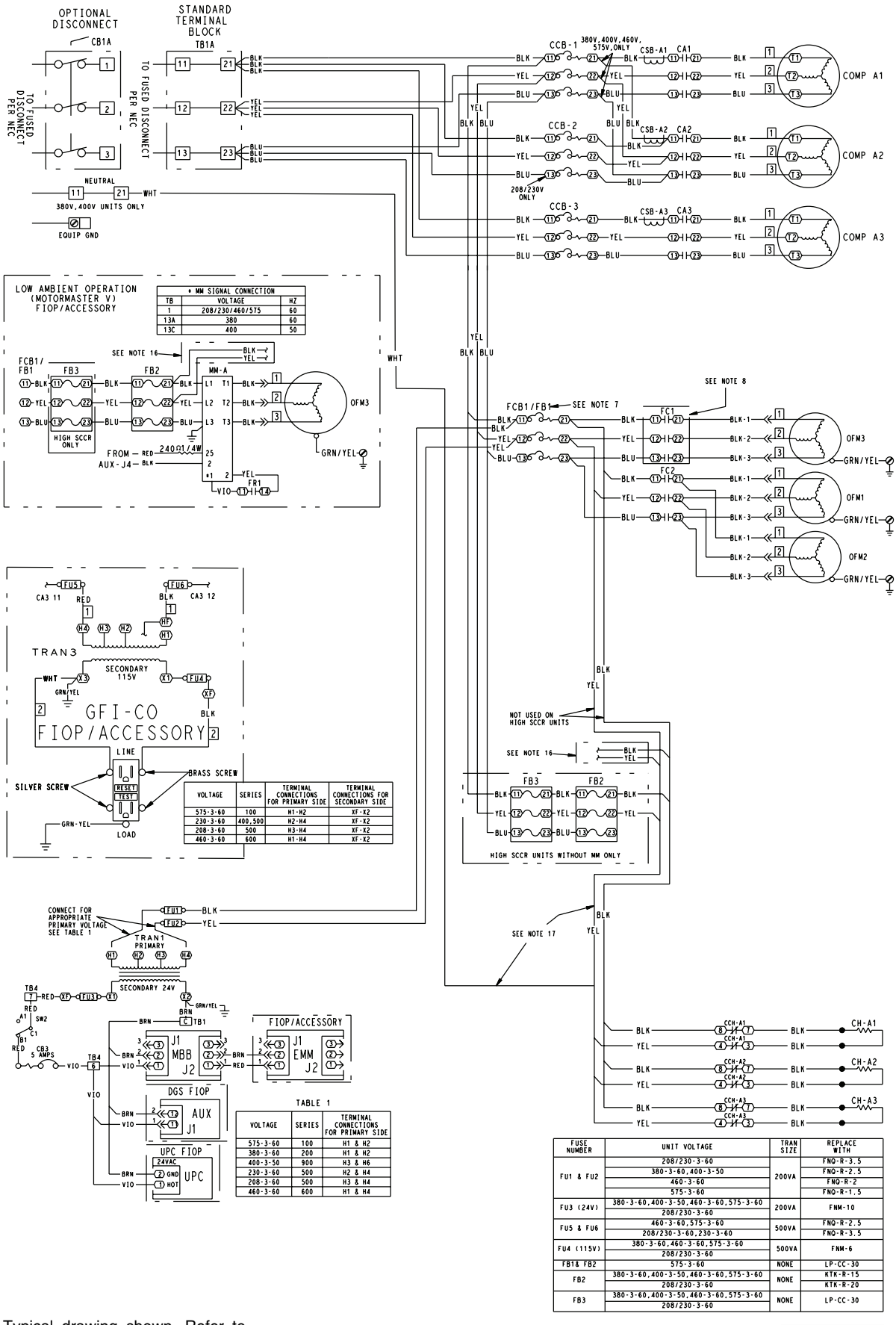
VOLTAGE	SERIES	TERMINAL CONNECTIONS FOR PRIMARY SIDE	TERMINAL CONNECTIONS FOR SECONDARY SIDE
575-3-60	100	H1-H2	XF-X2
230-3-60	400,500	H2-H4	XF-X2
208-3-60	500	H3-H4	XF-X2
460-3-60	600	H1-H4	XF-X2

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

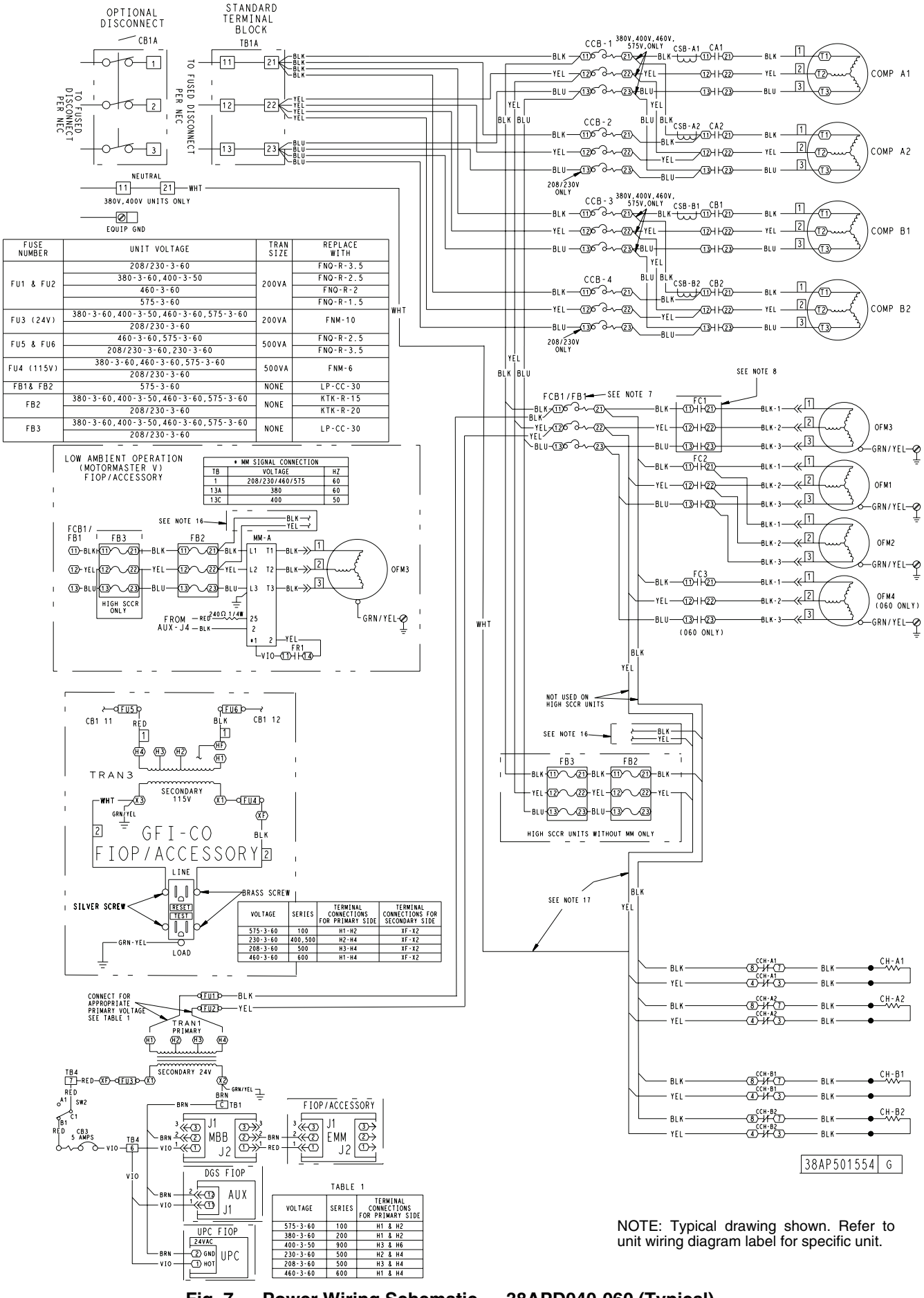
NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 5 — Power Wiring Schematic — 38APD,APS025-030 (Typical)



NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 6 — Power Wiring Schematic — 38APS040,050 (Typical)



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		
FU5 & FU6	460-3-60,575-3-60	500VA	FNQ-R-2.5
	208/230-3-60,230-3-60		FNQ-R-3.5
FU4 (115V)	380-3-60,460-3-60,575-3-60	500VA	FNM-6
	208/230-3-60		
FB1& FB2	575-3-60	NONE	LP-CC-30
FB2	380-3-60,400-3-50,460-3-60,575-3-60	NONE	KTK-R-15
	208/230-3-60		KTK-R-20
FB3	380-3-60,400-3-50,460-3-60,575-3-60	NONE	LP-CC-30
	208/230-3-60		

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

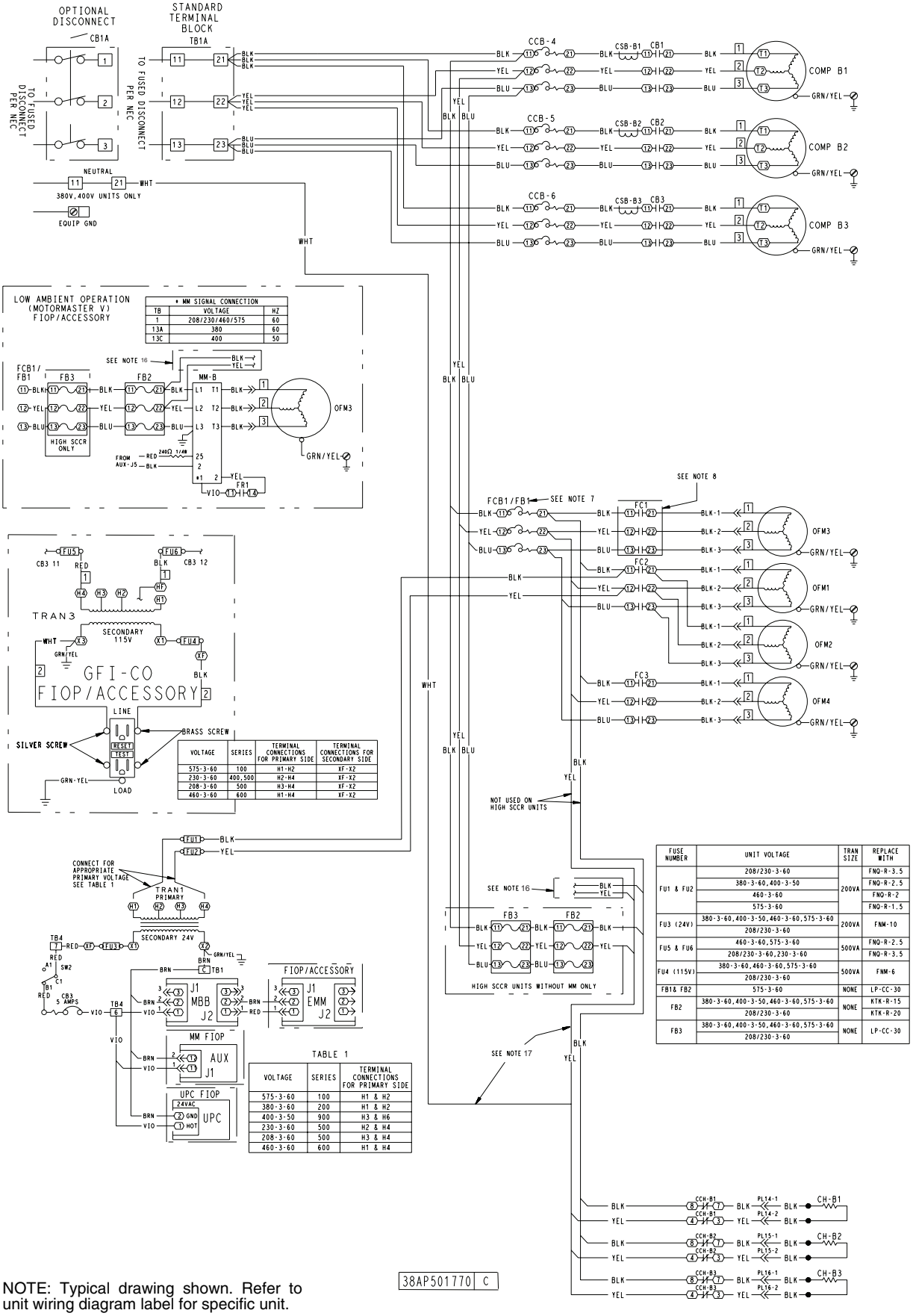
VOLTAGE	SERIES	TERMINAL CONNECTIONS FOR PRIMARY SIDE	TERMINAL CONNECTIONS FOR SECONDARY SIDE
575-3-60	100	H1-H2	XF-X2
230-3-60	400,500	H2-H4	XF-X2
208-3-60	500	H3-H4	XF-X2
460-3-60	600	H1-H4	XF-X2

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

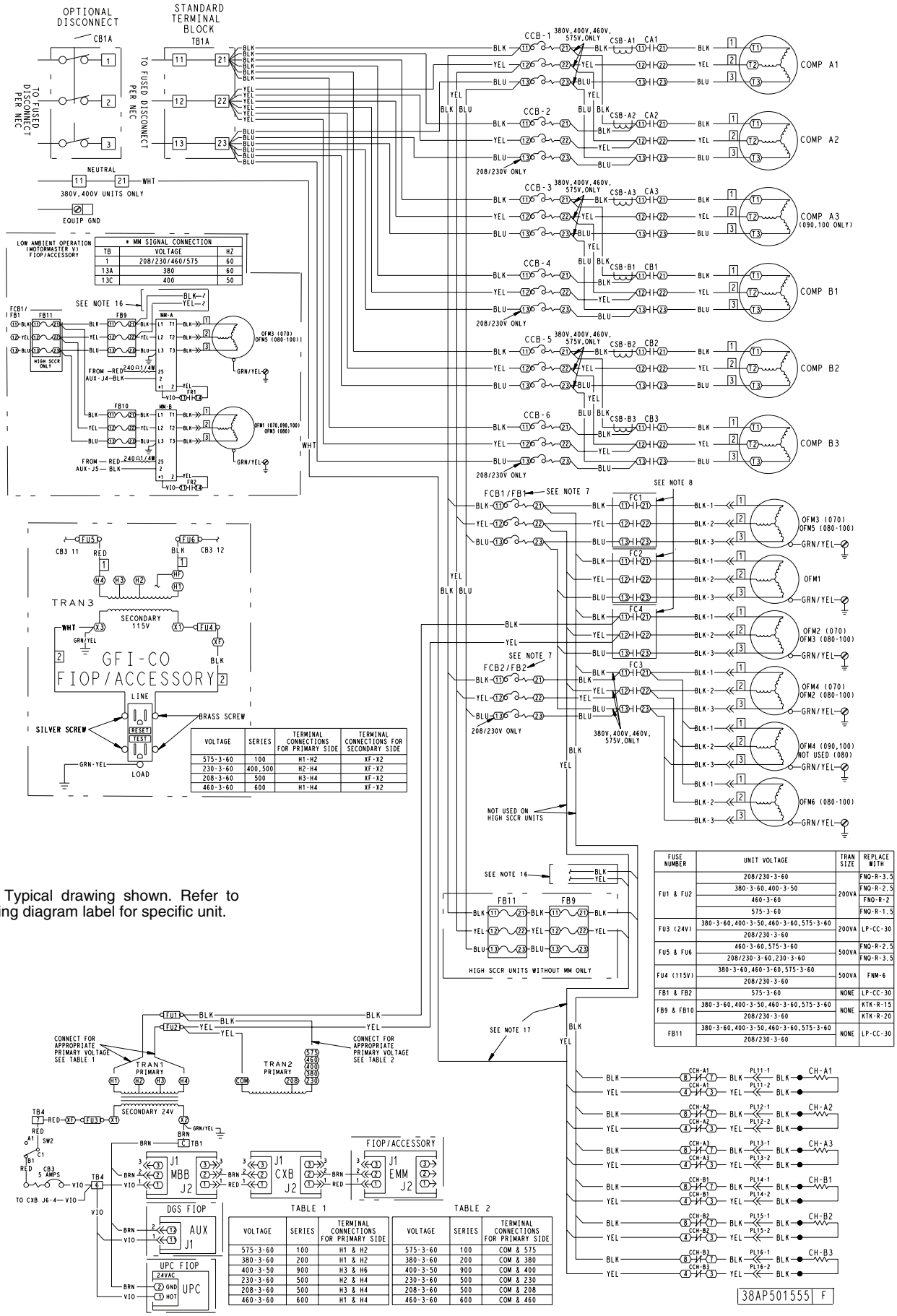
NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 7 — Power Wiring Schematic — 38APD040-060 (Typical)



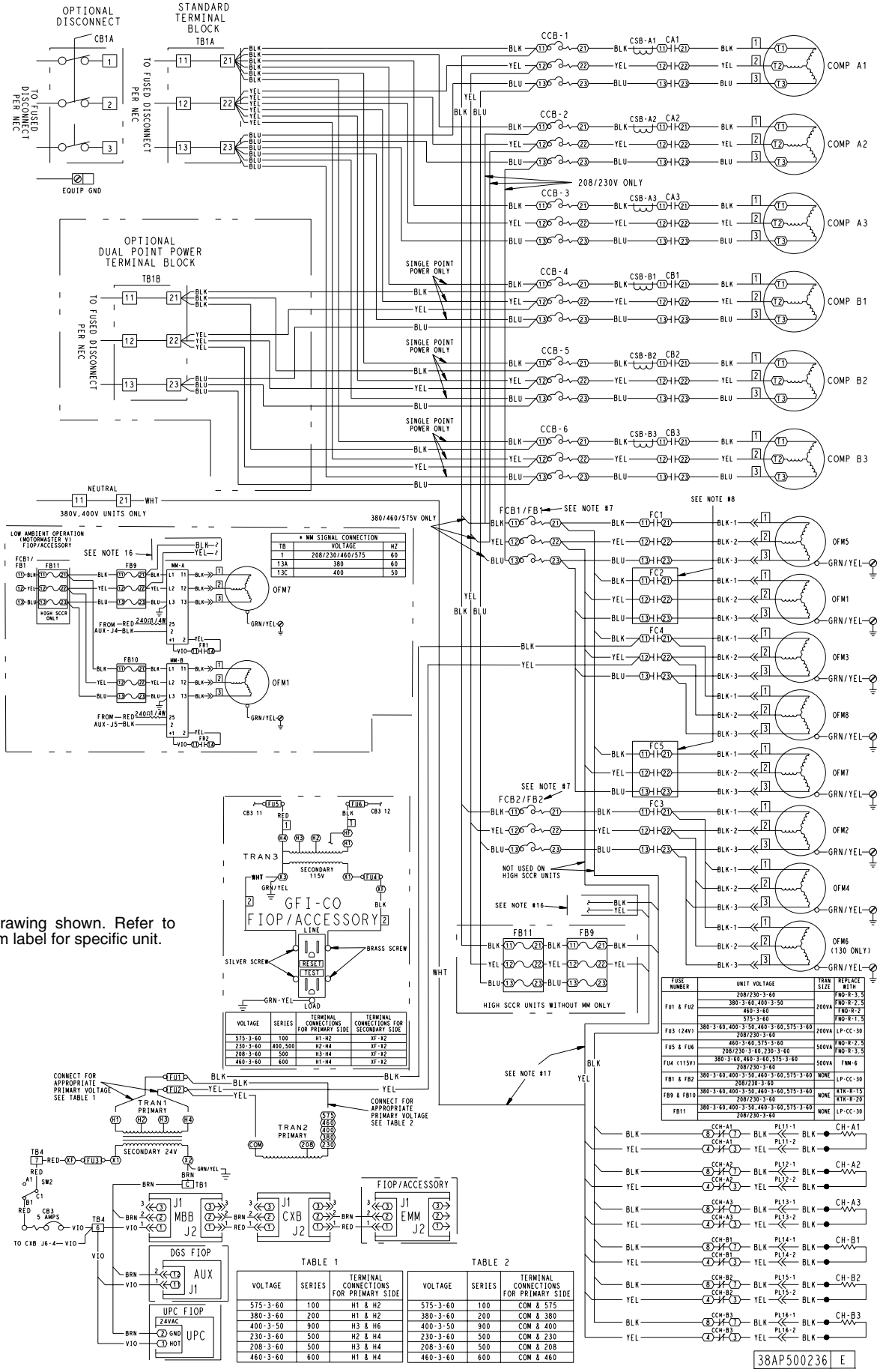
NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 8 — Power Wiring Schematic — 38APS065 (Typical)



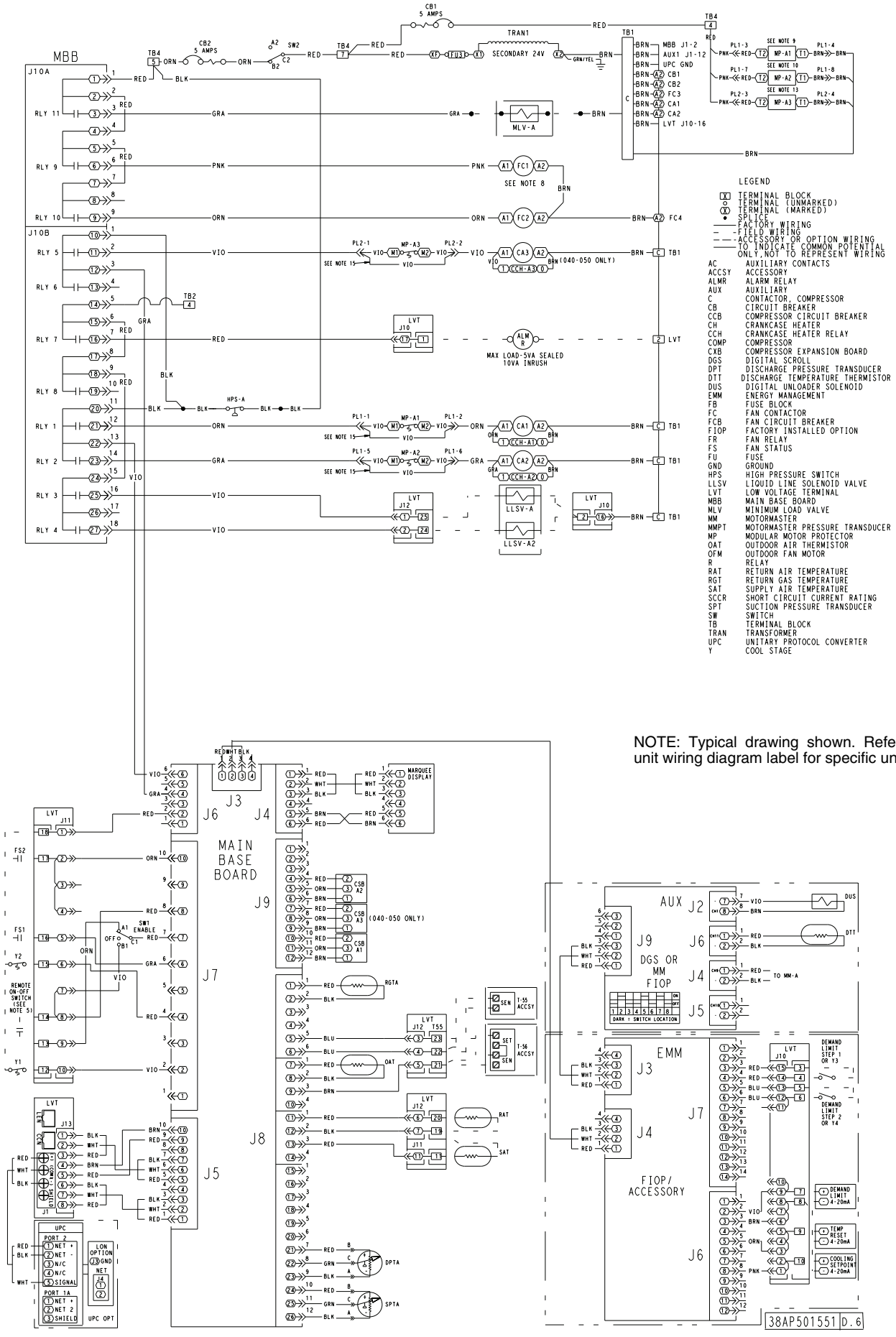
NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 9 — Power Wiring Schematic — 38APD070-100 (Typical)



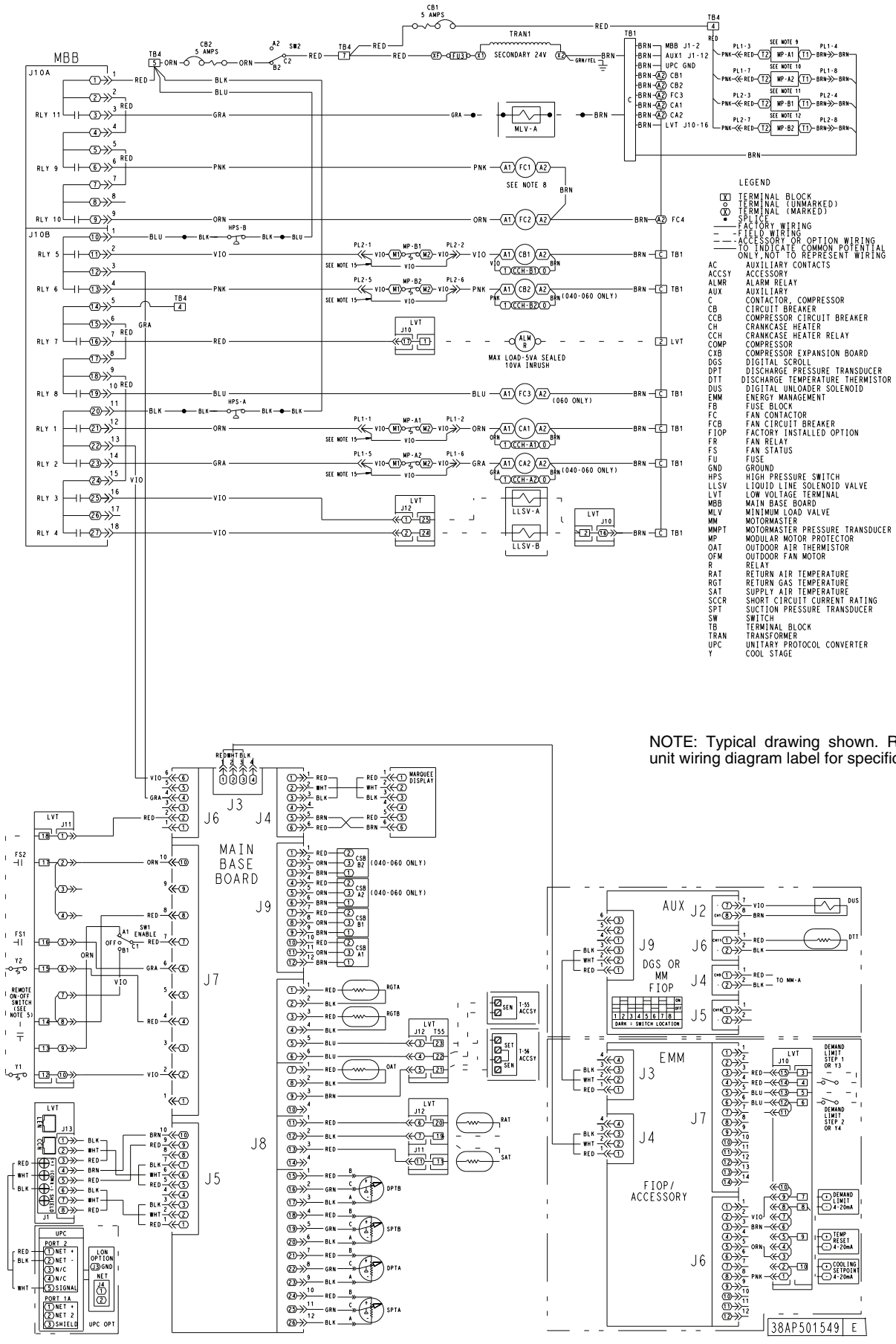
NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 10 — Power Wiring Schematic — 38APD115,130 (Typical)



NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 11 — Control Wiring Schematic — 38APS025-050 (Typical)



NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 12 — Control Wiring Schematic — 38APD025-060 (Typical)

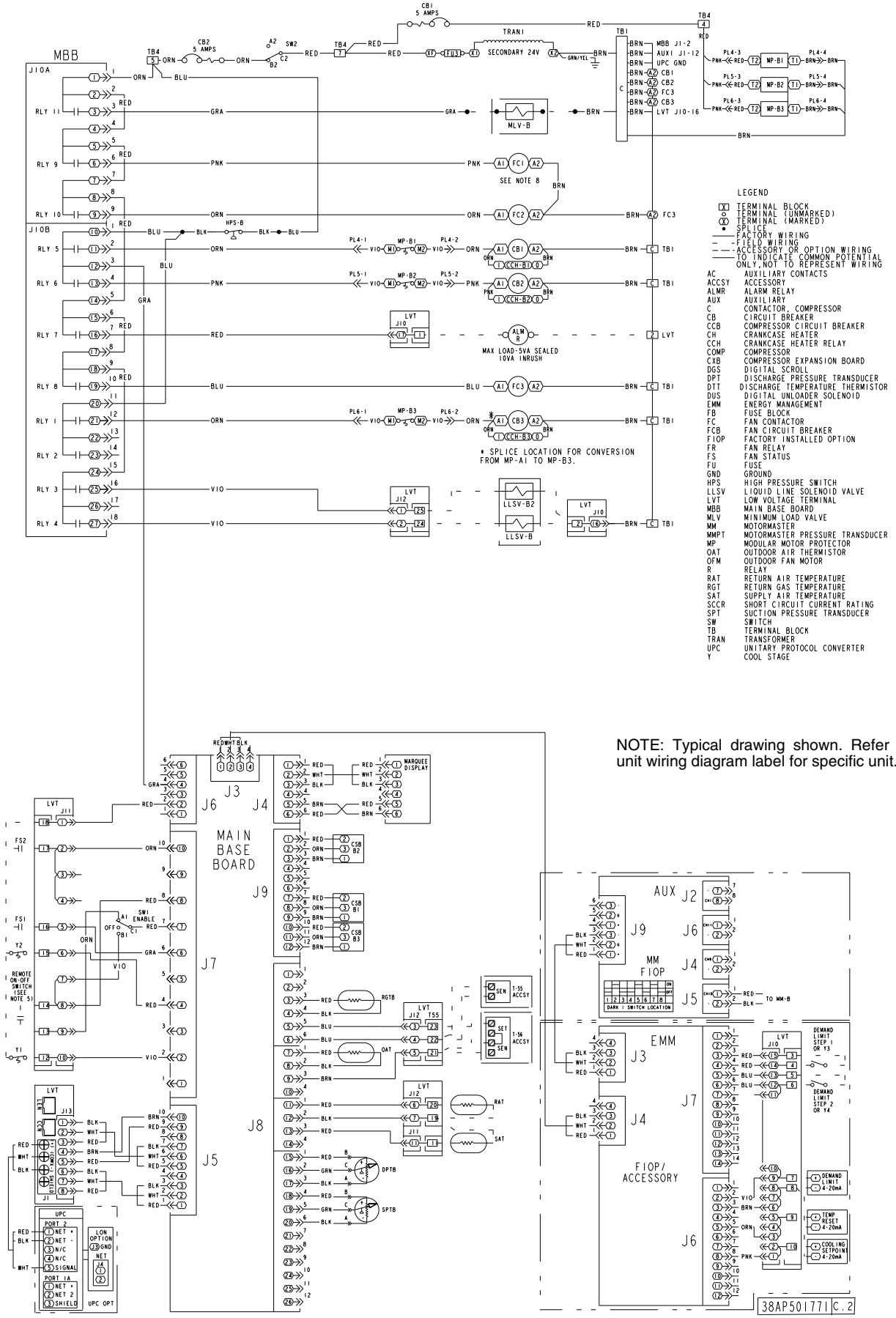
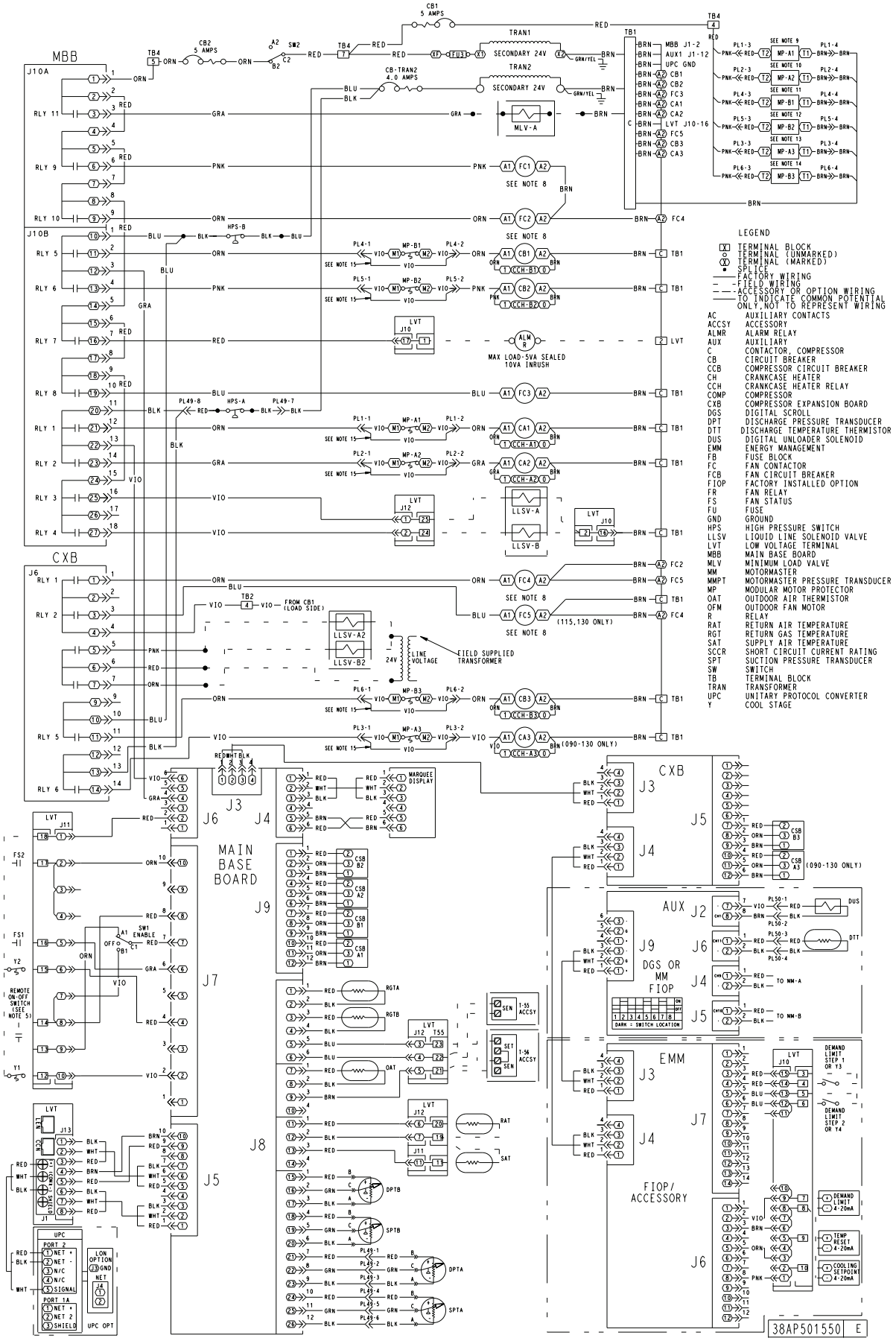


Fig. 13 — Control Wiring Schematic — 38APS065 (Typical)



NOTE: Typical drawing shown. Refer to unit wiring diagram label for specific unit.

Fig. 14 — Control Wiring Schematic — 38APD070-130 (Typical)

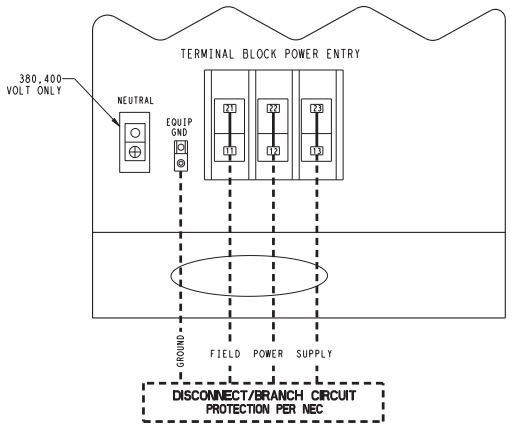
Legend and Notes for Fig. 5-14

LEGEND

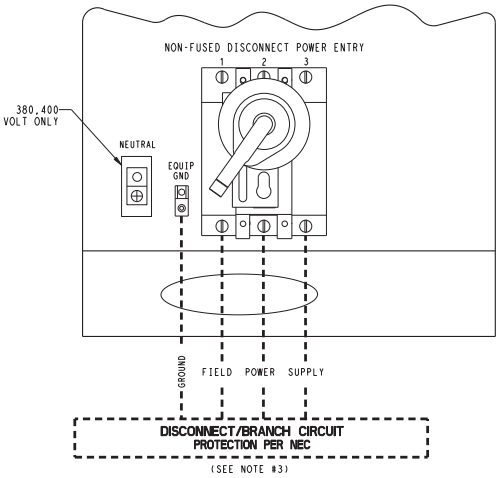
ACCSY	— Accessory
ALM	— Alarm
AMPS	— Amperes
AUX	— Auxiliary
C	— Contactor
CB	— Circuit Breaker
CCB	— Compressor Circuit Breaker
CCH	— Crankcase Heater Relay
CH	— Crankcase Heater
COMP	— Compressor
CSB	— Current Sensor Board
CXB	— Compressor Expansion Module
DGS	— Digital Scroll
DPT	— Discharge Pressure 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 diagrams in the section Capacity Control, page 64.
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 High SCCR or 575-3-60-v units, fan circuit breaker 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 accessory:
   38APD,APS025-030: Fan contactor FC1 is replaced with fan relay FR1
   38APS040-050: Fan contactor FC1 is replaced with fan relay FR1
   38APD040-060: Fan contactor FC1 is replaced with fan relay FR1
   38APD070-100: Fan contactor FC1 is replaced with fan relay FR1
   38APD070,090,100: Fan contactor FC2 is replaced with fan relay FR2
   38APD080: Fan contactor FC4 is replaced with fan relay FR2
   38APD115-130: Fan contactor FC5 is replaced with fan relay FR1; fan contactor FC2 is replaced with fan relay FR2
   38APS-065: Fan contactor FC1 is replaced with fan relay FR1
9. MP-A1 not used in the following units:
   38APD,APS025: All units
   38APD,APS027-030: 400-v, 460-v units without digital scroll
   38APS040,050 400-v, 460-v units without digital scroll
   38APD040,050: All units
   38APD 060: 400-v, 460-v units without digital scroll
   38APD070-100: 400-v, 460-v units without digital scroll
   38APD115-130: 400-v, 460-v units without digital scroll
10. MP-A2 not used in the following units:
    38APD,APS025: All units
    38APD,APS027,030: 400-v, 460-v units
    38APS040,050 400-v, 460-v units
    38APD040,050: All units
    38APD 060: 400-v, 460-v units
    38APD070-100: 400-v, 460-v
    38APD115-130: 400-v, 460-v units
11. MP-B1 not used in the following units:
    38APD,APS025: All units
    38APD,APS027,030: 400-v, 460-v units
    38APD40: All units
    38APD050,060: 400-v, 460-v units
    38APD 070: All units
    38APD080-100: 400-v, 460-v
12. MP-B2 not used in the following units:
    38APD,APS025-030: All units
    38APD40: All units
    38APD050,060: 400-v, 460-v units
    38APD070: All units
    38APD080-100: 400-v, 460-v
13. MP-A3 not used in the following units:
    38APD,APS025-030: All units
    38APS040,050 400-v, 460-v units
    38APD090,100: 400-v, 460-v
    38APD115-130: 400-v, 460-v units
14. MP-B3 not used in the following units:
    38APD,APS025-030: All units
    38APD070: All units
    38APD080-100: 400-v, 460-v
15. Jumper plug required when modular motor protector is not used.
16. High SCCR units with Motormaster controls only
17. For 380,400-v units, yellow CCH wire will connect to white neutral wire instead of terminal 22 of fuse blocks.



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. 15 — Field Power Wiring

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. 16. 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 on page 176 for further details.

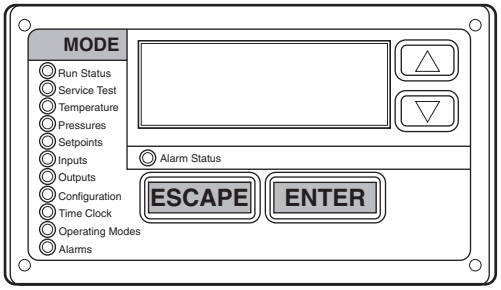


Fig. 16 — Scrolling Marquee Display

The scrolling marquee display module provides the user interface to the *Comfort*Link control system. The display has up and down arrow keys, an ENTER key, and an ESCAPE key. These keys are used to navigate through the different levels of the display structure. See Appendix A—Display Tables on page 176. 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 ENTER and ESCAPE keys simultaneously will scroll a clear language text description across the display indicating the full meaning of each display acronym. Clear language descriptions will be displayed in the language of choice (see page 22). Pressing the ENTER and ESCAPE keys when the display is blank (Mode LED level) will return the scrolling marquee display to its default menu of rotating display items, found under ***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. After a period of time with no key activity, the scrolling marquee will display its default menu of rotating display items found under ***Run Status→VIEW***.

When a specific item is located, the display will flash showing the operator, the item, the item value and then the item units (if any). Press the ENTER key 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.

NOTE: If a value has been forced, the lower right "." will be flashing.

ACCESSORY NAVIGATOR™ DISPLAY MODULE — The Navigator module (available only as a field-installed accessory) provides a mobile user interface to the *Comfort*Link control system. The display is a hand-held module with a 4-line by 40-character backlit LCD (liquid crystal diode) screen. Four keys control the display menus, which provide clear language descriptions of all menu items, operating modes, configuration points, and alarm diagnostics. A coiled extension cord capable of extending to 12 ft (5.6 m) allows the display to be moved around the condensing unit. Magnets attached to the back of the display hold the display module to any sheet metal panel to allow hands-free operation. The display module has a NEMA (National Electrical Manufacturers Association) 4x housing suitable for use in outdoor environments, and features a backlight and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module also has raised surface buttons with positive tactile response.

The Navigator 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. 17.

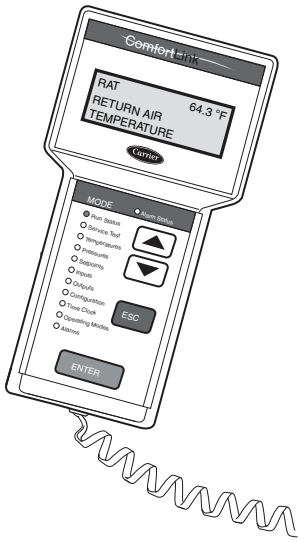


Fig. 17 — Accessory Navigator Display Module

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. Press the ESCAPE key to exit out of the expanded text mode. 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. After a period of time with no key activity, the Navigator will display its default menu of rotating display items found under ***Run Status→VIEW.***

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.

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
  PAS.E     ENBL
```

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 (Local Equipment Network) 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
  PAS.E     ENBL
```

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.

NOTE: If a value has been forced, a flashing "f" will be displayed next to the value.

Changing the Display Language — The factory default language is English. Several other languages are available, including Spanish, French, and Portugese.

REQUIRED CONFIGURATIONS — Table 3 shows the required configurations for Language Selection.

Table 3 — LANG (Language Selection) Required Configurations

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
DISP	LANG	X	Language Selection	Default: 0 Range: 0 to 3 0=English 1=Espanol 2=Francais 3=Portugese

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 Language Selection.

Changing the Units of Measure — The factory default unit of measure is English (for example, °F, ^F, psi). The display can be changed to metric units (for example, °C, ^C, kPa).

REQUIRED CONFIGURATIONS — Table 4 shows the required configurations for Metric Display.

Table 4 — METR (Metric Display) Required Configurations

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
DISP	METR	OFF/ON	Metric Display	Default: OFF OFF=English ON=Metric

NOTE: When the Metric Display (***Configuration→DISP→METR***) variable is changed, all appropriate display expansions will immediately change to the new units of measure. No power-off or control reset is required when reconfiguring Metric Display.

Configuration and Service Password — Items in the Configuration and Service Test modes are password protected. The words PASS and WORD will flash on the scrolling marquee. Press ENTER for the digits 1111 to be displayed. On the Navigator, press **Enter Password** and 1111 will be displayed. The default password is 1111. Use the arrow keys to change each number if required and press ENTER to accept the digit. Continue with the remaining digits of the password.

CHANGING SERVICE PASSWORD — The password can only be changed through CCN operator interface software such as ComfortWORKS®, ComfortVIEW™, and Service Tool. Caution should be exercised when changing the password. Once changed, the only way to determine the password is through one of these devices. To view or change the password, use the CCN Variable PASSWORD found in Service Configuration/Display.

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. See Fig. 18 and consult the CCN Contractor's Manual for further information.

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	—

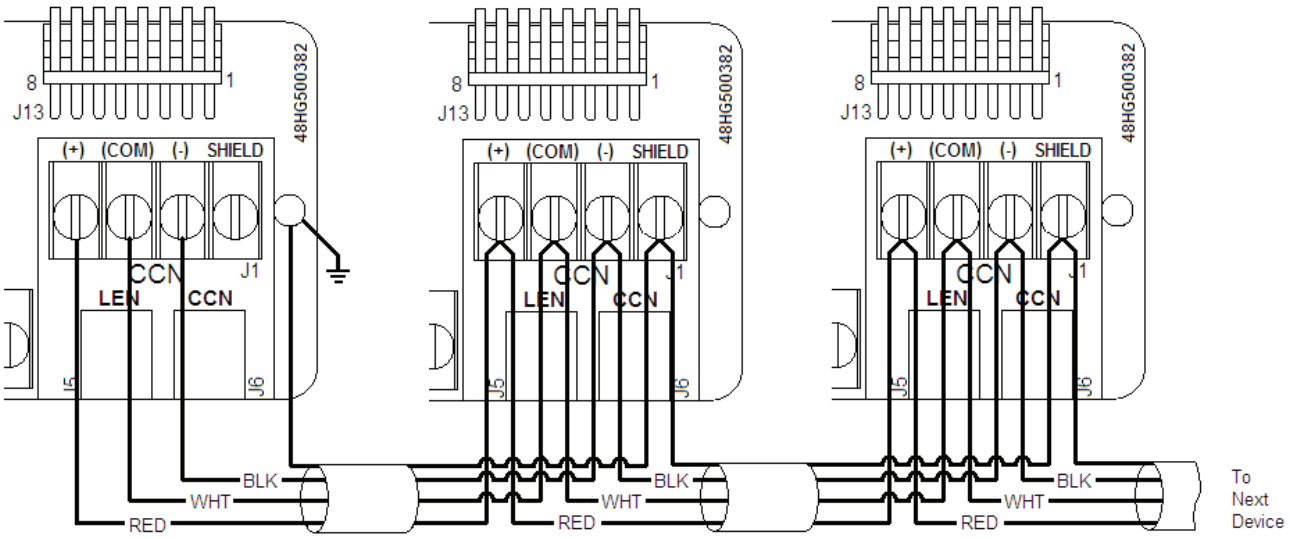


Fig. 18 — CCN Wiring Diagram

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 –4 F to 140 F (–20 C to 60 C) is required. Wire manufactured by Alpha (2413 or 5463), American (A22503), Belden (8772), or Columbia (02525) meets these 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.

*Registered trademark of Dupont.

*Comfort*Link Control Boards

CONTROL BOARD COMMUNICATION

*Comfort*Link control boards are communicating controls on the Local Equipment Network (LEN). Several light-emitting diodes (LEDs) indicate status of the board communications.

Red LED — Proper operation of the control boards can be visually checked by looking at the red status LEDs. During initial power-up the LED will signal a $^1/_2$-second blink 3 times, followed by a pause. This indicates that the processor is booting. If this pattern repeats, it is an indication that the control board is in a continuous reboot loop and the board should be replaced. 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 control is supplied with the current software. If necessary, reload current software. If the problem still persists, replace the control board. A red LED that is lit continuously or blinking at a rate of once per second or faster indicates that the control 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, except the scrolling marquee and Navigator, have a LEN LED which should be blinking whenever power is on and the device is communicating. If a particular board is installed but not required, it will not be communicating. An AUX1 board without the digital compressor or Motormaster options enabled is an example. 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 Main Base Board has one yellow LED. The Carrier Comfort Network® (CCN) LED will blink during times of network communication.

MAIN BASE BOARD (MBB) — See Fig. 19. 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. The MBB also receives the discrete inputs from

the thermostat contacts and other status switches. See Table 6. The MBB also controls several outputs. Information is transmitted between modules via a 3-wire communication bus or LEN. 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.

The Instance Jumper must be on "1."

AUX BOARD (AUX) — This control board is used with both the digital compressor and low ambient head pressure control factory-installed option or field-installed accessory. For the digital compressor option, it provides the additional input for the discharge temperature thermistor (DTT) as well as the output for the digital compressor unloader solenoid. For the load ambient head pressure control option/accessory it provides the analog signal to the head pressure control device for fan speed determination. See Fig. 20.

Addressing — The board address is set by the DIP switch S1 as follows:

SWITCH NUMBER/POSITION							
1	2	3	4	5	6	7	8
OFF	ON	OFF	OFF	ON	OFF	ON	OFF

COMPRESSOR EXPANSION MODULE (CXB) — The CXB is used only on unit sizes 070-130 to provide additional inputs and outputs for fans and compressors when the unit has more than 4 compressors. Additionally, if required refrigerant control for the second solenoid per circuit is provided from the CXB, a field-supplied 24-volt transformer to power the solenoids is required. See Fig. 21.

Addressing — The board address is set by the DIP switch S1 as follows:

SWITCH NUMBER/POSITION			
1	2	3	4
ON	ON	ON	ON

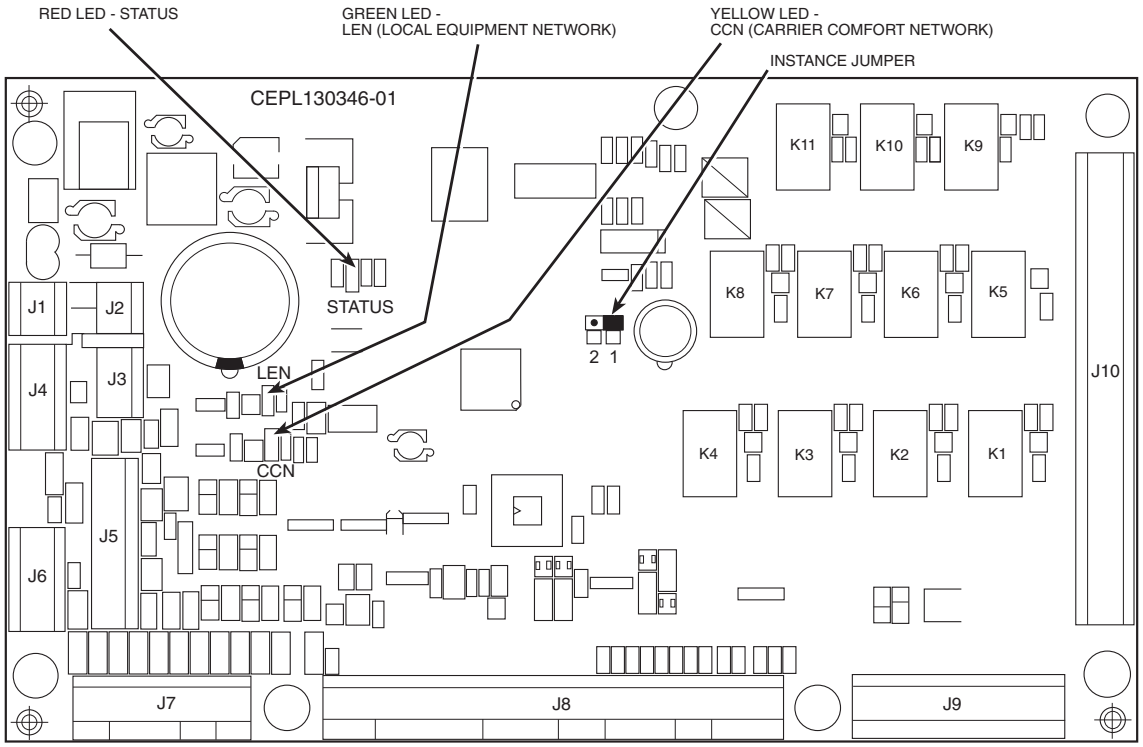


Fig. 19 — Main Base Board

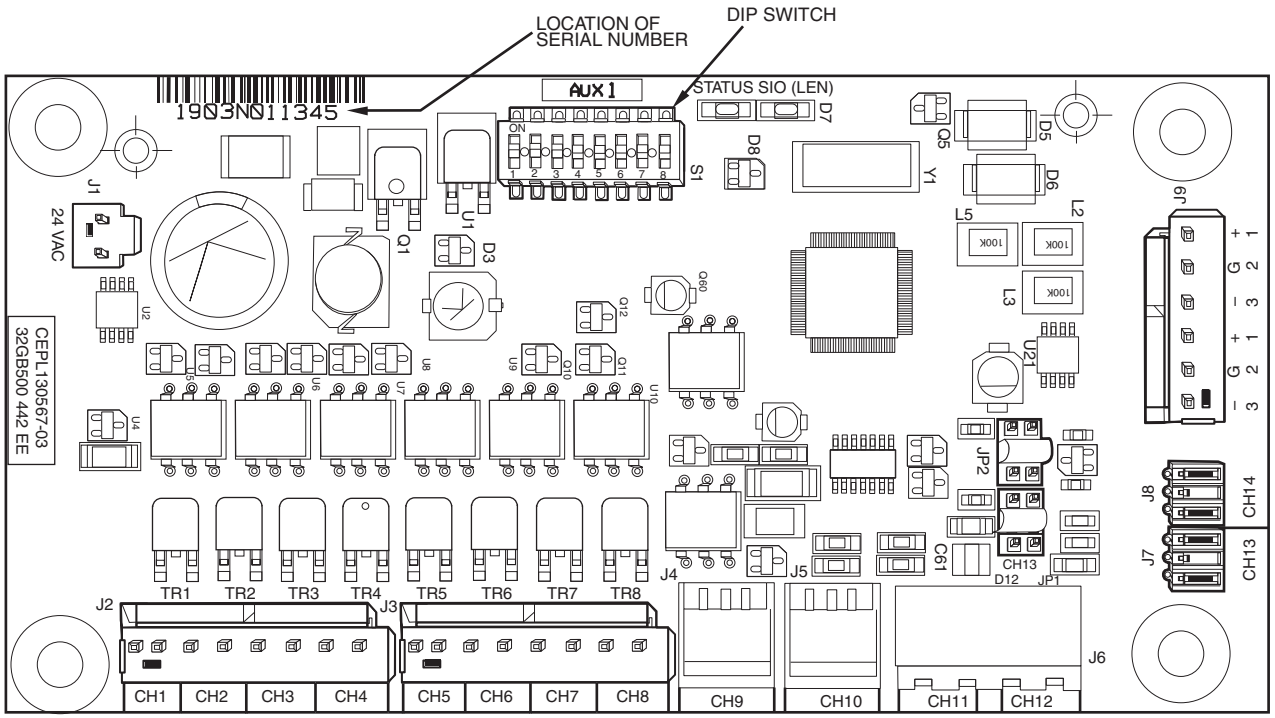


Fig. 20 — AUX Board

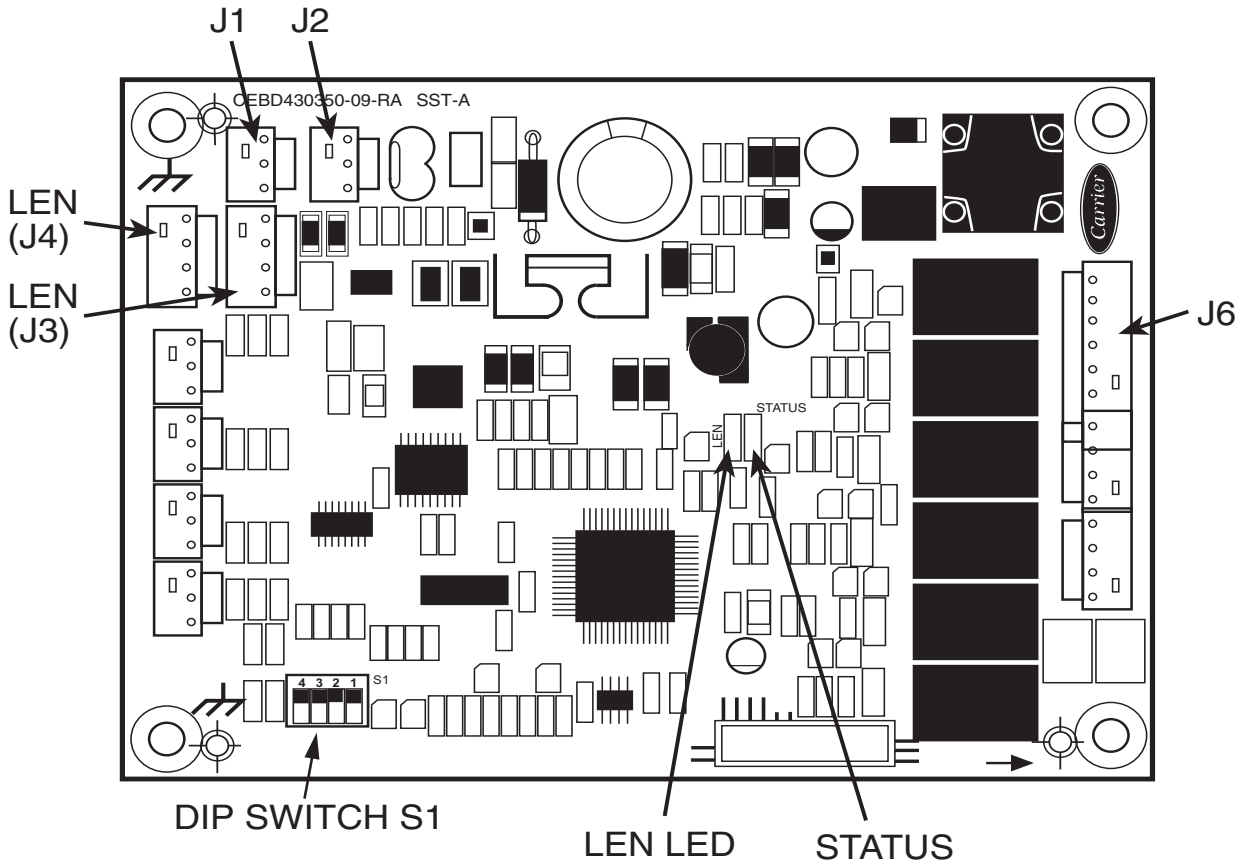


Fig. 21 — Compressor Expansion Board (CXB)

ENERGY MANAGEMENT MODULE (EMM) — The EMM module (Fig. 22) is a factory-installed option or field-installed accessory that provides inputs for various energy management or unit control functions as listed below:

- 4 to 20 mA Temperature Reset Input*
- 4 to 20 mA Cooling Set point Input*
- 4 to 20 mA Requested Cooling Capacity Input*
- 4 to 20 mA Demand Limit*
- Single or Two-Step Demand Limit Inputs†
- Discrete thermostat inputs Y3 and Y4 for Dual Thermostat Control†

*A field supplied 4 to 20 mA signal generator is required to use these options with the EMM.

†Single or Two-Step Demand Limit cannot be used in conjunction with Dual Thermostat Control, ***C.TYP*=8**.

⚠ CAUTION

Care should be taken when interfacing with other manufacturer's control systems due to 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.

Addressing — The board address is set by the DIP switch S1 as follows:

SWITCH NUMBER/POSITION			
1	2	3	4
ON	ON	ON	ON

Inputs — Several inputs are used for status signals and safeties. See Table 6.

CURRENT SENSING BOARD (CSB) — The CSB is used to monitor the status of each compressor by measuring current and providing an analog input to the main base board (MBB) or compressor expansion module (CXB). Table 7 lists CSB input connections.

ENABLE/OFF/REMOTE CONTACT SWITCH — The Enable/Off/Remote Control 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 Control 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 Control (dry contacts closed) positions, the unit is allowed to operate and respond to the scheduling configuration, CCN configuration and set point data. See Fig. 23.

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. See Fig. 23.

FAN STATUS SWITCH (FS1, FS2) — 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. The contacts must be rated for dry circuit application capable of handling a 24-vac load up to 50 mA. See Fig. 24.

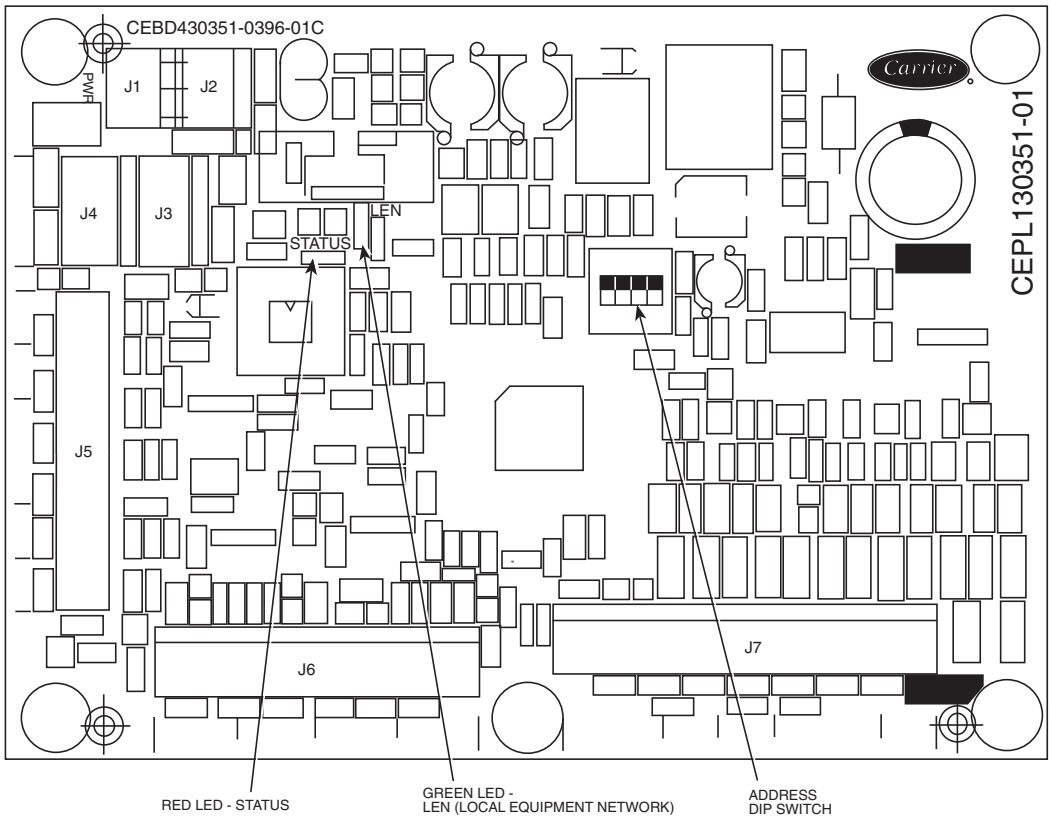


Fig. 22 — EMM Board

Table 6 — Switch Inputs

INPUT	DESIGNATION	FACTORY OR FIELD	CONNECTION POINT
CURRENT SENSING BOARD A1	CSB-A1	Factory	See Table 7
CURRENT SENSING BOARD A2	CSB-A2	Factory	
CURRENT SENSING BOARD A3	CSB-A3	Factory	
CURRENT SENSING BOARD B1	CSB-B1	Factory	
CURRENT SENSING BOARD B2	CSB-B2	Factory	
CURRENT SENSING BOARD B3	CSB-B3	Factory	
DEMAND LIMIT STEP 1		Field	LV-3,-4
DEMAND LIMIT STEP 2		Field	LV-5,-6
DISCHARGE PRESSURE TRANSDUCER A	DPTA	Factory	MBB-J8
DISCHARGE PRESSURE TRANSDUCER B	DPTB	Factory	MBB-J8
DISCHARGE TEMPERATURE THERMISTOR	DTT	Factory	See Table 9 on page 29
EMERGENCY ON/OFF SWITCH	SW2	Factory	MBB — J1 AUX — J1 UPC — 24VAC
FAN STATUS 1	FS1	Field	LVT-16,-18
FAN STATUS 2	FS2	Field	LVT-17,-18
HIGH PRESSURE SWITCH A	HPS-A	Factory	MBB-J6
HIGH PRESSURE SWITCH B	HPS-B	Factory	MBB-J6
OUTSIDE AIR TEMPERATURE THERMISTOR	OAT	Factory	See Table 9 on page 29
REMOTE ON-OFF SWITCH		Field	LVT-13,-14
REMOTE-OFF-ENABLE SWITCH	SW1	Factory	MBB-J7
RETURN AIR TEMPERATURE THERMISTOR	RAT	Field	See Table 9 on page 29
RETURN GAS TEMPERATURE THERMISTOR	RGT	Factory	See Table 9 on page 29
SPACE TEMPERATURE THERMISTOR	SPT	Field	See Table 9 on page 29
SUCTION PRESSURE TRANSDUCER A	SPTA	Factory	MBB-J7
SUCTION PRESSURE TRANSDUCER B	SPTB	Factory	MBB-J7
SUPPLY AIR TEMPERATURE THERMISTOR	SAT	Field	See Table 9 on page 29
THERMOSTAT Y1	Y1	Field	LVT-12,-18
THERMOSTAT Y2	Y2	Field	LVT-15,-18
THERMOSTAT Y3	Y3	Field	LVT-3,-4
THERMOSTAT Y4	Y4	Field	LVT-5,-6

Table 7 — Current Sensing Board (CSB) Input Connections

UNIT	38AP CURRENT SENSING BOARD CONNECTION					
	CSB-A1	**CSB-A2**	**CSB-A3**	**CSB-B1**	**CSB-B2**	**CSB-B3**
38APD025	MBB-J9	—	—	MBB-J9	—	—
38APS025	MBB-J9	MBB-J9	—	—	—	—
38APD027	MBB-J9	—	—	MBB-J9	—	—
38APS027	MBB-J9	MBB-J9	—	—	—	—
38APD030	MBB-J9	—	—	MBB-J9	—	—
38APS030	MBB-J9	MBB-J9	—	—	—	—
38APD040	MBB-J9	MBB-J9	—	MBB-J9	MBB-J9	—
38APS040	MBB-J9	MBB-J9	MBB-J9	—	—	—
38APD050	MBB-J9	MBB-J9	—	MBB-J9	MBB-J9	—
38APS050	MBB-J9	MBB-J9	MBB-J9	—	—	—
38APD060	MBB-J9	MBB-J9	—	MBB-J9	MBB-J9	—
38APS065	—	—	—	MBB-J9	MBB-J9	MBB-J9
38APD070	MBB-J9	MBB-J9	—	MBB-J9	MBB-J9	CXB-J5
38APD080	MBB-J9	MBB-J9	—	MBB-J9	MBB-J9	CXB-J5
38APD090	MBB-J9	MBB-J9	CXB-J5	MBB-J9	MBB-J9	CXB-J5
38APD100	MBB-J9	MBB-J9	CXB-J5	MBB-J9	MBB-J9	CXB-J5
38APD115	MBB-J9	MBB-J9	CXB-J5	MBB-J9	MBB-J9	CXB-J5
38APD130	MBB-J9	MBB-J9	CXB-J5	MBB-J9	MBB-J9	CXB-J5

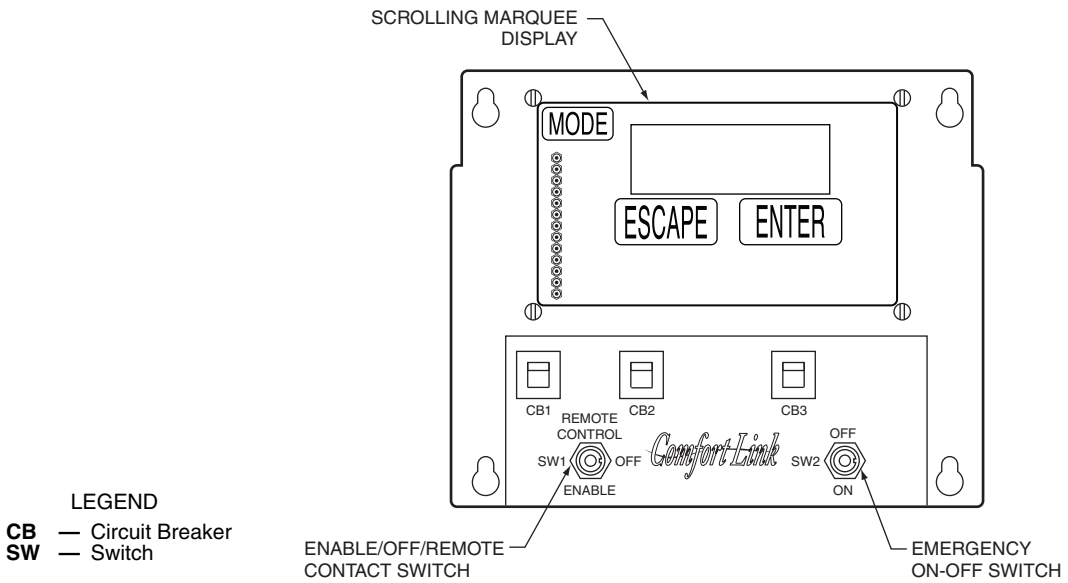


Fig. 23 — Scrolling Marquee, Enable/Off/Remote Contact Switch, and Emergency On/Off Switch Locations

HIGH PRESSURE SWITCH (HPS) — Each circuit is protected with a high pressure switch to prevent excessive condensing pressure. See the section Sensor Locations on page 32 for locations. The high pressure switch, P/N HK02ZZ001, opens at 650 ± 10 psig (4482 ± 69 kPa) and closes at 500 ± 15 psig (3447 ± 103 kPa).

PRESSURE TRANSDUCERS — 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 (–46 to 2896 kPa) while the discharge transducers have a red body with a pressure range of 14.5 to 667 psig (100 to 4599 kPa). 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. Table 8 summarizes pressure transducer characteristics.

Table 8 — Pressure Transducer Identification

TRANSDUCER	CARRIER PART NUMBER	BODY COLOR	PRESSURE RANGE, psi (kPa)
Discharge	HK05ZZ001	Red	14.5 to 667 (100 to 4599)
Suction	HK05SZ003	Yellow	–6.7 to 420 (–46 to 2896)

THERMISTORS — The electronic control uses 3 to 7 thermistors to sense temperatures for controlling unit operation. See Table 9. These sensors are outlined in the following sections. Three different thermistor curves are utilized depending on the thermistor and the configuration of the input. The three different types are 5,000 Ω at 77 F (25 C); 10,000 Ω at 77 F (25 C); and 86,000 Ω at 77 F (25 C).

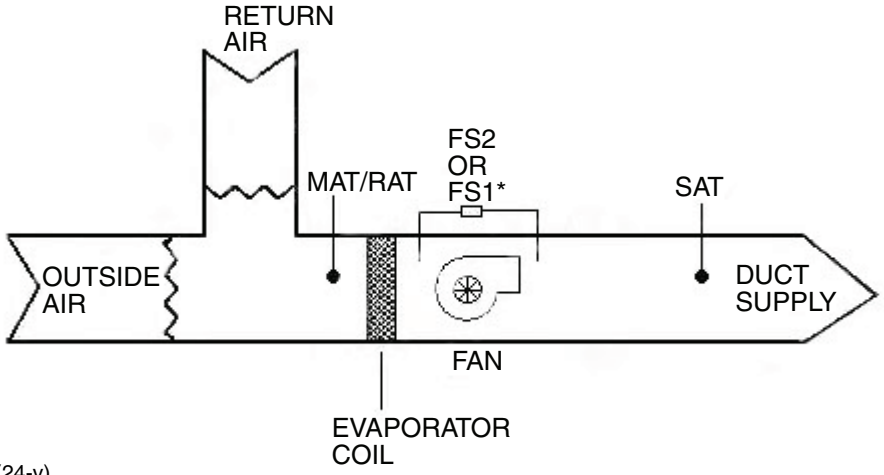
Return Air Temperature (RAT) — A return air temperature sensor (Part No. 33ZCSENSAT) is required for certain control types discussed in the section Capacity Control, beginning on page 64. The sensor is field-installed in the indoor unit and wired to the low voltage terminal (LVT) of the unit to measure the air temperature entering the evaporator coil. Sensor wiring should not be in conduit with other control voltages, or erroneous or erratic readings may result. The sensor should be located directly in front of the evaporator coil after an outside air intake. See Fig. 24.

The RAT sensor consists of a thermistor encased within a stainless steel probe. See Fig. 25. The sensor probe is 6 in. nominal length with 114 in. (2.9 m) of unshielded, 2-conductor, 18 AWG twisted-pair cables. The sensor temperature range is –40 to 245 F (–40 to 118 C) with a nominal resistance of 10,000 ohms at 77 F (25 C). The sensor has an accuracy of ±0.36 F (±0.2 C). Refer to the 38AP Installation Instructions for information on wiring.

In lieu of wiring a sensor to the 38AP controls, the MAT/RAT sensor reading can be broadcast to the unit. It is recommended that the broadcast frequency be at least once every 30 seconds. If a broadcast is not received for 3 minutes a thermistor failure alert will be generated. The broadcast should write to the CCN point, RETURN_T. Even though the MAT/RAT temperature is being broadcast, a thermistor type ***Configuration→ OPT1→RAT.T*** (RAT Thermistor Type) must be set to **0** (5,000 Ω) or **1** (10,000 Ω).

Table 9 — Thermistors

WIRING DIAGRAM DESIGNATION	THERMISTOR	FIELD CONNECTION	CONTROLLER CONNECTION	REFERENCE VOLTAGE	COMMENTS
DTT	Discharge Temperature Thermistor	Factory	AUX-J6 CH11	5.0 vdc	Digital compressor units only
OAT	Outside Air Temperature	Factory	MBB-J8-7, 8	4.0 vdc	
RAT	Return Air Temperature	LVT-19, -20	MBB-J8-11, 12	4.0 vdc	
RGTA	Return Gas Thermistor, Circuit A	Factory	MBB-J8-1, 2	4.0 vdc	Not used on 38APS065
RGTB	Return Gas Thermistor, Circuit B	Factory	MBB-J8-3, 4	4.0 vdc	38APD and 38APS065 only
SAT	Supply Air Temperature	LVT-11, -19	MBB-J8-12, 13	4.0 vdc	
T55	Space Temperature Thermistor	LVT-21, -22	MBB-J8-9, -6	4.0 vdc	
T56	Space Temperature Thermistor	LVT-21, -22	MBB-J8-9, -6	4.0 vdc	
	Space Temperature Offset	LVT-22, -23	MBB-J8-6, -5	4.0 vdc	



LEGEND

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

*FS1 or FS2 can be pressure differential switch (shown), motor current detection, or sail switch.

Fig. 24 — Mixed Air Temperature (MAT)/Return Air Temperature (RAT), Supply Air Temperature (SAT) and Fan Status Switch Sensor Layout

Supply Air Temperature (SAT) — A supply air temperature sensor is required for certain control types discussed in the section Capacity Control, beginning on page 64. The sensor is field-installed in the indoor unit and wired to the low voltage terminal (LVT) of the unit to measure the air temperature leaving the evaporator coil. Sensor wiring should not be in conduit with other control voltages, or erroneous or erratic readings may result.

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. See Fig. 24. Be sure the probe tip does not come in ontact with any of the unit surfaces.

The SAT sensor (Part No. 33ZCSENSAT) consists of a thermistor encased within a stainless steel probe. See Fig. 25. The SAT sensor probe is 6 in. (150 mm) nominal length with 114 in. (2.9 m) of unshielded, 2-conductor 18 AWG twisted-pair cables. Wiring to the device must be field-supplied. Shielded 2-conductor, 18 AWG twisted-pair cabled is required. The sensor temperature range is –40 to 245 F (–40 to 118 C) and is a Type II thermistor with a nominal resistance of 10,000 ohms at 77 F (25 C). The sensor has an accuracy of ±0.36 °F (±0.2 °C).

As an alternative to a single thermistor, an averaging sensor (Part No. HH79NZ041) can be utilized to provide the supply air temperature to the 38AP controls. See Fig. 26. This sensor consists of 9 individual sensors wired within a 24 ft (7.3 m) flexible copper tube. Wiring to the device must be field supplied. Shielded 2-conductor, 18 AWG twisted-pair cabled is required. The sensor temperature range is –40 to 245 F (–40 to 118 C) and is a Type II thermistor with a nominal resistance of 10,000 ohms at 77 F (25 C). The sensor has an accuracy of ±0.36 °F (± 0.2 °C).

In lieu of wiring a sensor to the 38AP controls, the SAT sensor reading can be broadcast to the unit. It is recommended that the broadcast frequency be at least once every 30 seconds. If a broadcast is not received for 3 minutes a thermistor failure alert will be generated. The broadcast should write to the CCN point, SUPPLY_T. Even though the SAT temperature is being broadcast, a thermistor type ***Configuration→OPT1→SAT.T*** (SAT Thermistor Type) must be set to **0** (5,000 Ω) or **1** (10,000 Ω).

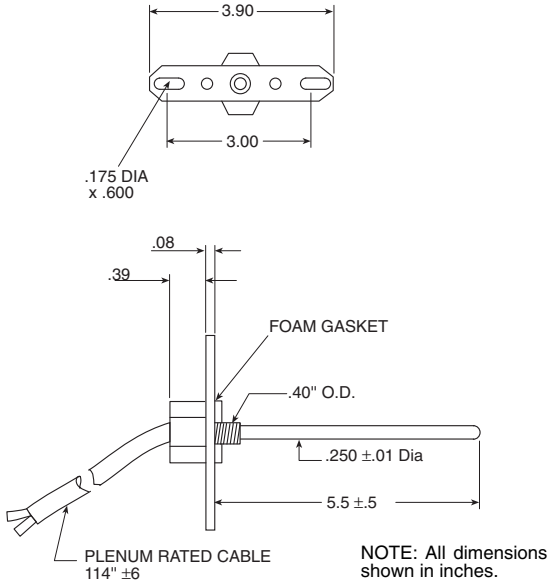


Fig. 25 — 33ZCSENSAT Sensor

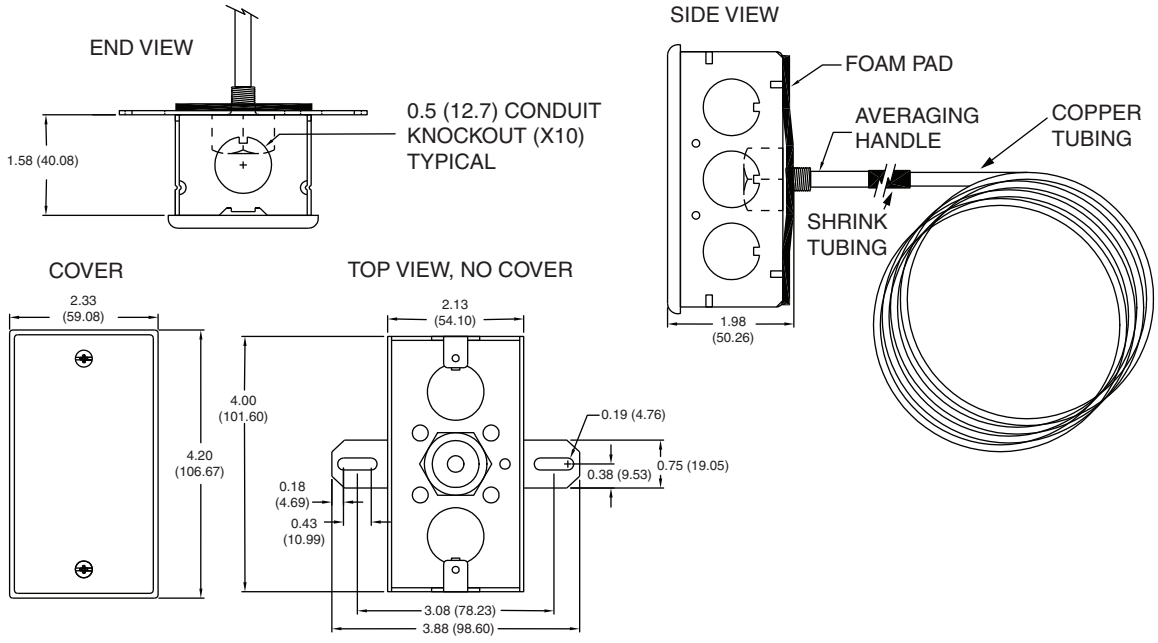


Fig. 26 — HH79NZ041 Averaging Sensor

Return Gas Temperature (RGT) — These sensors are factory installed in a friction fit well located in the suction line of each circuit. The sensor is a 5,000 Ω at 77 F (25 C) thermistor connected to the main base board. These thermistors are used in the suction superheat calculations. The thermistor must be insulated with cork tape insulation to reduce the effects of ambient temperature on the sensor.

Outdoor-air Temperature Sensor (OAT) — This sensor is factory installed on a bracket which is inserted through the base pan of the unit on unit sizes 025-060 (see the section Sensor Locations on page 32) or mounted to the back of the control box on the unit sizes 065-130. This sensor is a 5,000 Ω thermistor at 77 F (25 C) connected to the main base board.

Outside Air Temperature can be forced to a value at the scrolling marquee or Navigator device. To force the value, access the parameter ***Temperatures→UNIT→OAT***. Press ENTER to view the current value. Press ENTER again and use the up and down arrow keys to display the desired value; then press ENTER to accept the value. On the scrolling marquee, the "." in the lower right corner will flash. On the Navigator device, a flashing "f" will be displayed next to the value. To clear the forced value, press ENTER followed by the up and down arrow keys simultaneously. The value will revert to the actual reading and the flashing "." or "f" will be removed.

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. The thermistor must be insulated with cork tape insulation to reduce the effects of ambient temperature on the sensor. 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 an 86,000 Ω at 77 F (25 C) thermistor connected to the AUX board (see Table 9).

Space Temperature Sensor (T55, T56) — Space temperature sensors are used to measure the interior temperature of a building.

Space Temperature can be forced to a value at the scrolling marquee or Navigator device. To force the value, access the parameter ***Temperatures→UNIT→SPT***. Press ENTER to view the current value. Press ENTER again and use the up and down arrow keys to display the desired value; then press ENTER to accept the value. On the scrolling marquee, the "." in the lower right corner will flash. On the Navigator device, a flashing "f" will be displayed next to the value. To clear the forced value, press ENTER followed by the up and down arrow keys simultaneously. The value will revert to the actual reading and the flashing "." or "f" will be removed.

The following three types of SPT sensors are available:

- Space temperature sensor (33ZCT55SPT) with timed override button (see Fig. 27)
- Space temperature sensor (33ZCT56SPT) with timed override button and set point adjustment (see Fig. 28)
- Space temperature sensor (33ZCT59SPT) with occupancy override button, space temperature offset, and LCD (liquid crystal display) display (see Fig. 29)

All of the above sensors are 10,000 Ω at 77 F (25 C), Type II thermistors and are connected to the low voltage terminal (LVT). The sensor should be mounted approximately 5 ft (1.5 m) from the floor in an area representing the average temperature in the space. Allow at least 4 ft (1.2 m) between the sensor and any corner. Mount the sensor at least 2 ft (0.6 m) from an open doorway.

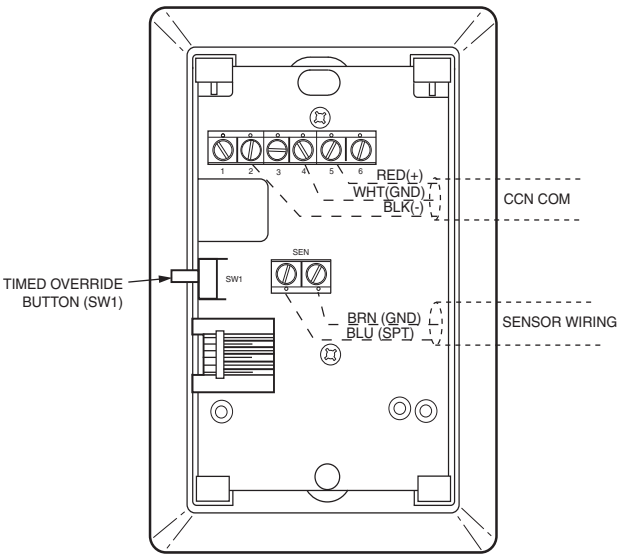


Fig. 27 — Space Temperature Sensor Typical Wiring (33ZCT55SPT)

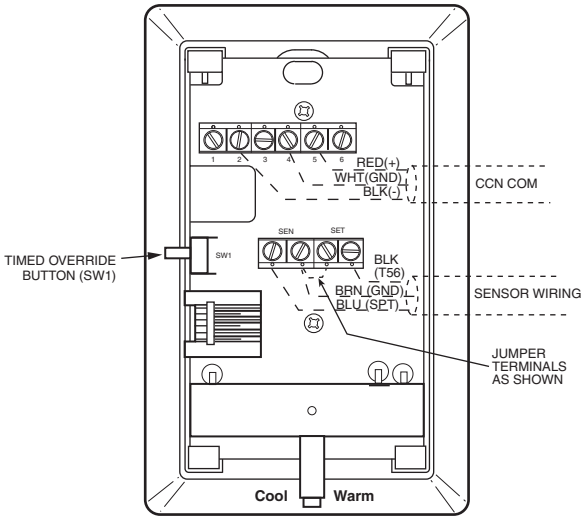


Fig. 28 — Space Temperature Sensor Typical Wiring (33ZCT56SPT)

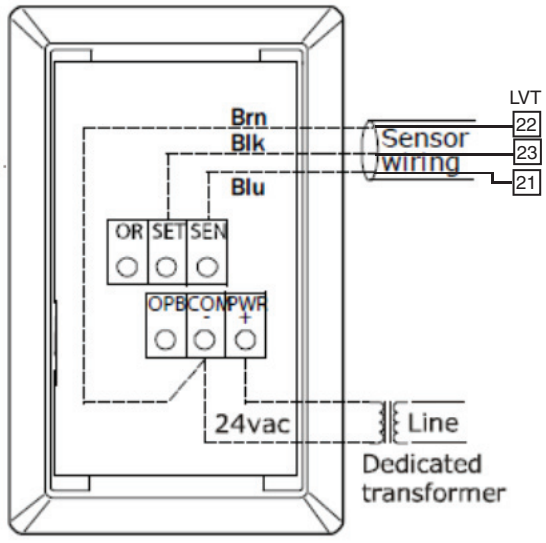


Fig. 29 — Space Temperature Sensor Typical Wiring (33ZCT59SPT)

To connect the space temperature sensor (Fig. 30):

1. Use a 20 gage wire to connect the sensor to the controller. The wire is suitable for distances of up to 500 ft (152 m). 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. Sensor wiring should not be in conduit wth other control voltages, or erroneous or erratic readings may result.
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. 31):

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 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.

In lieu of a single sensor providing space temperature, an averaging sensor array of either 4 or 9 sensors may be employed to provide a space temperature as shown in Fig. 32. With this control scheme, only T55 space temperature sensors (P/N 33ZCT55SPT) can be used. Total sensor wiring must not exceed 1,000 ft (305 m). Do not use T56 space temperature sensors (P/N 33ZCT56SPT) for space temperature averaging because the 5-degree offset function will not work in a multiple sensor application.

NOTE: The Timed Override feature from a space temperature sensor requires a single space temperature sensor connected to the unit. This feature does not function when used with averaging space temperature sensor arrays.

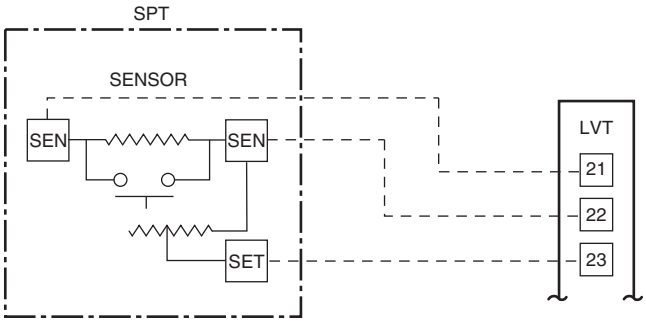


Fig. 30 — Typical SPT Wiring

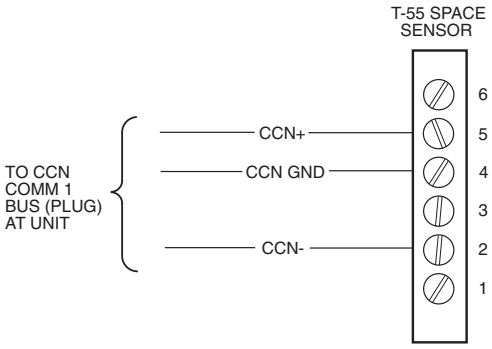
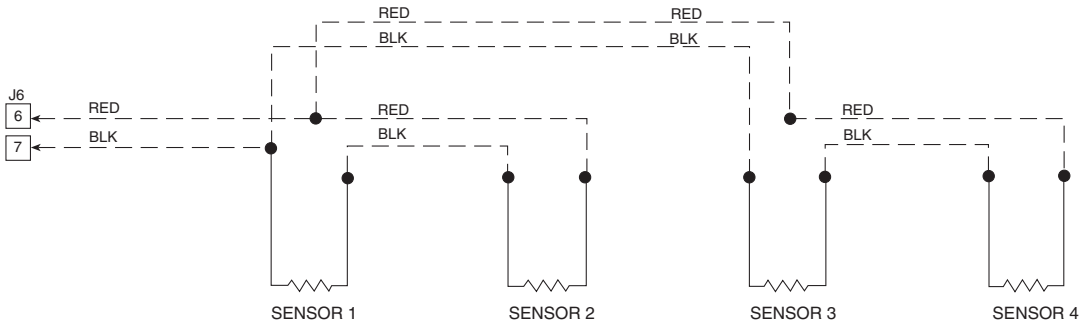


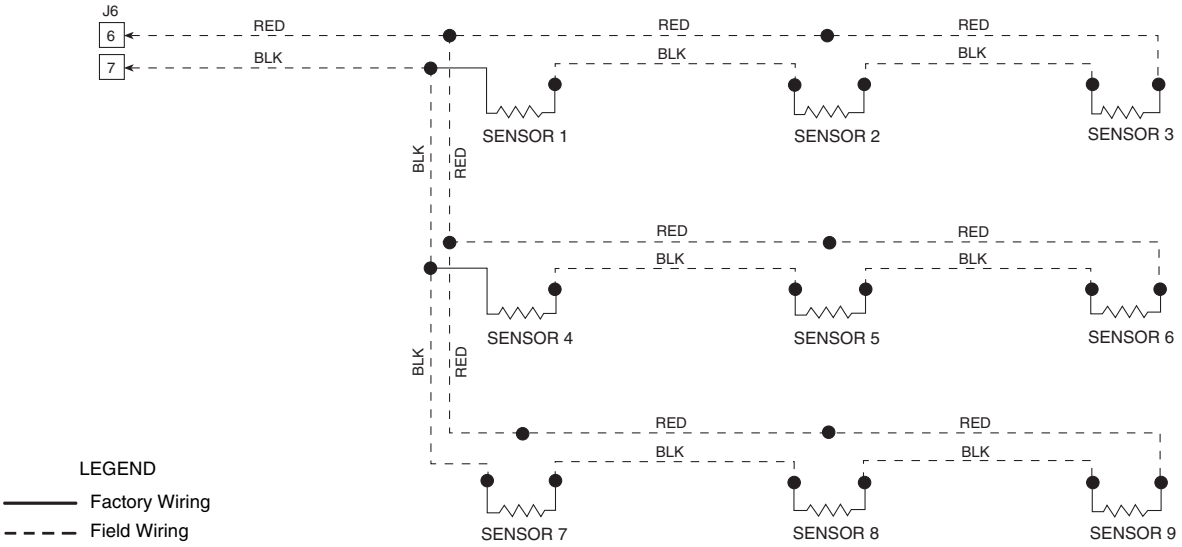
Fig. 31 — CCN Communications Bus Wiring to Optimal Space Sensor RJ11 Connector

THERMOSTAT INPUT — A two-stage thermostat can be used for constant volume applications to provide Y1 and Y2 cooling inputs. A thermostat can also be used in a variable air volume application to determine supply air set point with Y1 and Y2 cooling inputs. For dual circuit machines, two separate systems can be controlled independently from two 2-stage thermostats. Y1 and Y2 cooling inputs control circuit A. Y3 and Y4 cooling inputs control circuit B. Thermostat connections depend on the machine control type which is discussed later in this book.

Sensor Locations — See Fig. 33-49.

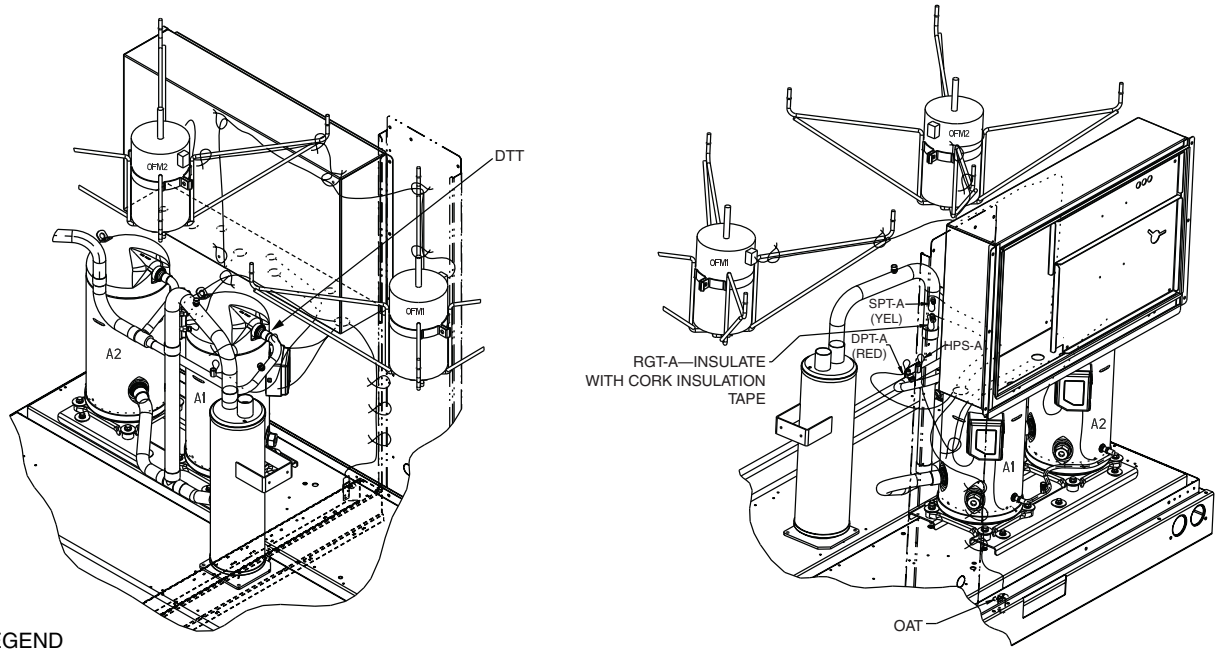


SPACE TEMPERATURE AVERAGING — 4 SENSOR APPLICATION



SPACE TEMPERATURE AVERAGING — 9 SENSOR APPLICATION

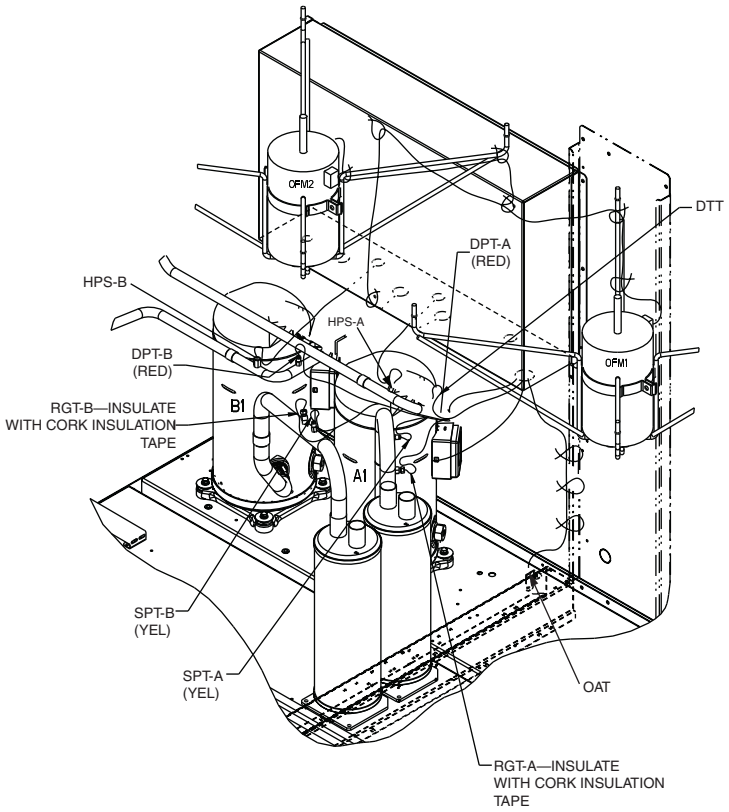
Fig. 32 — Space Temperature Averaging



LEGEND

DPT — Discharge Pressure Transducer
DTT — Discharge Temperature Thermistor
OAT — Outside Air Temperature Thermistor
OFM — Outdoor Fan Motor
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

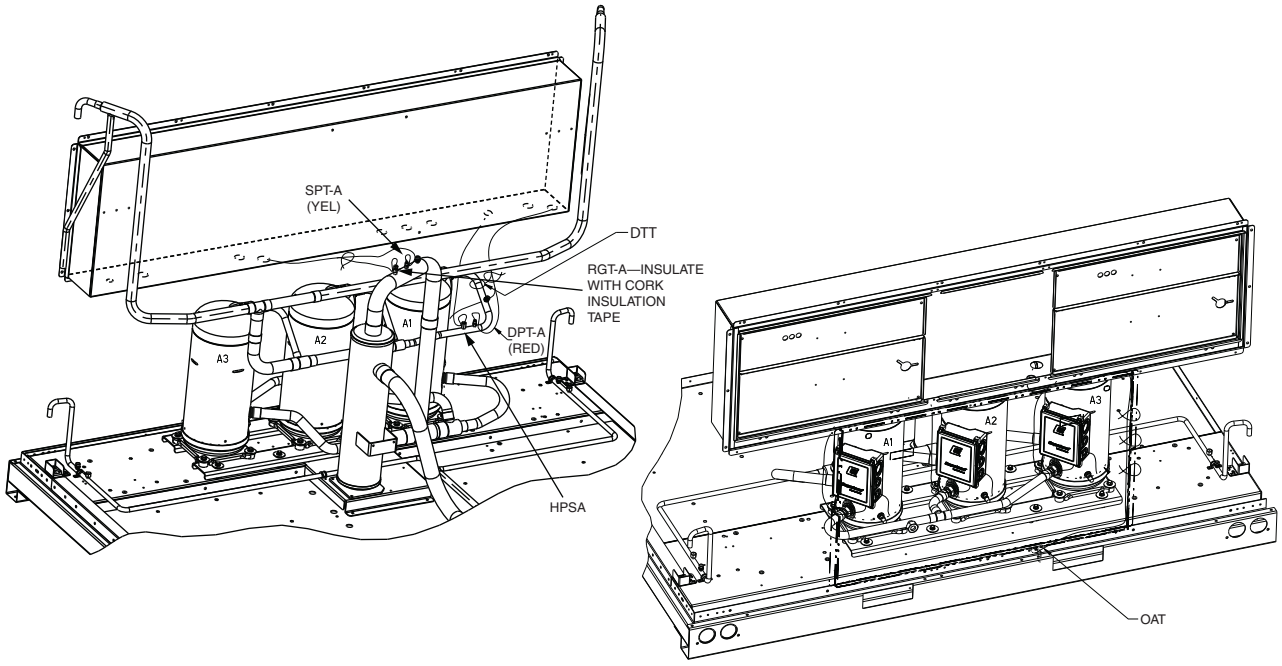
Fig. 33 — 38APS025, 027, 030 Sensor Locations



LEGEND

DPT — Discharge Pressure Transducer
DTT — Discharge Temperature Thermistor
HPS — High Pressure Switch
OAT — Outside Air Temperature Thermistor
OFM — Outdoor Fan Motor
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

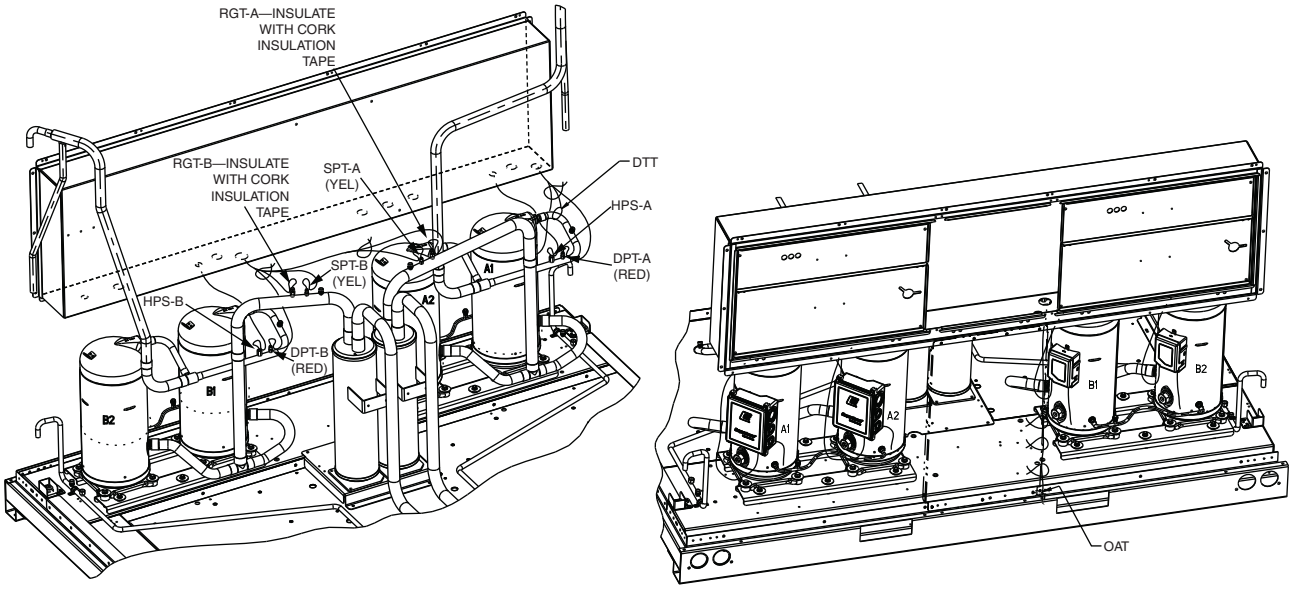
Fig. 34 — 38APD025, 027, 030 Sensor Locations



LEGEND

DPT — Discharge Pressure Transducer
DTT — Discharge Temperature Thermistor
HPS — High Pressure Switch
OAT — Outside Air Temperature Thermistor
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

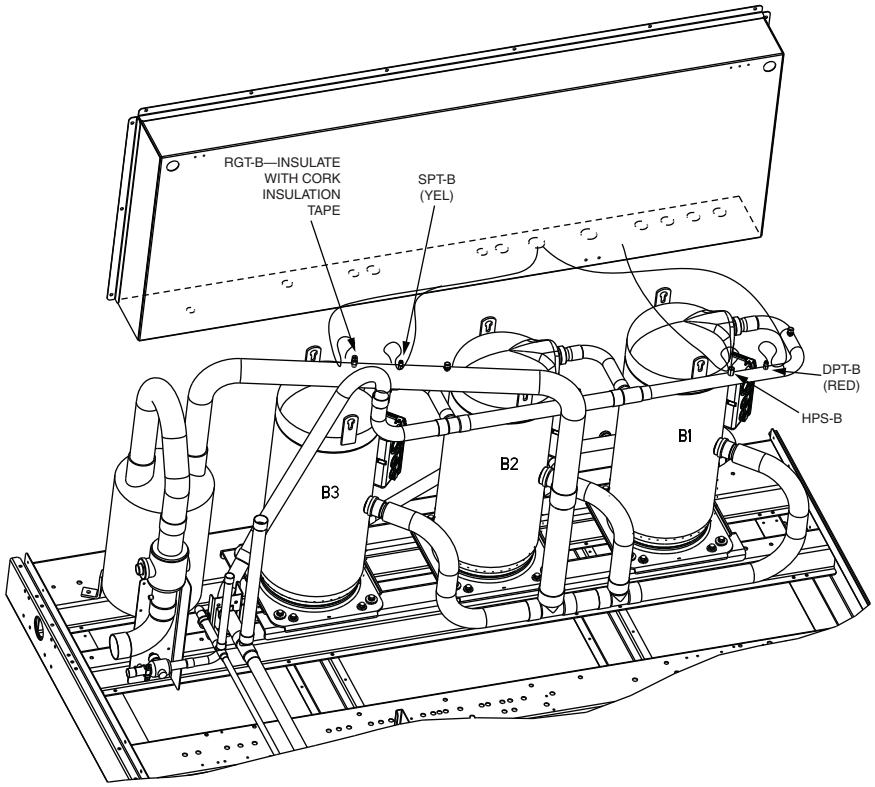
Fig. 35 — 38APS040, 050 Sensor Locations



LEGEND

DPT — Discharge Pressure Transducer
DTT — Discharge Temperature Thermistor
HPS — High Pressure Switch
OAT — Outside Air Temperature Thermistor
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

Fig. 36 — 38APD040, 050, 060 Sensor Locations

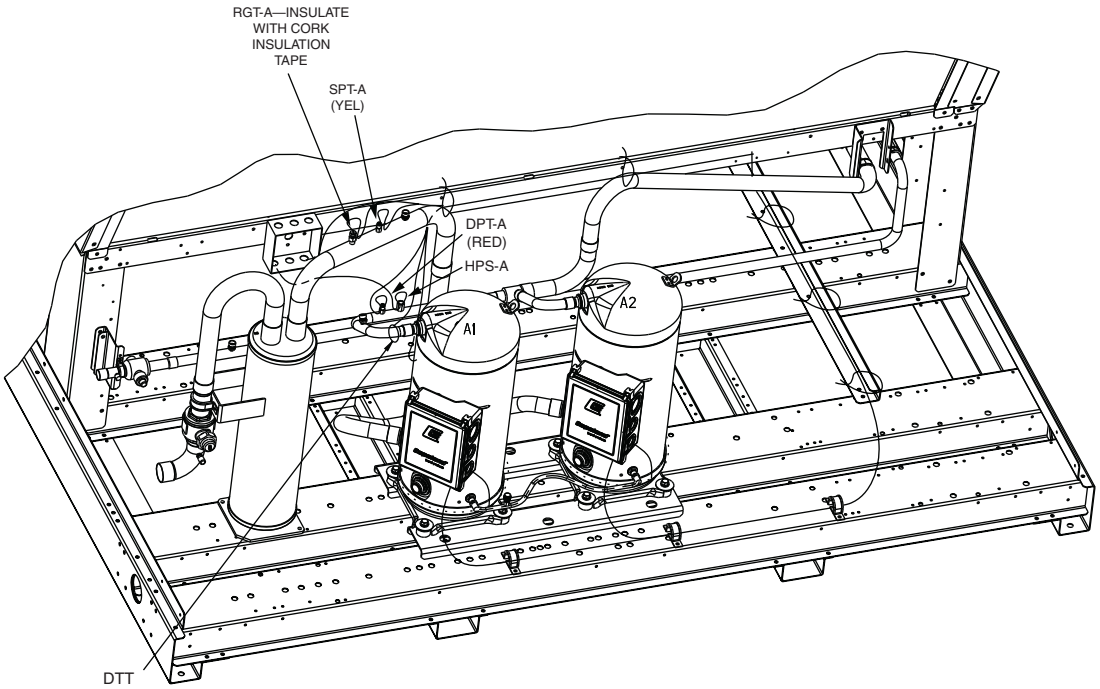


LEGEND

DPT — Discharge Pressure Transducer
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

NOTE: For OAT location, see Fig. 44.

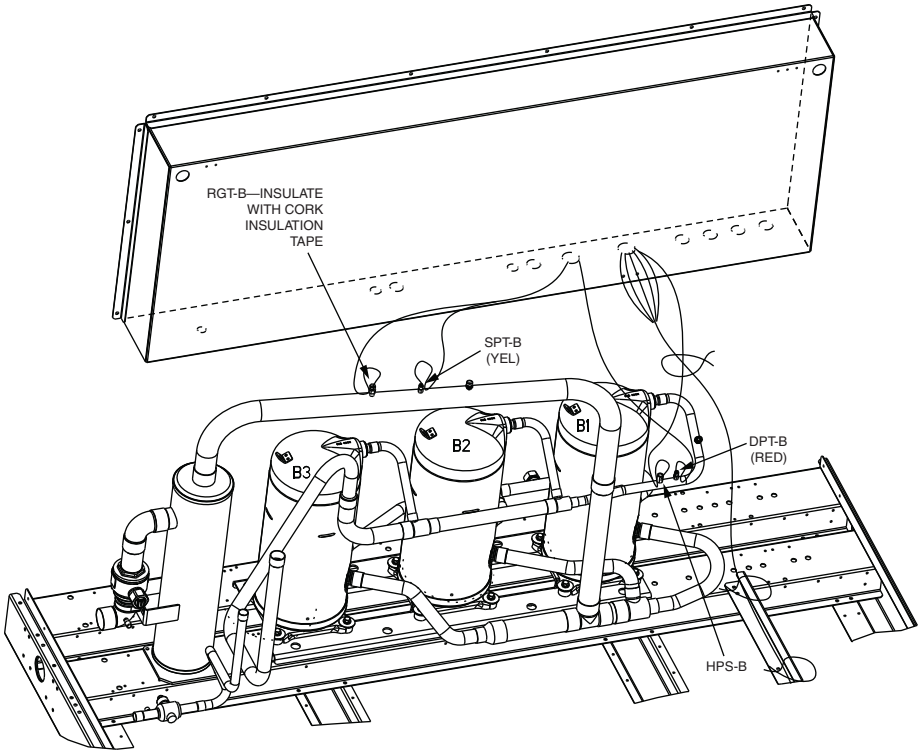
Fig. 37 — 38APS065 Sensor Locations



LEGEND

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

Fig. 38 — 38APD070,080 Sensor Locations, Circuit A

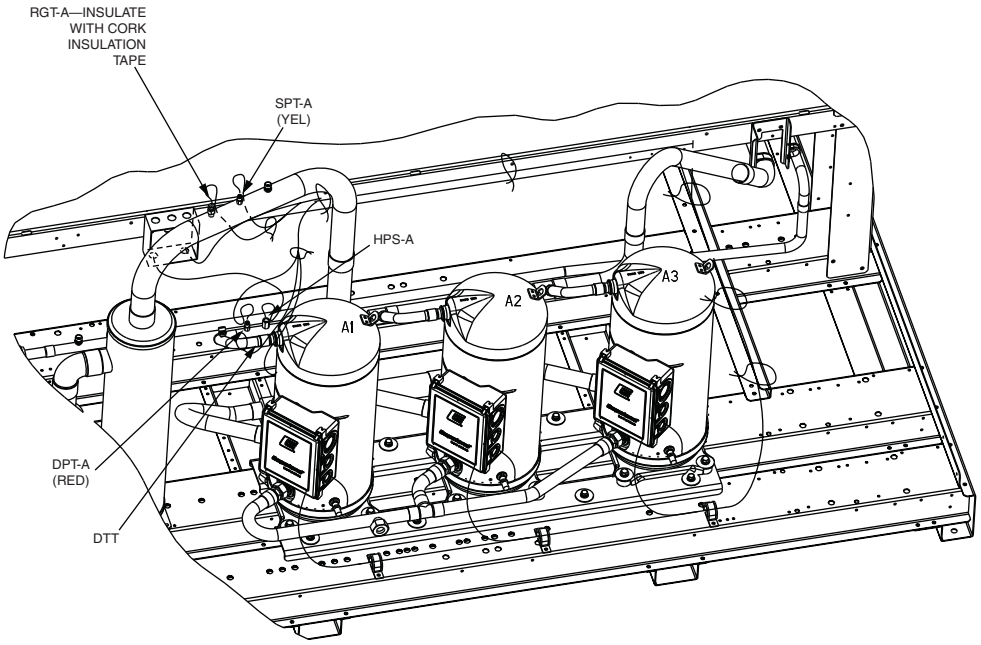


LEGEND

DPT — Discharge Pressure Transducer
HPS — High Pressure Switch
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

NOTE: For OAT location, see Fig. 44.

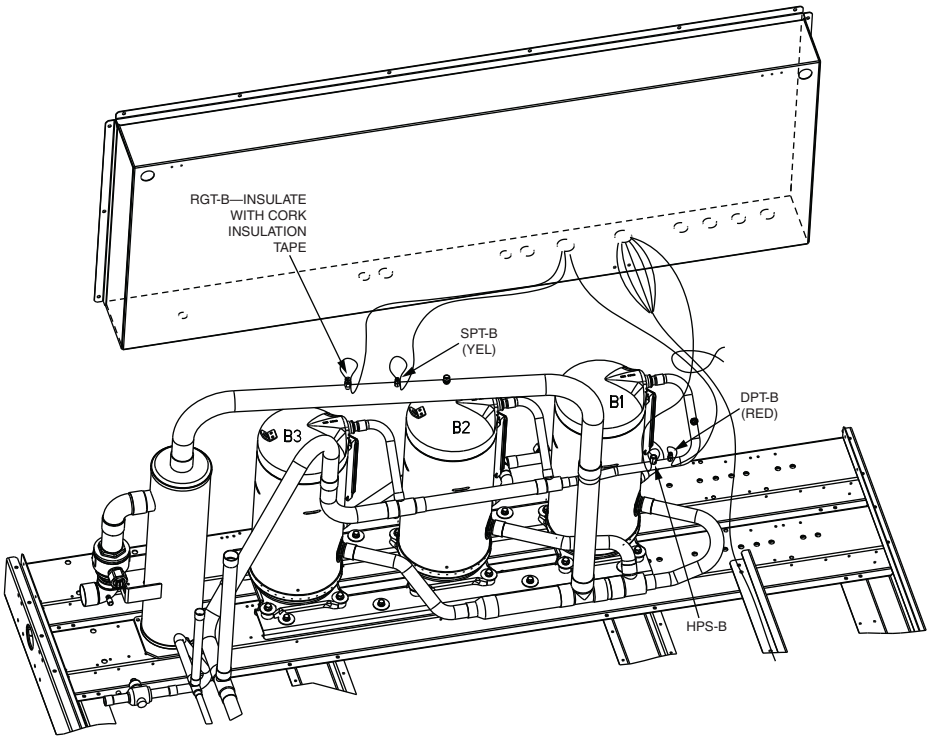
Fig. 39 — 38APD070 Sensor Locations, Circuit B



LEGEND

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

Fig. 40 — 38APD090, 100 Sensor Locations Circuit A

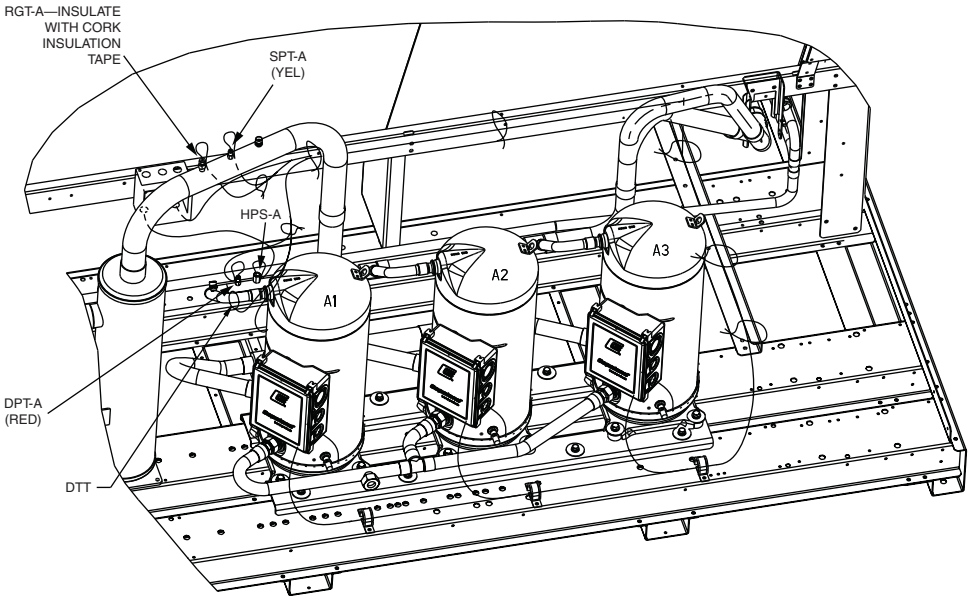


LEGEND

DPT — Discharge Pressure Transducer
HPS — High Pressure Switch
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

NOTE: For OAT location, see Fig. 44.

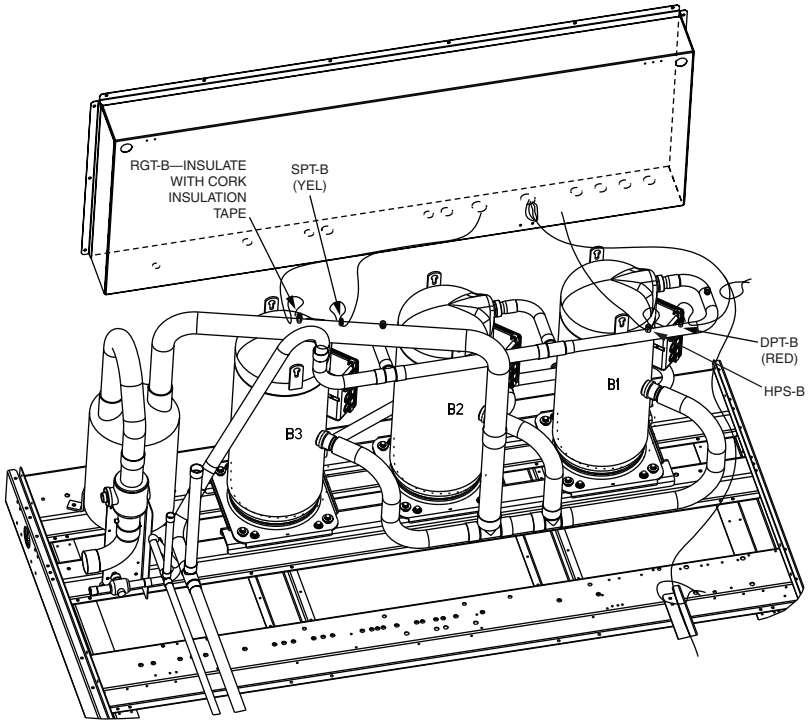
Fig. 41 — 38APD080, 090, 100 Sensor Locations Circuit B



LEGEND

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

Fig. 42 — 38APD115, 130 Sensor Locations Circuit A

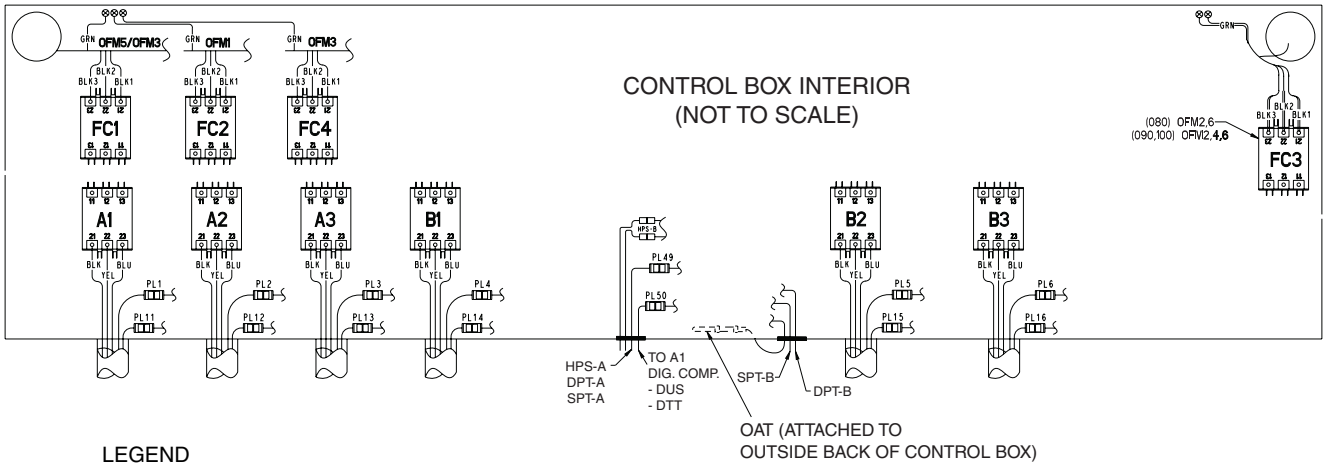


LEGEND

DPT — Discharge Pressure Transducer
HPS — High Pressure Switch
RGT — Return Gas Thermistor
SPT — Suction Pressure Transducer

NOTE: For OAT location, see Fig. 44.

Fig. 43 — 38APD115, 130 Sensor Locations Circuit B



LEGEND

DPT — Discharge Pressure Transducer
DTT — Discharge Temperature Thermistor
DUS — Digital Unloaded Solenoid
HPS — High Pressure Switch
OAT — Outside Air Temperature Thermistor
OFM — Outside Fan Motor
SPT — Suction Pressure Transducer

Fig. 44 — 38APS065, 38APD070-130 OAT Location (38APD080-100 Shown)

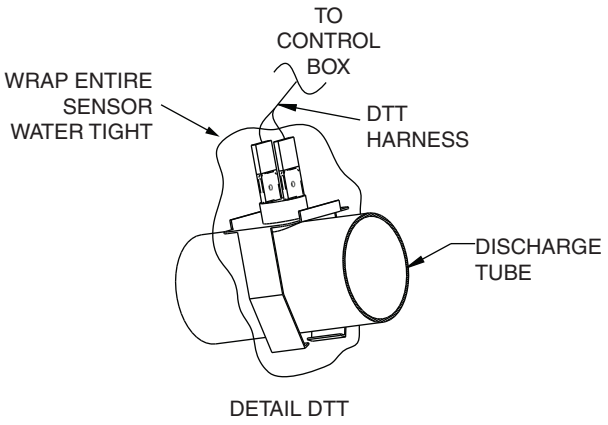
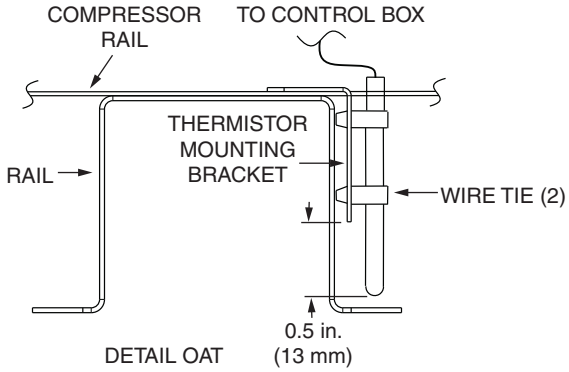


Fig. 45 — Discharge Temperature Thermistor (DTT) Mounting



NOTE: SECURE OAT WITH TWO TIES. INSERT ASSEMBLY INTO BASE HOLE AND SECURE WITH SCREW.

Fig. 46 — Outdoor Air Temperature (OAT) Thermistor Mounting, 38AP025-060

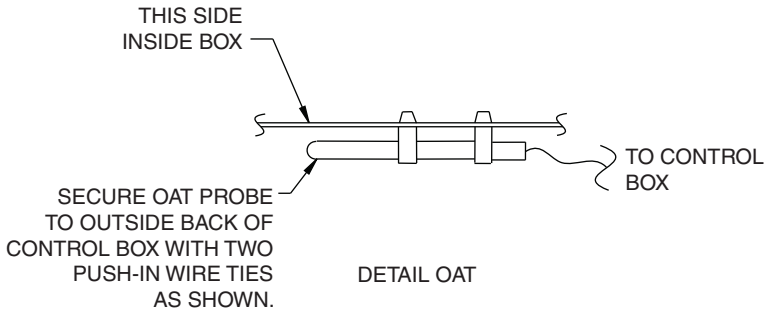


Fig. 47 — Outdoor Air Temperature (OAT) Thermistor Mounting, 38APS065, 38APD070-130

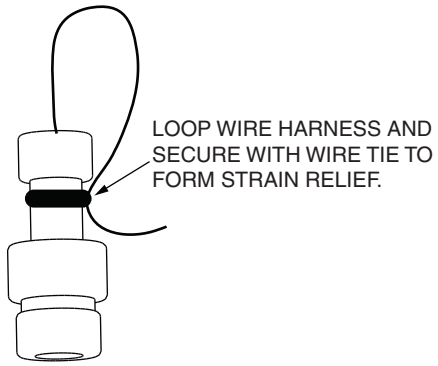


Fig. 48 — High Pressure Switch (HPS), Suction Pressure Transducer (SPT), and Discharge Pressure Transducer (DPT) Mounting

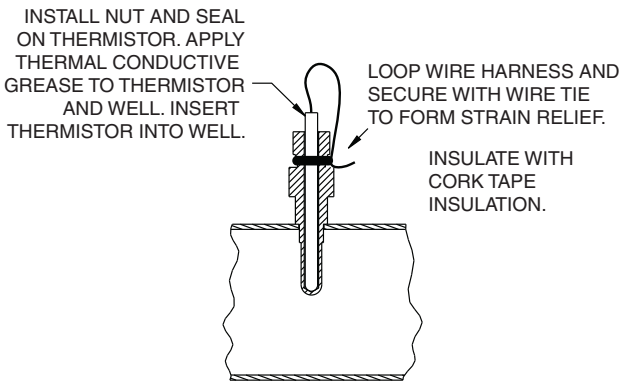


Fig. 49 — Return Gas Thermistor (RGT) Mounting

Outputs — In addition to the capacity staging outputs of the compressor or digital compressor (if equipped) and the outdoor fan staging for head pressure control, several external and optional outputs are used for status signals and unit refrigerant control.

ALARM RELAY — The 38AP *Comfort*Link units have a remote alarm relay feature that allows for remote annunciation of a unit alarm. For Alert and Alarm definitions, see the Alarms and Alerts section on page 162. A field-installed relay, ALMR, must be installed and connected between LVT-1 and LVT-2. For alarm relay specifications see the appropriate machine control type wiring diagrams.

LIQUID LINE SOLENOID VALVES — The 38AP units have the ability to control a number of liquid line solenoids depending on the unit size. See Table 10.

Table 10 — Liquid Line Solenoid Valve Connections

UNIT	CIRCUIT	LIQUID LINE SOLENOID VALVE CONNECTIONS		COMMENTS
38APD025-060	A	A1	LVT-25, 2	
	B	B1	LVT-24, 2	
38APD070-130	A	A1	LVT-25, 2	
		A2	CXB-J6-5, 6	Separate Power Supply Required
	B	B1	LVT-24, 2	
		B2	CXB-J6-7, 6	Separate Power Supply Required
38APS025-050	A	A1	LVT-25, 2	
		A2	LVT-24, 2	
38APS065	B	B1	LVT-25, 2	
		B2	LVT-24, 2	

Two conditions will open the liquid line solenoid valves. Each circuit operates independently. The primary liquid line solenoid valve (LLSV-A or LLSV-B) is energized any time a compressor is operating in the circuit. The circuit's primary liquid line solenoid is opened for approximately 20 seconds before a lead circuit compressor is started. The primary liquid line solenoid valve is de-energized 5 seconds after the circuit stops.

If the circuit has an additional liquid line solenoid valve (LLSV-A2 or LLSV-B2), it will be energized with the start of the second compressor in the circuit. The second liquid line solenoid in the circuit will be de-energized when the circuit returns to a single compressor running.

As part of the refrigerant management routine, the primary liquid line solenoid valve, LLSV-A or LLSV-B, is opened when the circuit is OFF and the Outdoor Air Temperature (OAT) is less than the circuit's Saturated Suction Temperature (SST). The primary liquid line solenoid will close if the circuit is OFF and the OAT is greater than the SST plus 2° F (1.1° C). If equipped, the second liquid line solenoid in the circuit will not operate as part of this refrigerant management routine.

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 for proper operation, 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 the Oil Charge section on page 147 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. See Condenser Fans section on page 150 for proper rotation direction.

Evacuation and Dehydration — For evacuation and dehydration procedures, refer to the unit installation instructions.

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 11. This table is based on 25 ft (7.6 m) of liquid line and does not include the indoor coil refrigerant charge which must be added to the preliminary charge amount. For liquid lines longer than 25 ft (7.6 m), additional charge is required and can be found in the notes section of the table.

Adjust Refrigerant Charge

⚠ CAUTION

Never charge liquid into the low pressure side of system. Do not overcharge. During charging or removal of refrigerant, 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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts (Fig. 50-76). Failure to comply may result in equipment damage.

Table 11 — 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)
38APS065	—	55 (25.0)
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)
38APD115	46 (20.7)	55 (25.0)
38APD130	46 (20.7)	71 (32.3)

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)
   $1^3/_8$ in. (34.9 mm) liquid line — 5.1 lb per 10 linear ft (2.32 kg per 3 m)

IMPORTANT: For proper charging, units equipped with a digital compressor must have the digital compressor operation disabled to maintain stable operation. To disable digital compressor operation, set ***Configuration→ UNIT→ A1.TY*** (Compressor A1 Digital?) to **NO**. Be sure to re-enable the digital operation after charging operation is complete.

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. (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts. If the unit is equipped with a digital compressor, disable the digital operation while charging the machine to maintain stable operation. To disable the digital compressor operation, set ***Configuration→UNIT→A1.TY*** (Compressor A1 Digital?) to **NO**. Be sure to re-enable the digital operation after charging operation is complete. If charging at low outdoor ambient, the condenser coil can be partially blocked in order to increase head pressure.

NOTE: Do not use recycled refrigerant as it may contain contaminants.

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. 50-76. It is recommended that the full load superheat be between 15 and 20 F (8.3 and 11.1 C), measured entering the compressors downstream of the accumulator. To use the Charging Chart, measure refrigerant 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. Compare the readings to those measured with the curve for the appropriate Saturated Suction Temperature, available on the scrolling marquee display, ***Temperatures→CIR.A→SST.A*** or ***Temperatures→ CIR.B→ SST.B***. Add or remove 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.

NOTE: Indoor-air cfm must be within normal operating range of unit.

Trim refrigerant charge into compressor low-side service port located on the suction service valve using the liquid connection of the refrigerant cylinder and a liquid charging adapter to vaporize the refrigerant before it enters the system.

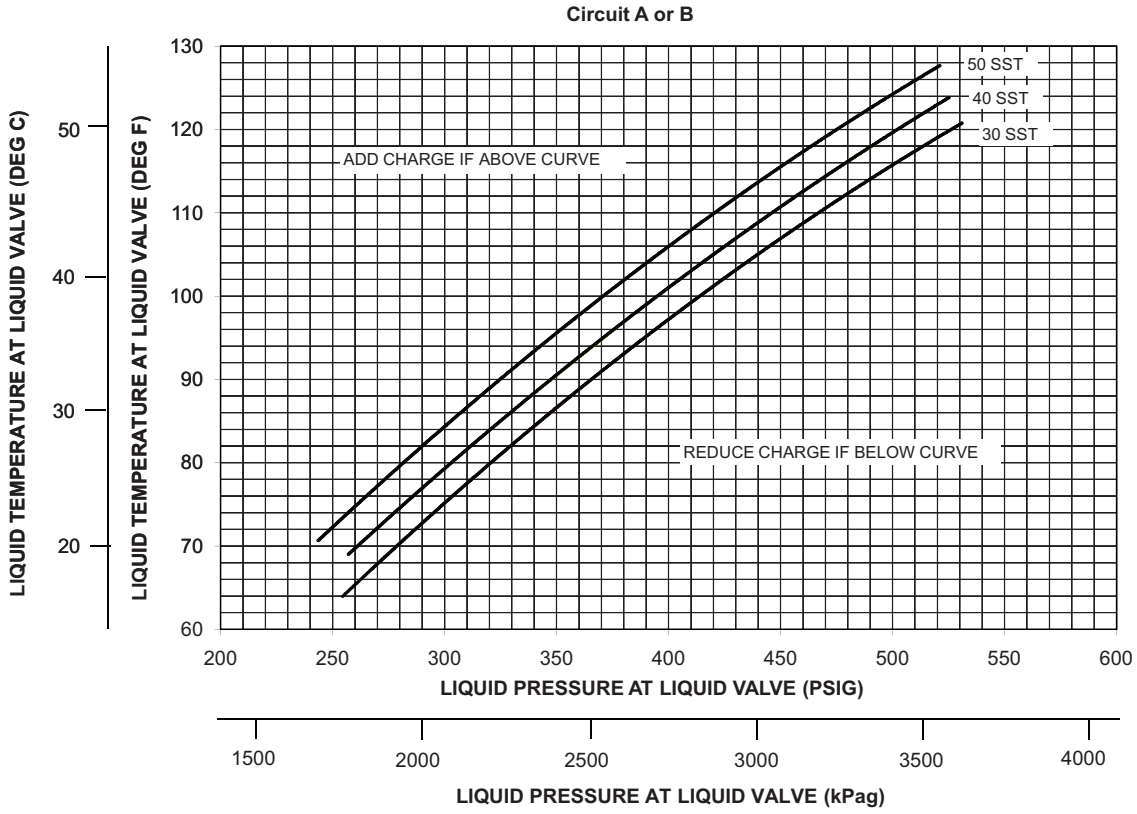
⚠CAUTION

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

If the sight glass is cloudy, check refrigerant charge again. See Fig. 77 and Fig. 78 for proper locations of filter driers, solenoid valves, sight glasses and TXVs. 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.

After full load charging is complete, check the circuit superheat entering the compressors downstream of the accumulator at part load conditions to ensure that superheat is greater than 5° F (2.8° C). If superheat is less than 5° F (2.8° C), further field action to increase the superheat is required to prevent nuisance alarms and potential compressor failures.

Once charging is complete, if the digital compressor was disabled, re-enable the digital operation.

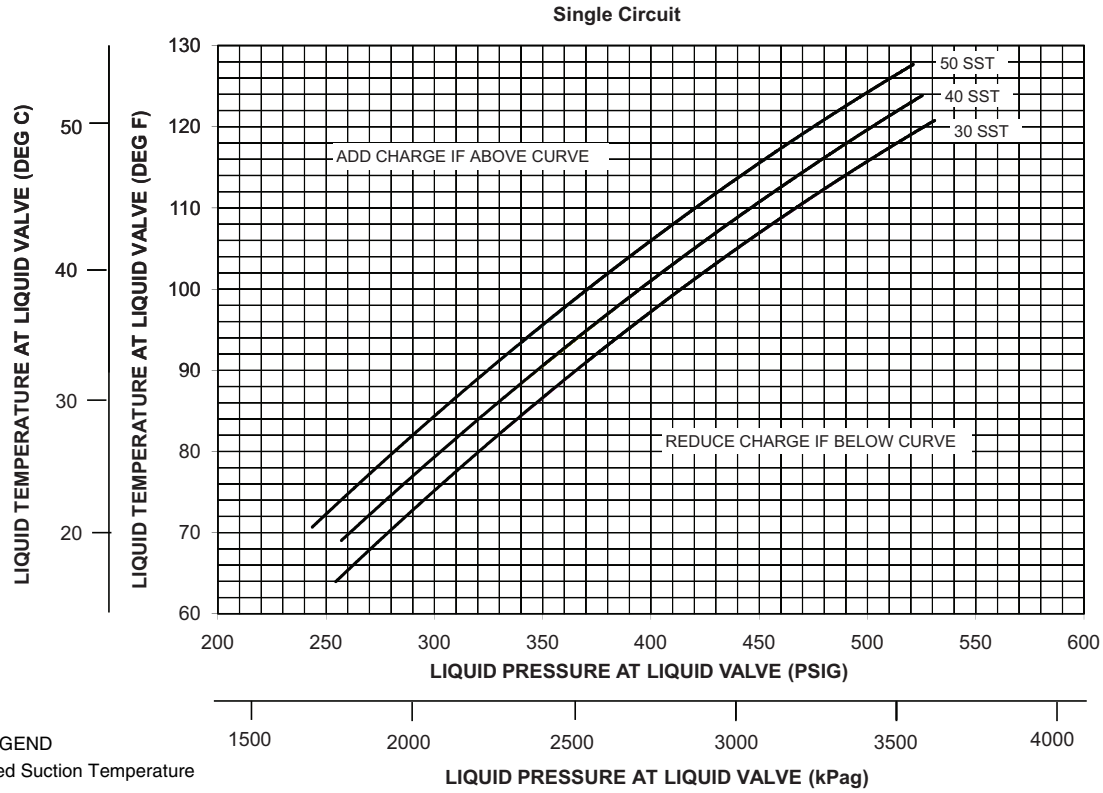


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

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

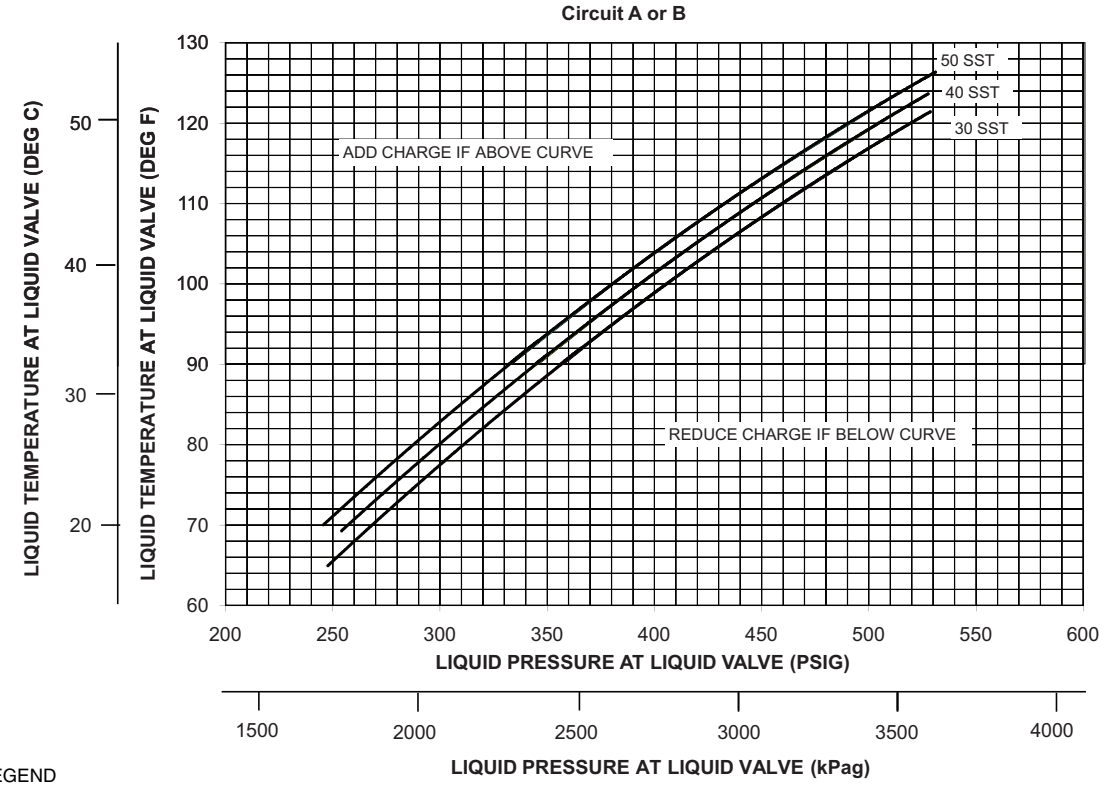


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 51 — Charging Chart — 38APS025, 50/60 Hz

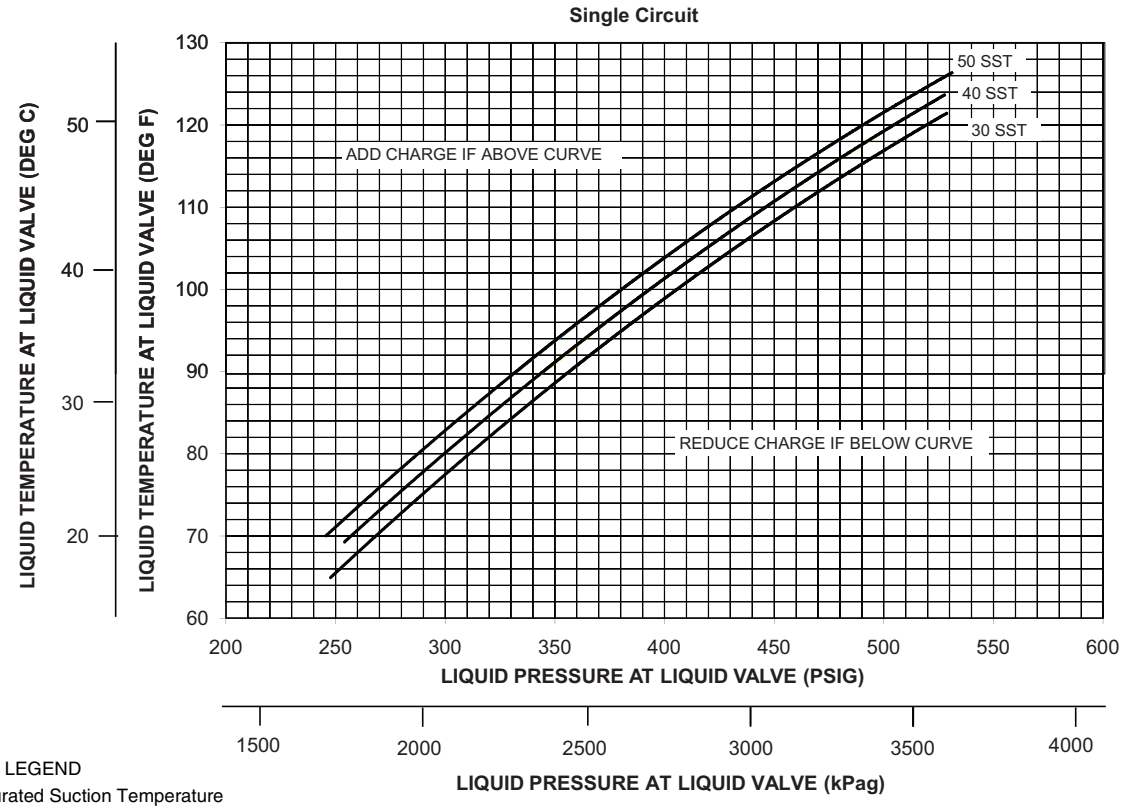


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 52 — Charging Chart — 38APD027, 50/60 Hz

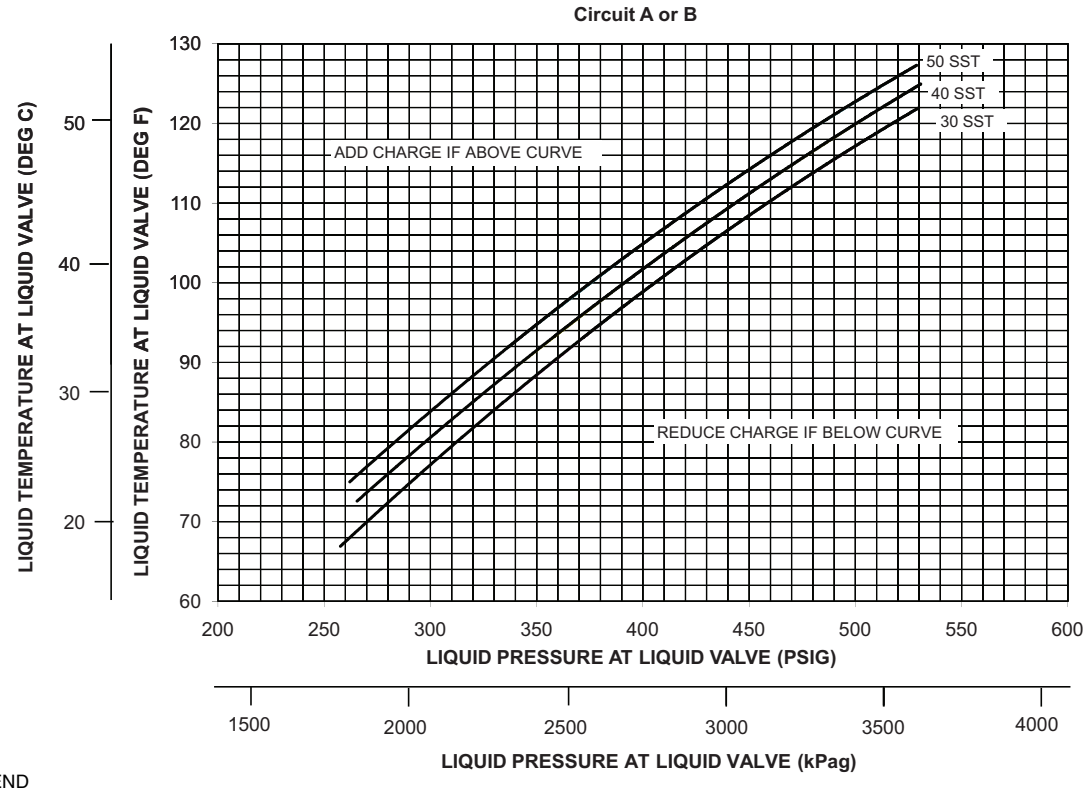


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 53 — Charging Chart — 38APS027, 50/60 Hz

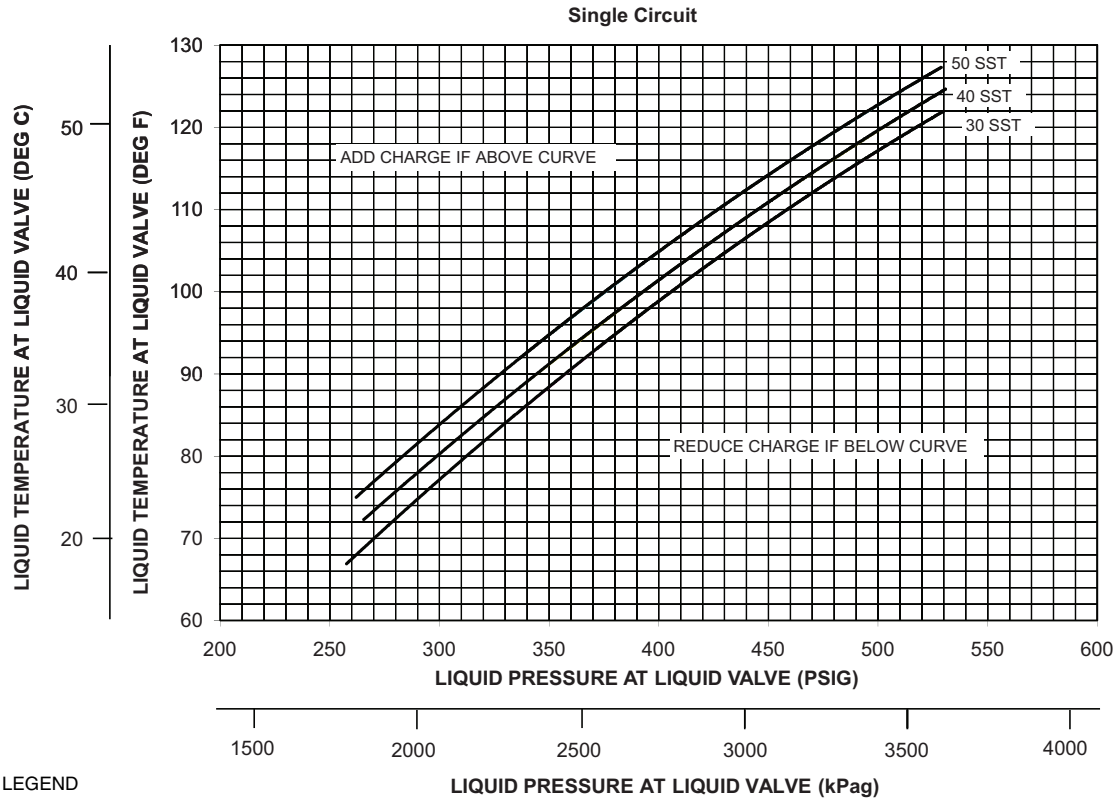


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 54 — Charging Chart — 38APD030, 50/60 Hz

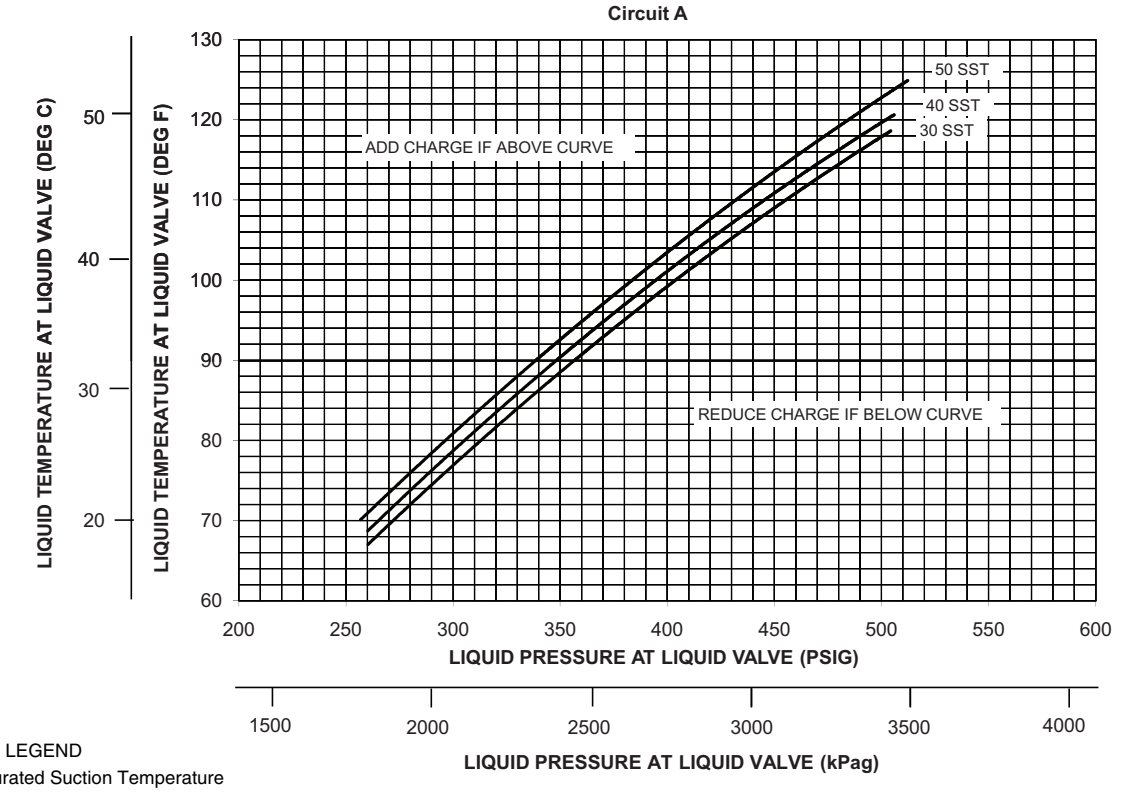


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 55 — Charging Chart — 38APS030, 50/60 Hz

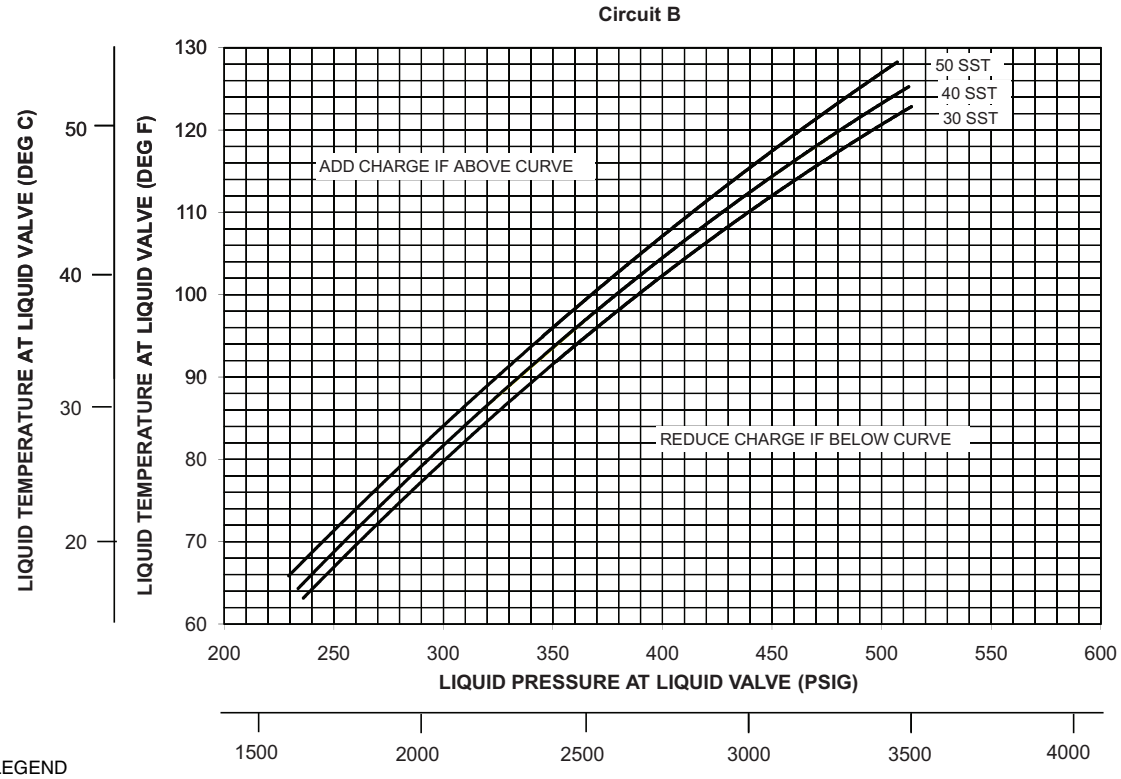


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 56 — Charging Chart — 38APD040 — Circuit A, 50/60 Hz

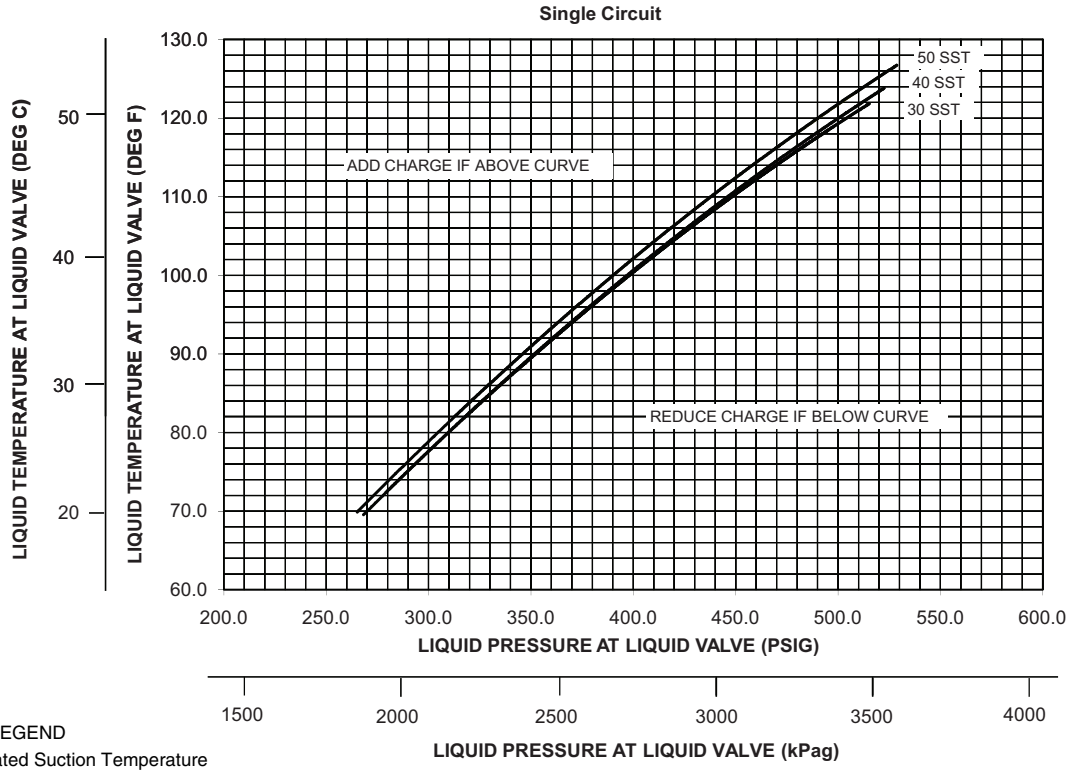


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 57 — Charging Chart — 38APD040 — Circuit B, 50/60 Hz

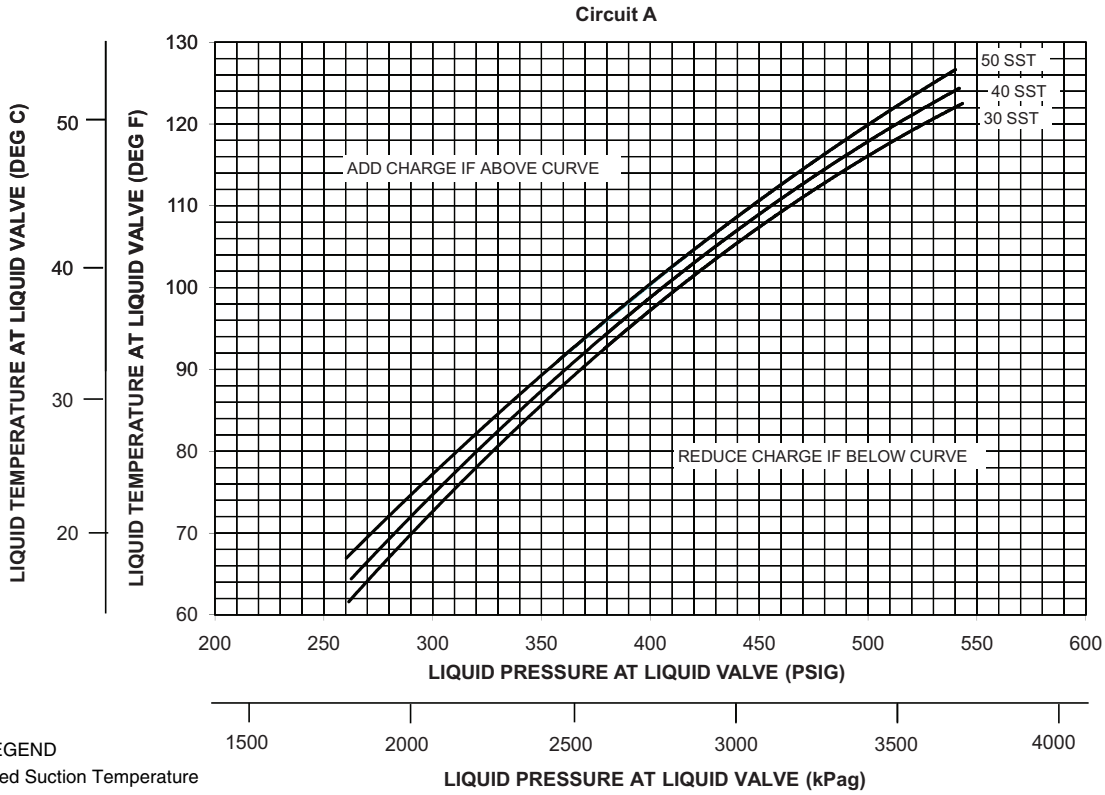


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 58 — Charging Chart — 38APS040, 50/60 Hz

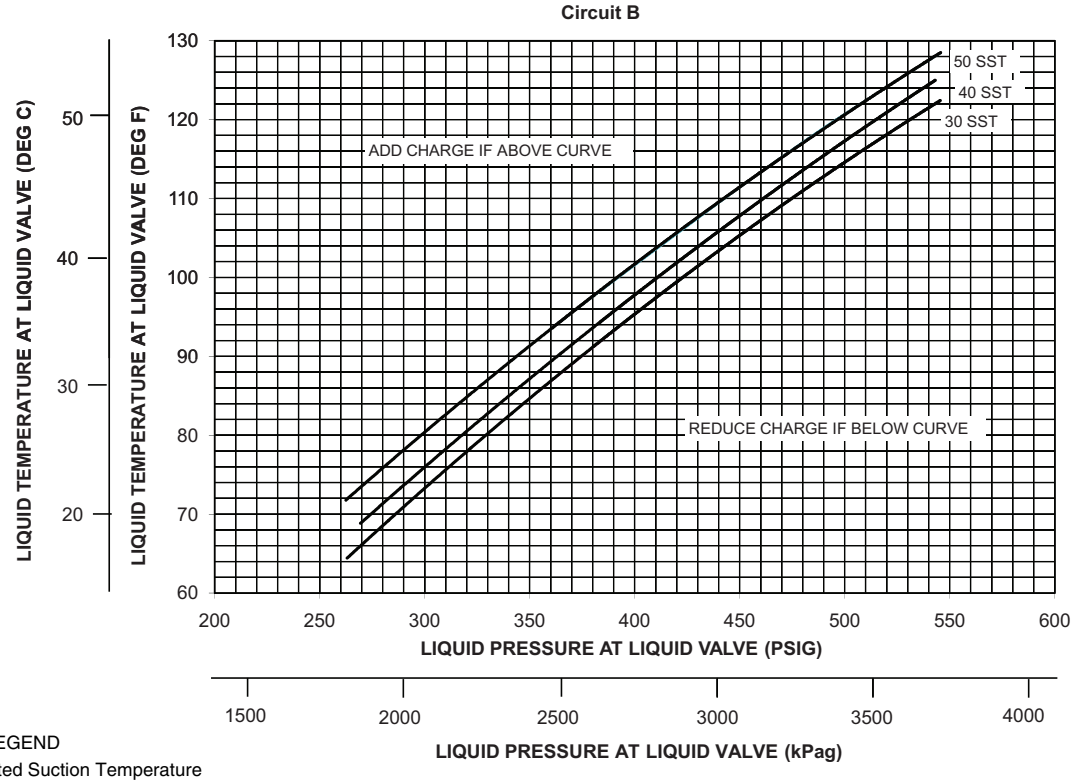


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 59 — Charging Chart — 38APD050 — Circuit A, 50/60 Hz

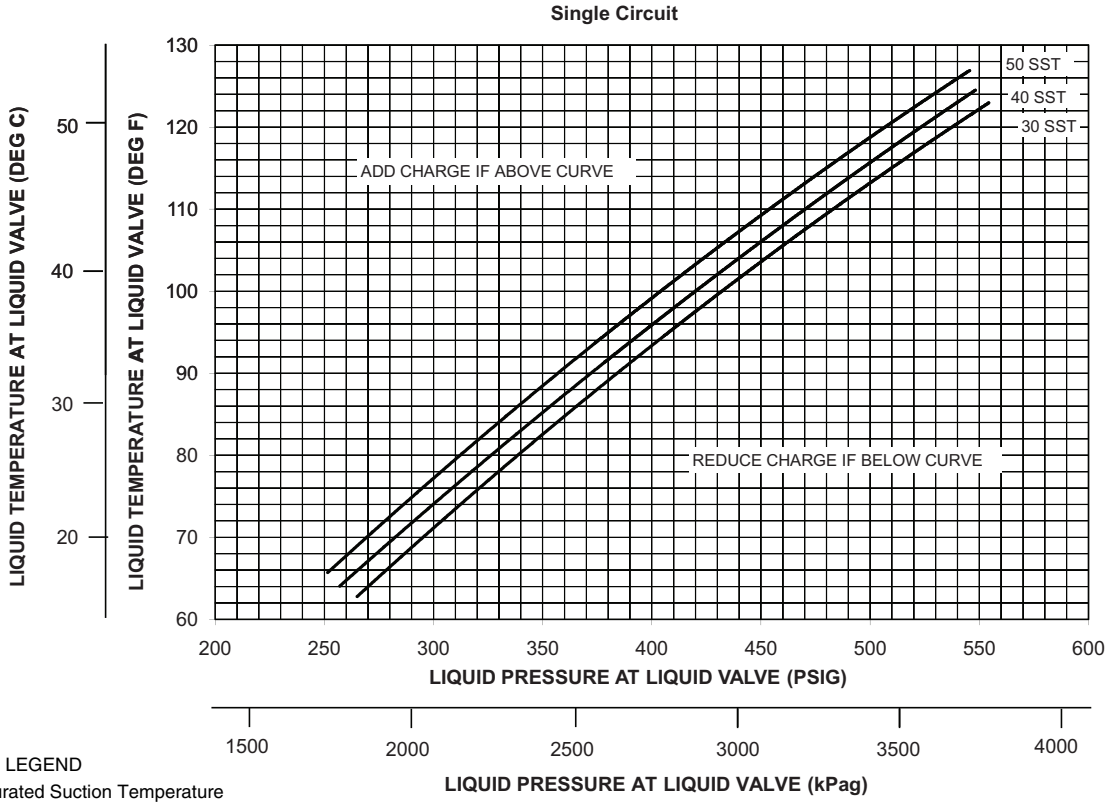


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

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

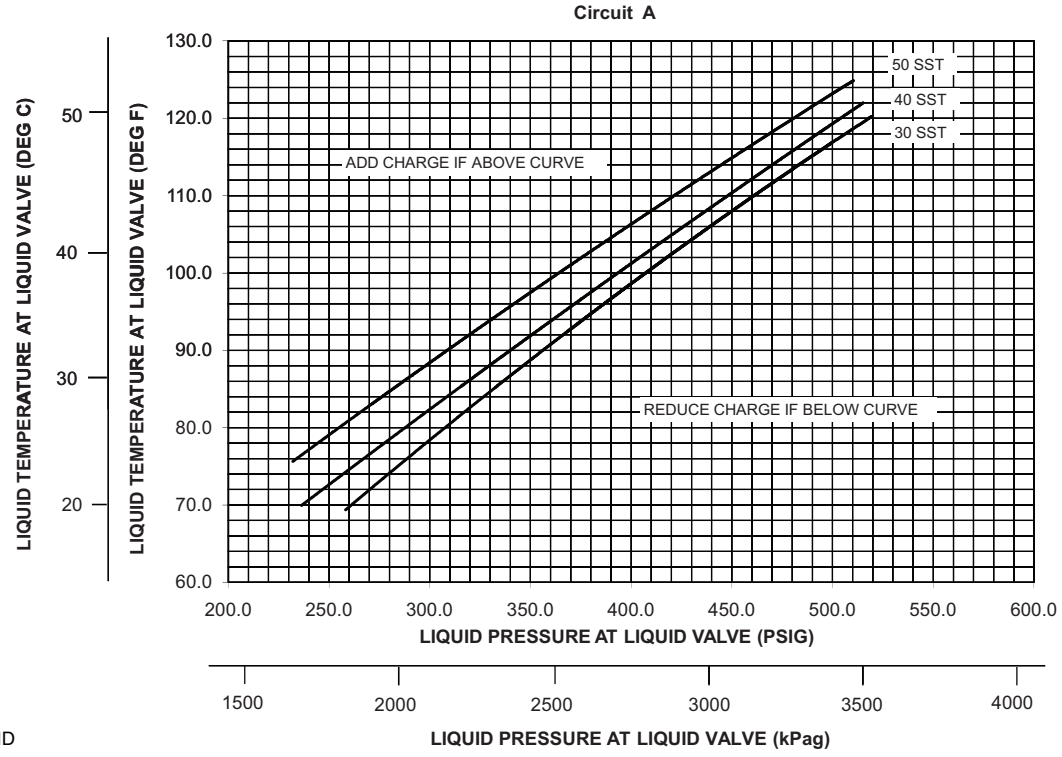


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 61 — Charging Chart — 38APS050, 50/60 Hz

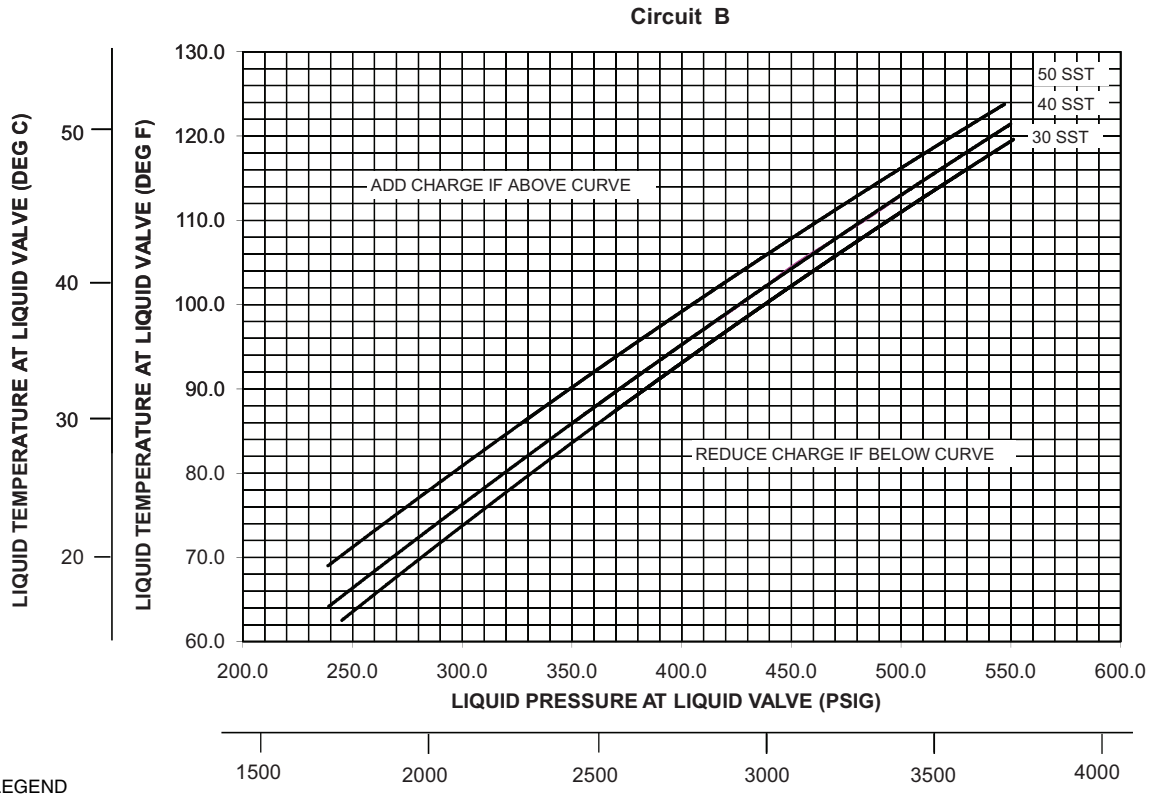


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 62 — Charging Chart — 38APD060 — Circuit A, 50/60 Hz

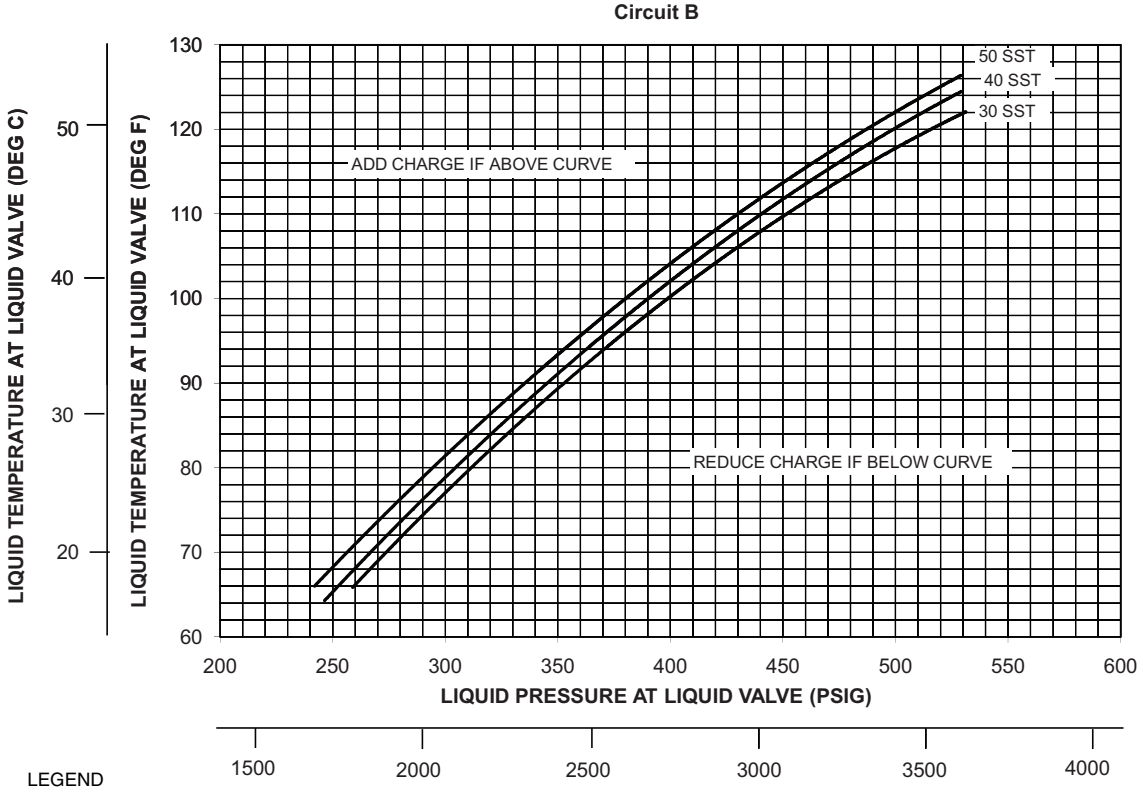


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 63 — Charging Chart — 38APD060 — Circuit B, 50/60 Hz

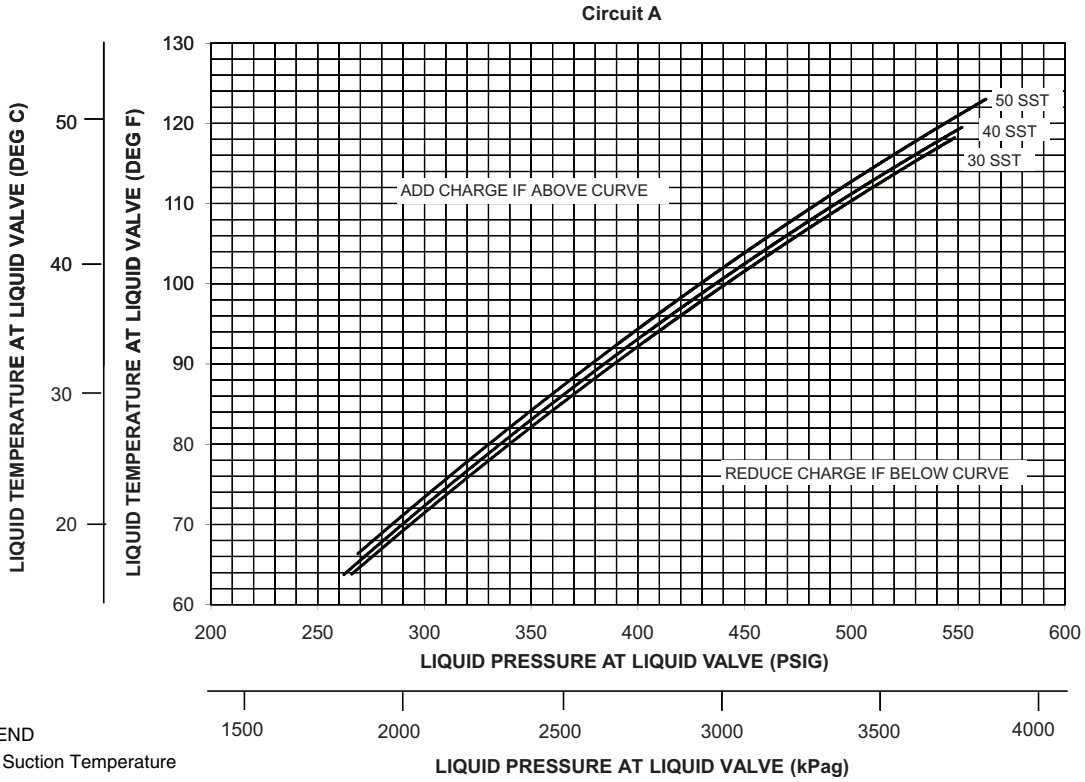


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 64 — Charging Chart — 38APS065 — Single Circuit, 50/60 Hz

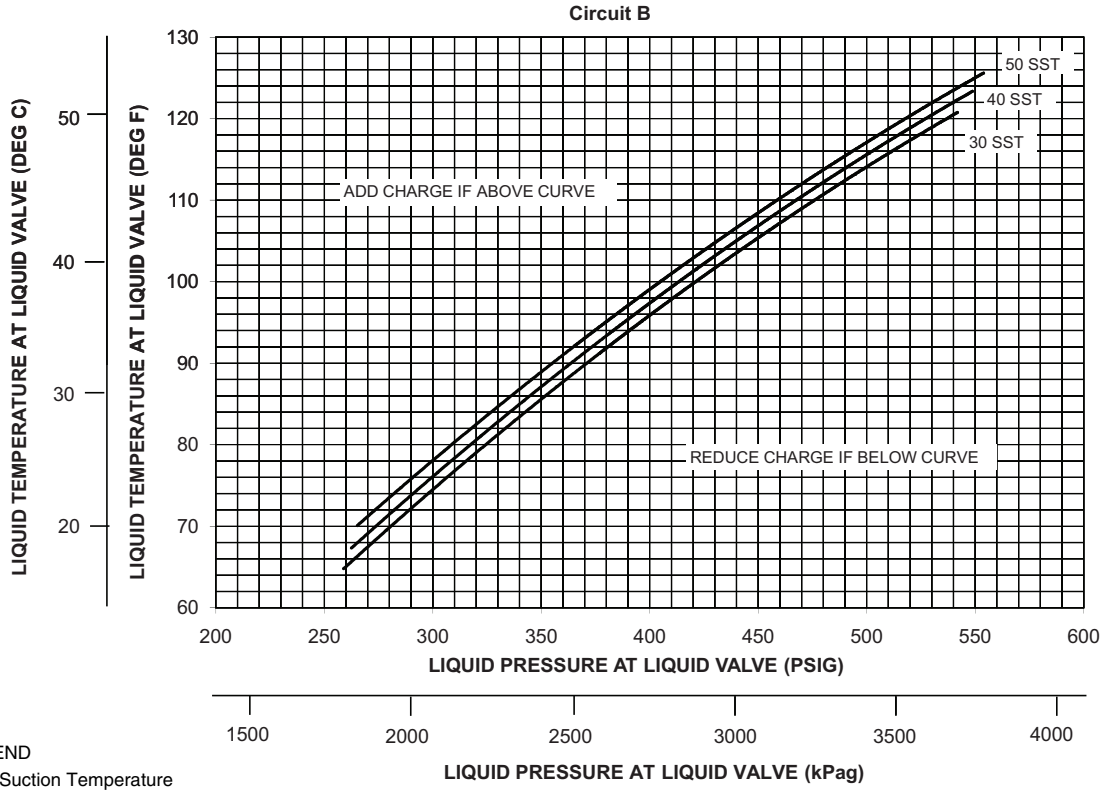


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 65 — Charging Chart — 38APD070 — Circuit A, 50/60 Hz

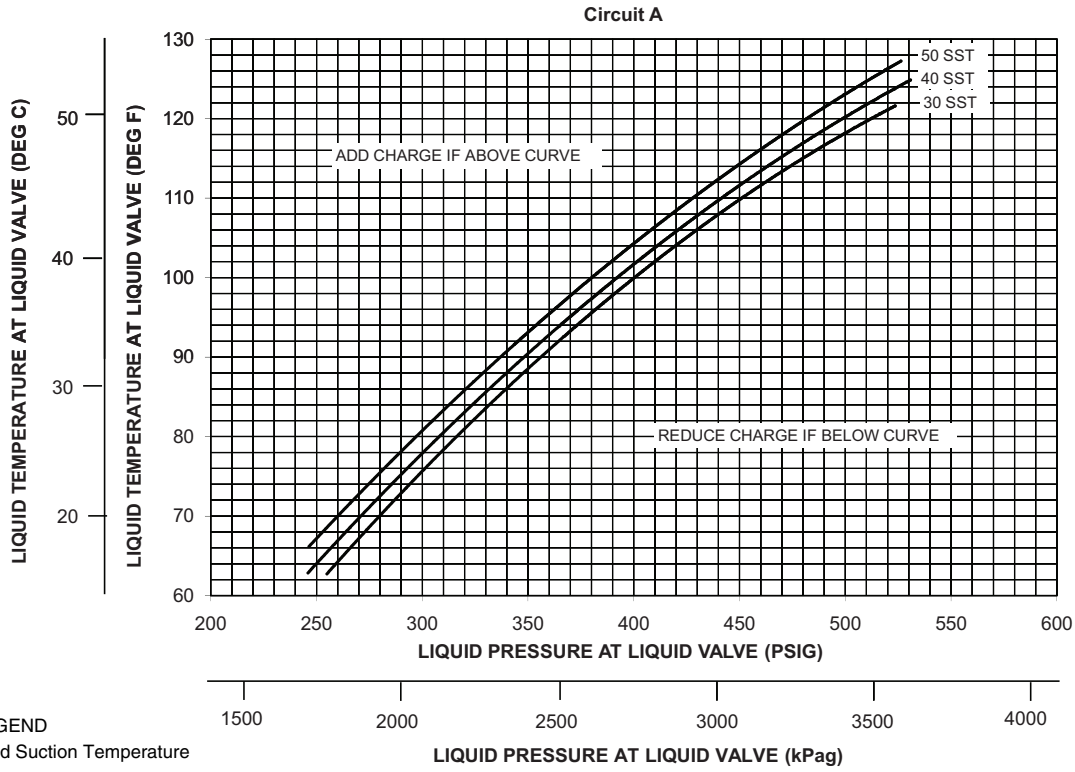


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 66 — Charging Chart — 38APD070 — Circuit B, 50/60 Hz

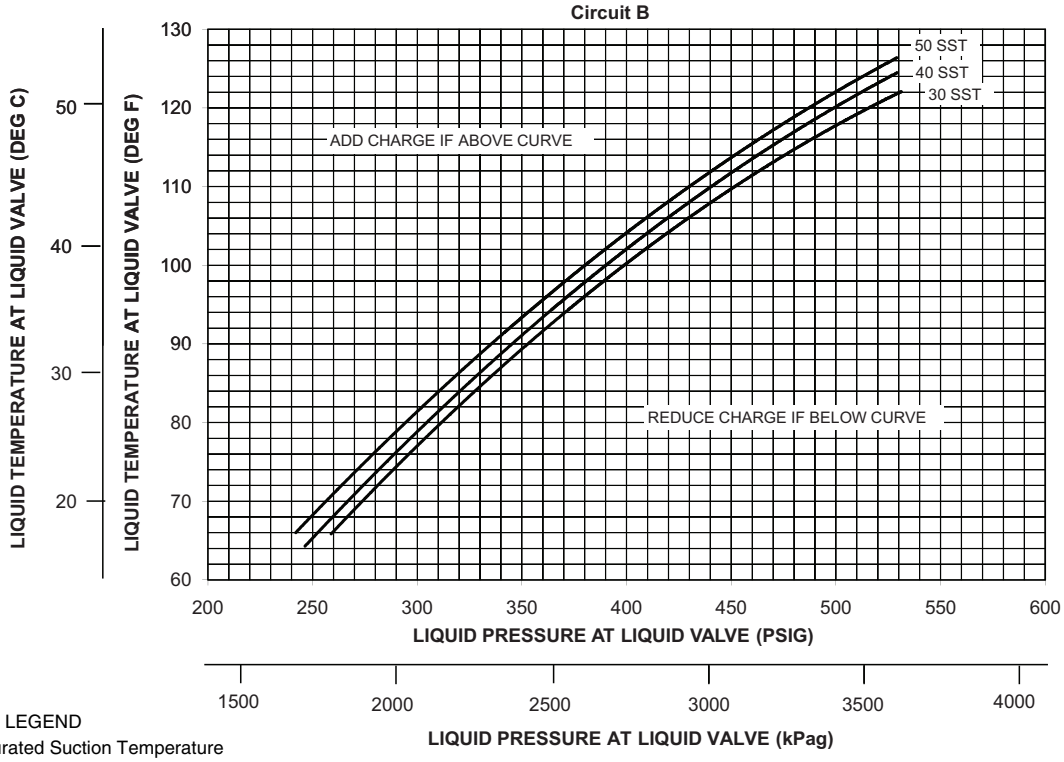


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 67 — Charging Chart — 38APD080 — Circuit A, 50/60 Hz

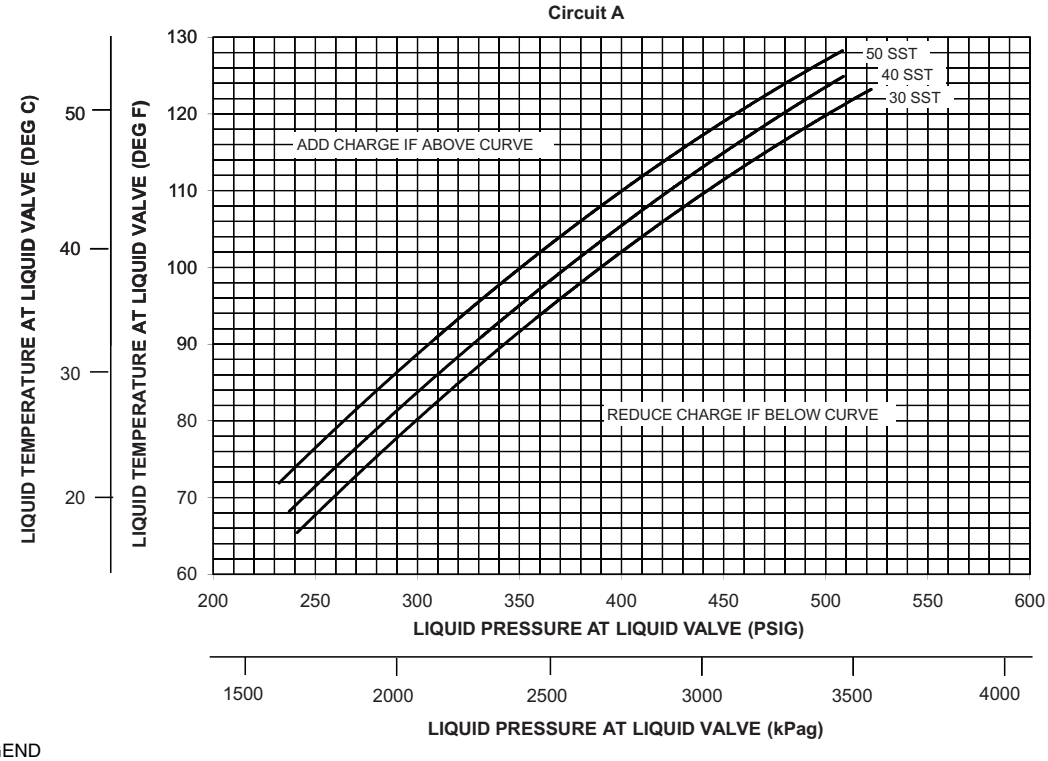


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 68 — Charging Chart — 38APD080 — Circuit B, 50/60 Hz

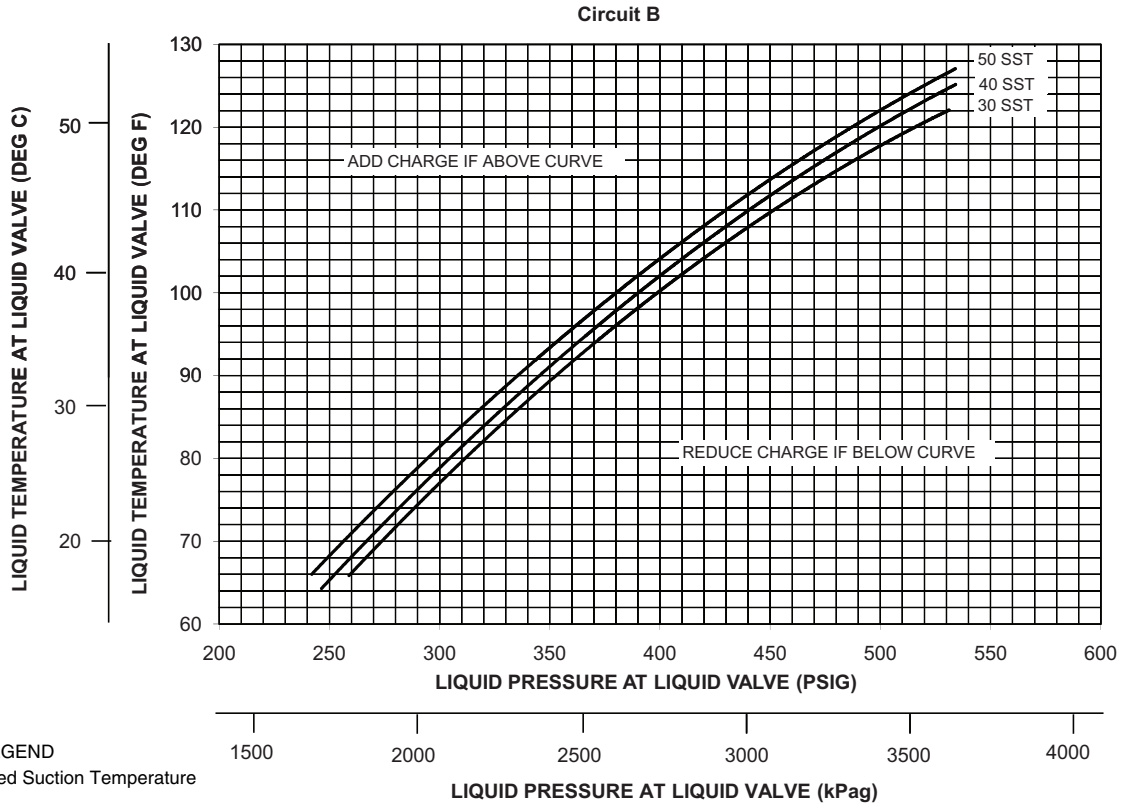


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 69 — Charging Chart — 38APD090 — Circuit A, 50/60 Hz

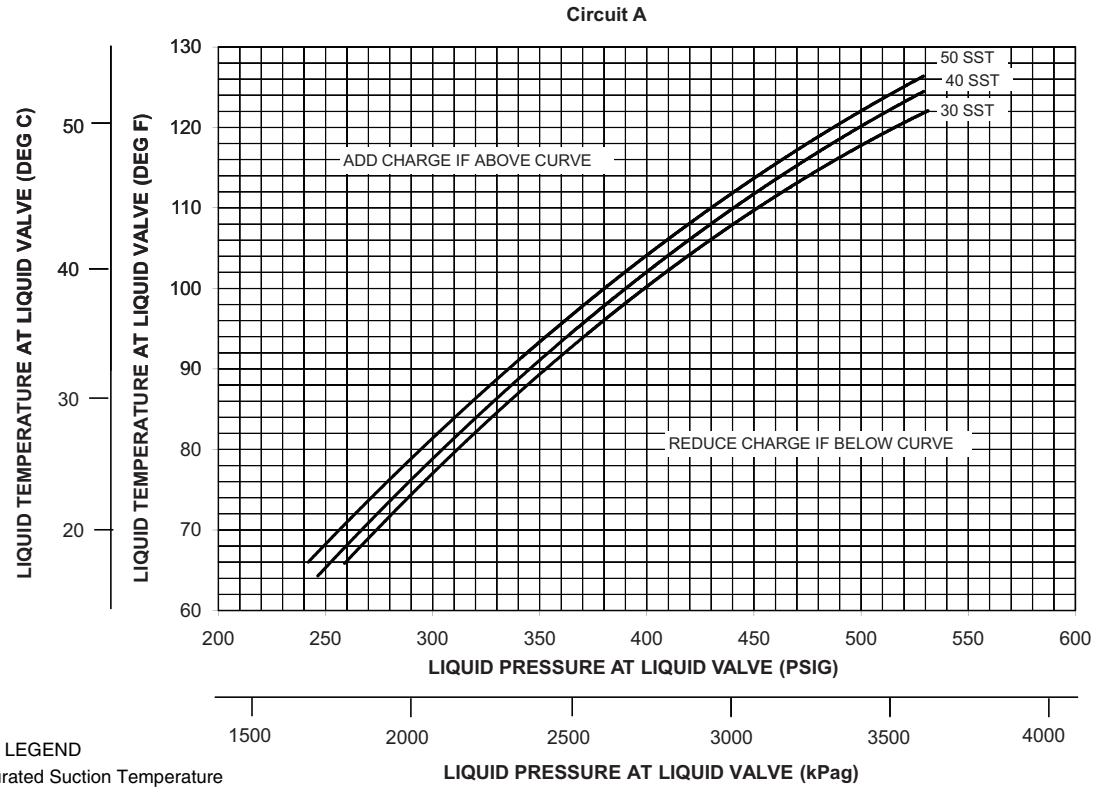


LEGEND

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(0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 70 — Charging Chart — 38APD090 — Circuit B, 50/60 Hz

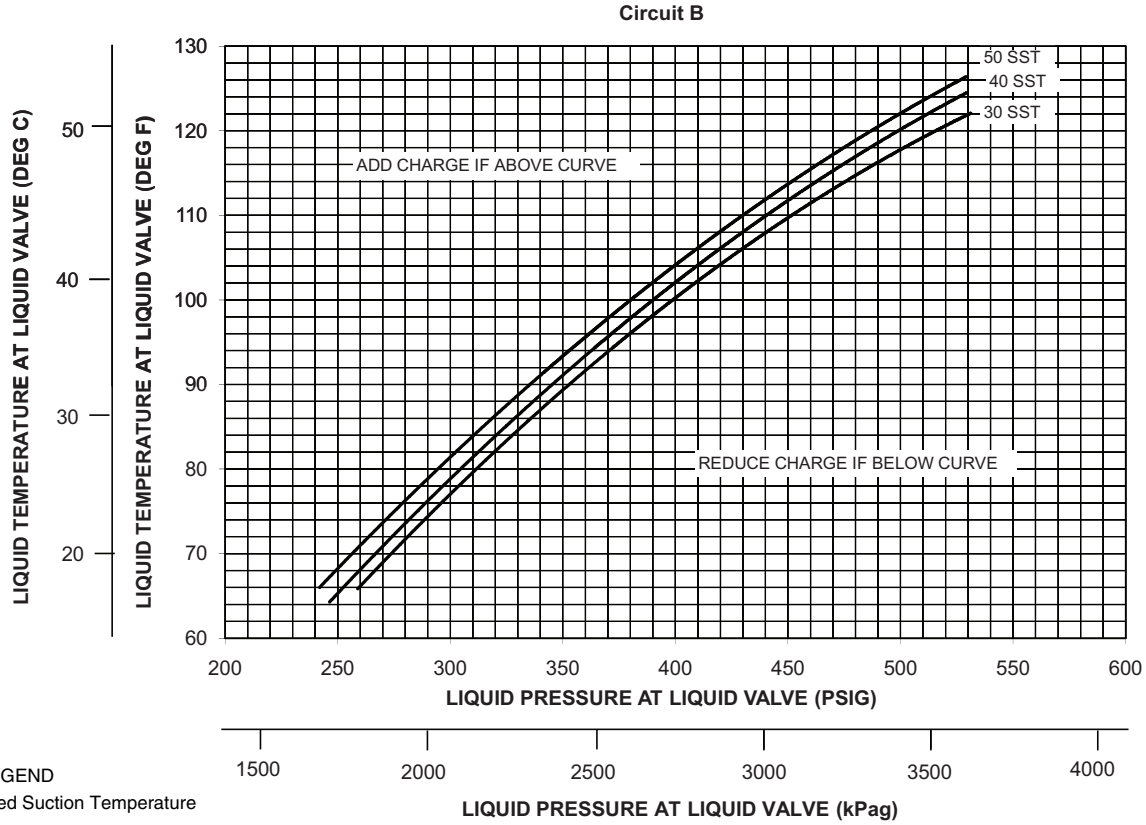


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 71 — Charging Chart — 38APD100 — Circuit A, 50/60 Hz

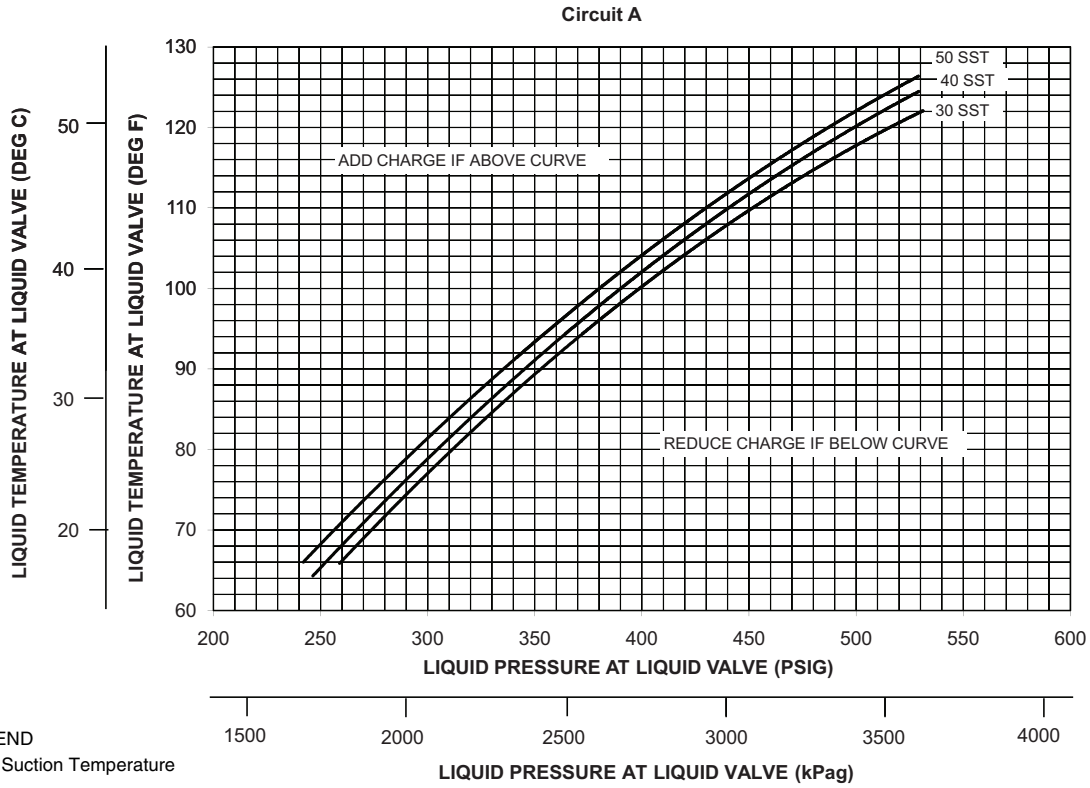


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 72 — Charging Chart — 38APD100 — Circuit B, 50/60 Hz

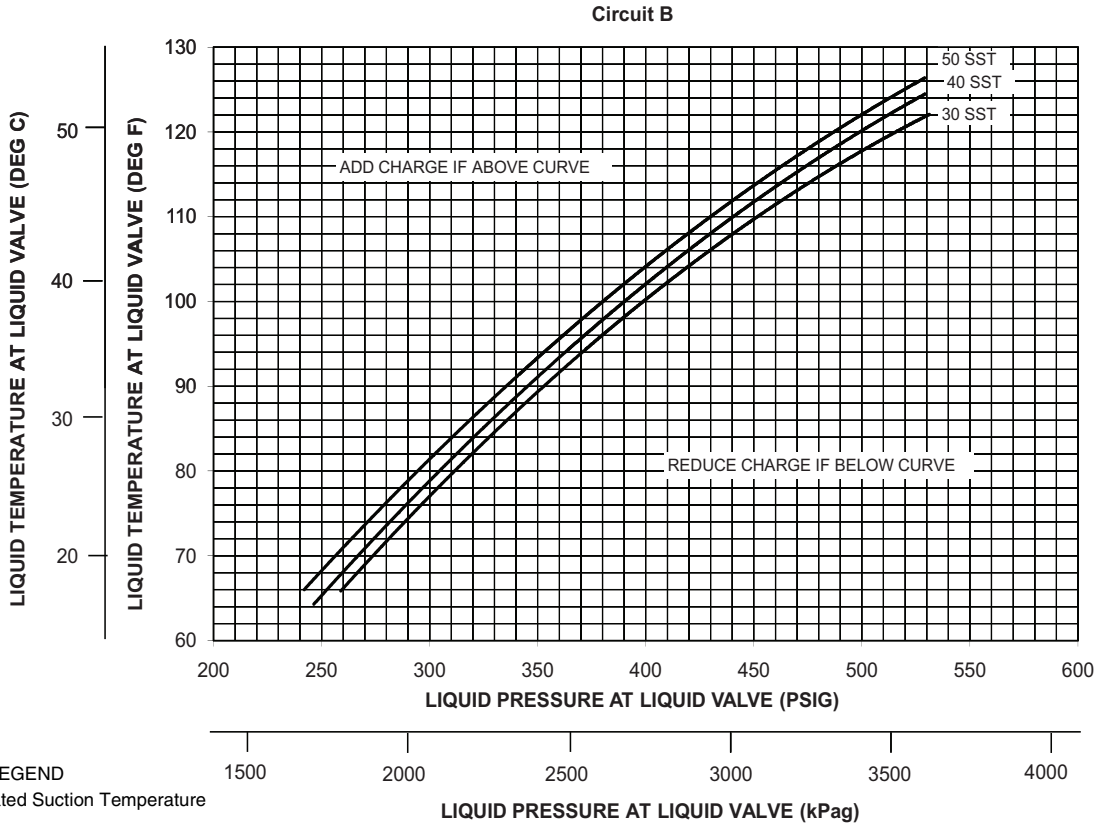


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 73 — Charging Chart — 38APD115 — Circuit A, 50/60 Hz

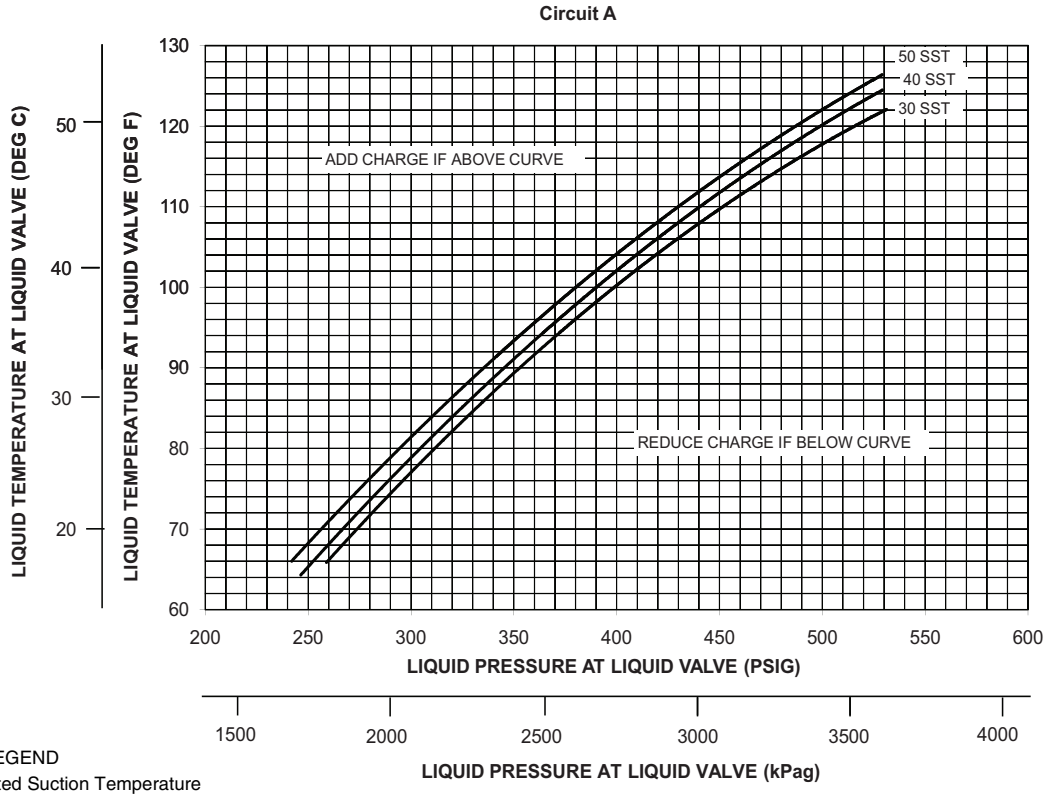


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 74 — Charging Chart — 38APD115 — Circuit B, 50/60 Hz

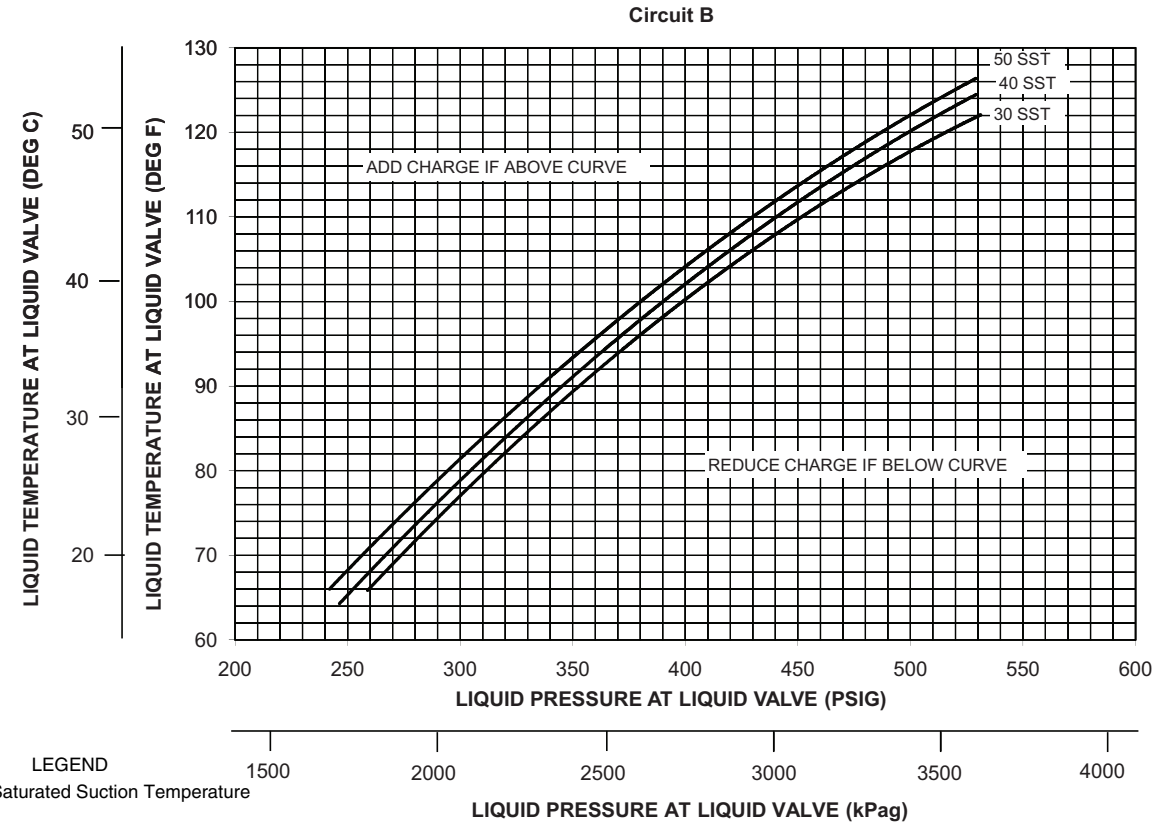


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 75 — Charging Chart — 38APD130 — Circuit A, 50/60 Hz

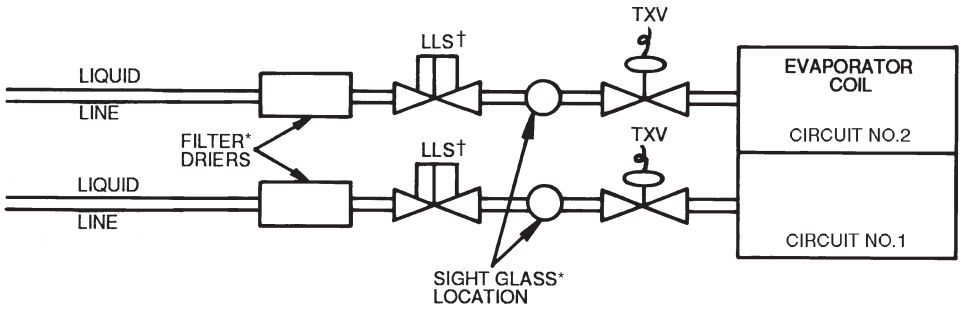


LEGEND

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 (0.11 kg) increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

Fig. 76 — Charging Chart — 38APD130 — Circuit B, 50/60 Hz

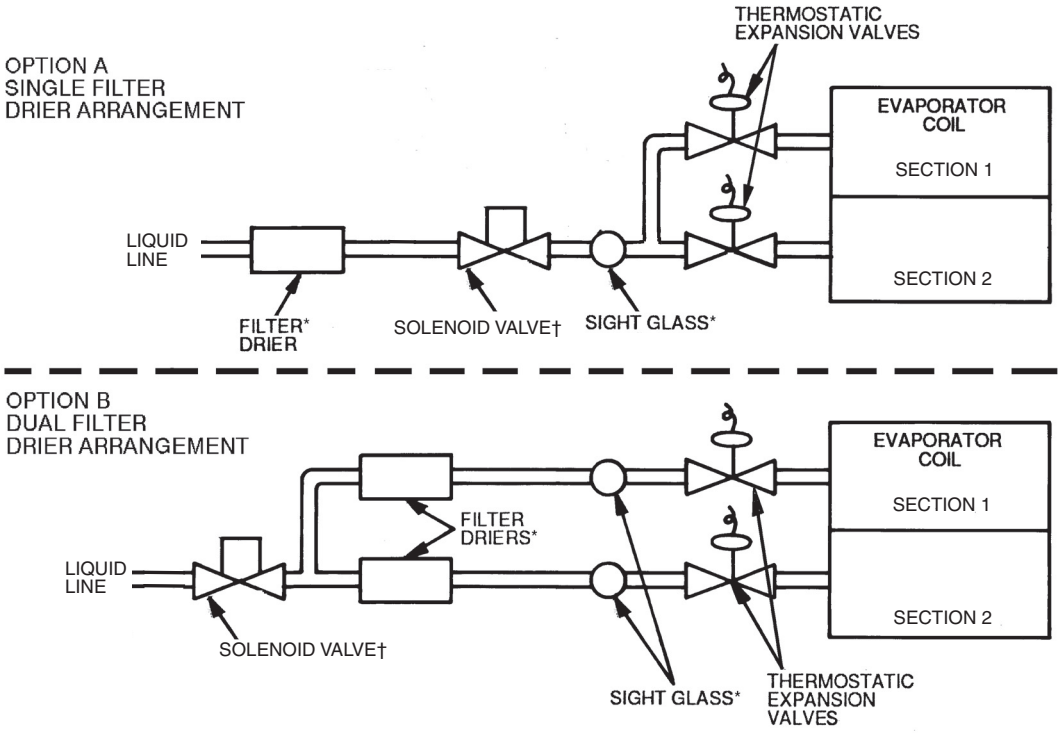


LEGEND

LLS — Liquid Line Solenoid
TXV — Thermostatic Expansion Valve

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

Fig. 77 — Required Location of Solenoid Valves and Recommended Filter Drier and Sight Glass Locations for 38APD025-130 Dual-Circuit Units



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

Fig. 78 — Required Location of Solenoid Valves and Recommended Filter Drier and Sight Glass Locations for 38APS025-050,065 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.

Adjust Oil Charge — Although the compressors are factory charged with oil, additional oil is likely required to maintain the oil level in the compressor. Tables 12-15 indicate the likely amount required based on the liquid line size and system piping length. Additional lubricant estimate is based on using recommended pipe sizes. Values listed are estimates only. See Adding Oil section on page 147 for Carrier-approved oils. After operating the compressor for a period of time, the oil level should be between $^1/_8$ and $^3/_8$ of the oil sight glass. The compressor oil level should be checked with the compressor off to avoid the sump turbulence when the compressor is running. Oil must be added if the oil level does not meet the requirements.

Table 12 — 38AP 60 Hz Additional Lubricant (English)

UNIT SIZE	CIRCUIT	ADDITIONAL LUBRICANT (FLUID OUNCES) ESTIMATE FOR PIPING LENGTH AND REFRIGERANT							
		UP to 25 ft	25 to 50 ft	50 to 75 ft	75 to 100 ft	100 to 125 ft	125 to 150 ft	150 to 175 ft	175 to 200 ft
38APD025	A	0	0	0	7	8	8	9	10
	B	0	0	0	7	8	8	9	10
38APS025	Single	10	12	17	19	22	24	26	29
38APD027	A	0	0	6	7	8	9	9	10
	B	0	0	6	7	8	9	9	10
38APS027	Single	11	16	18	20	23	25	27	29
38APD030	A	0	0	7	7	8	9	16	17
	B	0	0	7	7	8	9	16	17
38APS030	Single	12	17	19	21	24	26	28	44
38APD040	A	9	11	12	18	20	23	25	27
	B	0	9	10	12	19	21	23	26
38APS040	Single	23	30	33	37	40	57	63	69
38APD050	A	9	11	16	19	21	23	25	28
	B	11	16	18	20	23	25	27	29
38APS050	Single	29	35	39	51	57	63	68	74
38APD060	A	11	16	18	21	23	25	28	30
	B	12	17	19	21	24	26	28	44
38APS065	Single	33	44	50	56	61	67	73	102
38APD070	A	12	17	19	21	24	26	28	44
	B	20	26	30	33	36	40	59	65
38APD080	A	12	17	19	21	24	26	28	44
	B	28	34	38	50	56	62	67	73
38APD090	A	23	30	33	37	40	57	63	69
	B	28	34	38	50	56	62	67	73
38APD100	A	29	35	39	51	57	63	68	74
	B	28	34	38	50	56	62	67	73
38APD115	A	28	34	38	50	56	62	67	73
	B	33	44	50	56	61	67	73	102
38APD130	A	28	34	38	50	56	62	67	73
	B	43	54	60	65	71	94	103	112

Table 13 — 38AP 60 Hz Additional Lubricant (SI)

UNIT SIZE	CIRCUIT	ADDITIONAL LUBRICANT (mL) ESTIMATE FOR PIPING LENGTH AND REFRIGERANT							
		UP to 7.5 m	7.5 to 15 m	15 to 22.5 m	22.5 to 30 m	30 to 37.5 m	37.5 to 45 m	45 to 52.5 m	52.5 to 60 m
38APD025	A	0	0	0	200	223	246	270	293
	B	0	0	0	200	223	246	270	293
38APS025	Single	298	364	501	569	637	704	772	840
38APD027	A	0	0	185	209	232	255	278	302
	B	0	0	185	209	232	255	278	302
38APS027	Single	323	459	526	594	661	729	797	864
38APD030	A	0	0	194	217	241	264	463	511
	B	0	0	194	217	241	264	463	511
38APS030	Single	361	496	563	631	699	766	834	1283
38APD040	A	261	326	359	532	599	667	735	802
	B	0	277	309	342	550	617	685	752
38APS040	Single	693	886	983	1079	1176	1681	1846	2011
38APD050	A	274	339	476	544	612	679	747	815
	B	323	459	526	594	661	729	797	864
38APS050	Single	852	1046	1142	1511	1676	1841	2006	2170
38APD060	A	336	471	539	606	674	742	809	877
	B	361	496	563	631	699	766	834	1283
38APS065	Single	977	1306	1471	1636	1801	1965	2130	2984
38APD070	A	361	496	563	631	699	766	834	1283
	B	586	779	876	973	1069	1166	1739	1904
38APD080	A	361	496	563	631	699	766	834	1283
	B	817	1010	1107	1476	1641	1805	1970	2135
38APD090	A	693	886	983	1079	1176	1681	1846	2011
	B	817	1010	1107	1476	1641	1805	1970	2135
38APD100	A	852	1046	1142	1511	1676	1841	2006	2170
	B	817	1010	1107	1476	1641	1805	1970	2135
38APD115	A	817	1010	1107	1476	1641	1805	1970	2135
	B	977	1306	1471	1636	1801	1965	2130	2984
38APD130	A	817	1010	1107	1476	1641	1805	1970	2135
	B	1261	1590	1755	1920	2085	2767	3017	3268

Table 14 — 38AP 50 Hz Additional Lubricant (English)

UNIT SIZE	CIRCUIT	ADDITIONAL LUBRICANT (FLUID OUNCES) ESTIMATE FOR PIPING LENGTH AND REFRIGERANT							
		UP to 25 ft	25 to 50 ft	50 to 75 ft	75 to 100 ft	100 to 125 ft	125 to 150 ft	150 to 175 ft	175 to 200 ft
38APD025	A	0	0	0	7	8	8	9	10
	B	0	0	0	7	8	8	9	10
38APS025	Single	10	12	13	15	22	24	26	29
38APD027	A	0	0	6	7	8	9	9	10
	B	0	0	6	7	8	9	9	10
38APS027	Single	11	13	14	20	23	25	27	29
38APD030	A	0	0	7	7	8	9	10	11
	B	0	0	7	7	8	9	10	11
38APS030	Single	12	14	19	21	24	26	28	31
38APD040	A	9	11	12	13	14	16	25	27
	B	0	9	10	12	13	14	23	26
38APS040	Single	23	30	33	37	40	43	47	50
38APD050	A	9	11	13	14	21	23	25	28
	B	11	13	14	20	23	25	27	29
38APS050	Single	29	35	39	42	45	63	68	74
38APD060	A	11	14	15	21	23	25	28	30
	B	12	14	19	21	24	26	28	31
38APS065	Single	33	40	43	56	61	67	73	102
38APD070	A	12	14	19	21	24	26	28	31
	B	20	26	30	33	36	40	43	46
38APD080	A	12	14	19	21	24	26	28	31
	B	28	34	38	41	56	62	67	73
38APD090	A	23	30	33	37	40	43	47	50
	B	28	34	38	41	44	62	67	73
38APD100	A	29	35	39	42	45	63	68	74
	B	28	34	38	41	44	62	67	73
38APD115	A	28	34	38	41	44	62	67	73
	B	33	40	43	56	61	67	73	78
38APD130	A	28	34	38	41	44	62	67	73
	B	43	54	60	65	71	77	82	112

Table 15 — 38AP 50 Hz Additional Lubricant (SI)

UNIT SIZE	CIRCUIT	ADDITIONAL LUBRICANT (mL) ESTIMATE FOR PIPING LENGTH AND REFRIGERANT							
		UP to 7.5 m	7.5 to 15 m	15 to 22.5 m	22.5 to 30 m	30 to 37.5 m	37.5 to 45 m	45 to 52.5 m	52.5 to 60 m
38APD025	A	0	0	0	200	223	246	270	293
	B	0	0	0	200	223	246	270	293
38APS025	Single	298	364	396	429	637	704	772	840
38APD027	A	0	0	185	209	232	255	278	302
	B	0	0	185	209	232	255	278	302
38APS027	Single	323	388	421	594	661	729	797	864
38APD030	A	0	0	194	217	241	264	287	311
	B	0	0	194	217	241	264	287	311
38APS030	Single	361	426	563	631	699	766	834	902
38APD040	A	261	326	359	391	424	457	735	802
	B	0	277	309	342	374	407	685	752
38APS040	Single	693	886	983	1079	1176	1272	1369	1466
38APD050	A	274	339	371	404	612	679	747	815
	B	323	388	421	594	661	729	797	864
38APS050	Single	852	1046	1142	1239	1336	1841	2006	2170
38APD060	A	336	401	433	606	674	742	809	877
	B	361	426	563	631	699	766	834	902
38APS065	Single	977	1170	1267	1636	1801	1965	2130	2984
38APD070	A	361	426	563	631	699	766	834	902
	B	586	779	876	973	1069	1166	1262	1359
38APD080	A	361	426	563	631	699	766	834	902
	B	817	1010	1107	1203	1641	1805	1970	2135
38APD090	A	693	886	983	1079	1176	1272	1369	1466
	B	817	1010	1107	1203	1300	1805	1970	2135
38APD100	A	852	1046	1142	1239	1336	1841	2006	2170
	B	817	1010	1107	1203	1300	1805	1970	2135
38APD115	A	817	1010	1107	1203	1300	1805	1970	2135
	B	977	1170	1267	1636	1801	1965	2130	2295
38APD130	A	817	1010	1107	1203	1300	1805	1970	2135
	B	1261	1590	1755	1920	2085	2249	2414	3268

OPERATION

Time, Day, and Date — Many features of the 38AP controls require that the time, day and date be properly set. This is especially helpful when troubleshooting alarms, as they are reported with a time and date stamp. *Comfort*Link controls also have the ability to automatically adjust for daylight savings time, when configured. The unit time and date is set at the factory based in the Eastern Time Zone.

To set the time, ***Time Clock→TIME→HH.MM*** (Hour and Minute) is the item. The time clock is programmed in a 24-hour format, 00.00 to 23.59. See Table 16.

To set the month, ***Time Clock→DATE→MNTH*** (Month) is the item. This item follows the standard convention, 1=January, 2=February, etc.

To set the day of the month, ***Time Clock→DATE→DOM*** (Day of Month) is the item.

To set the day of the week, ***Time Clock→DATE→DAY*** (Day of Week) is the item. This item uses the following convention: 1=Monday, 2=Tuesday, 3=Wednesday, etc. This setting is important if using the internal schedule.

To set the year, ***Time Clock→DATE→YEAR*** (Year of Century) is the item. This item follows the convention of a 4-digit year, such as 2014.

Table 17 lists the required configurations for these settings.

TIME/DATE BROADCAST — The 38AP unit controls have the ability to broadcast the time and date on the network. If the CCN Time/Date Broadcast configuration ***Configuration→BCST→T.D.BC*=ON**, the control will send the time and date out onto the CCN bus once a minute. If this device is on a CCN network, it is important to make sure that only one device on the bus has this configuration set to **ON**. If more than one time broadcaster is present, problems with the time will occur. If the unit is installed on a network, another unit must be configured to be Broadcast Acknowledger, ***Configuration→BCST→BC.AK***. Only one unit can be the Broadcast Acknowledger. See Table 18 for required configurations.

DAYLIGHT SAVINGS TIME — The 38AP controls have the ability to automatically adjust the time for daylight savings time. To utilize this feature, several items must be configured, including a start date and time to add as well as an end date. All items are found in the Daylight Saving Time sub-mode, ***Time Clock→DST*** and the Broadcast sub-mode, ***Configuration→BCST***. See Table 19 for required configurations.

NOTE: Only the time and date broadcaster can perform daylight savings time adjustments. Even if the unit is stand-alone, the user may want to set ***Configuration→BCST→T.D.BC*** to **ON** to accomplish the daylight savings function. To disable the daylight savings time feature, set ***T.D.BC*** to **OFF**.

Table 16 — Time Required Configuration

TIME CLOCK MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
TIME	HH.MM	XX.XX	Hour and Minute	24-hour format Range: 00.00 to 23.59

Table 17 — Day and Date Required Configurations

TIME CLOCK MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
DATE	MNTH	XX	Month of Year	Range: 1-12 (1=January, 2=February, etc.)
	DOM	XX	Day of Month	Range: 1-31
	DAY	X	Day of Week	Range: 1-7 (1=Monday, 2=Tuesday, etc.)
	YEAR	XXXX	Year of Century	

Table 18 — Broadcast Required Configurations

CONFIGURATION MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
BCST	T.D.BC	ON/OFF	CCN Time/Date Broadcast	Default: Off Must be set to ON to enable automatic Daylight Savings Time correction.*
	BC.AK	ON/OFF	CCN Broadcast Ack'er	Default: Off One unit on the network must be set to ON. The broadcast unit cannot be the acknowledger.

*Only the time and date broadcaster can perform daylight savings time adjustments. Even if the unit is stand-alone, the user may want to set this to ON to accomplish the daylight savings function.

Table 19 — Daylight Savings Required Configurations

TIME CLOCK MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
DST	STR.M	XX	Month	Daylight Savings Start Month Default: 4 (April) Range: 1 to 12 (1=January, 2=February, etc.)
	STR.W	X	Week	Daylight Savings Start Week Default: 1 Range: 1 to 5
	STR.D	X	Day	Daylight Savings Start Day Default: 7 (Sunday) Range: 1 to 7 (1=Monday, 2=Tuesday, etc.)
	MIN.A	XX	Minutes to Add	Default: 60 Range: 0 to 99
	STP.M	XX	Month	Daylight Savings Stop Month Default: 10 (October) Range: 1 to 12 (1=January, 2=February, etc.)
	STP.W	X	Week	Daylight Savings Stop Week Default: 5 Range: 1 to 5
	STP.D	X	Day	Daylight Savings Stop Day Default: 7 (Sunday) Range: 1 to 7 (1=Monday, 2=Tuesday, etc.)
	MIN.S	XX	Minutes to Subtract	Default: 60 Range: 0 to 99
CONFIGURATION MODE				
BCST	T.D.BC	ON/OFF	CCN Time/Date Broadcast	Default: Off Must be set to ON to enable automatic Daylight Savings Time correction.

Control Methods — This term refers to how the machine is started and stopped. Several control methods are available to enable and disable the unit. Machine On/Off control is determined by the configuration of the Control Method, ***Configuration→OPT2→CTRL***.

ENABLE-OFF-REMOTE CONTROL — With the control method set to Enable-Off-Remote Contact, ***CTRL*=0** (Switch) , simply switching the Enable/Off/Remote Control switch to the Enable or Remote Control position with external contacts closed will place the unit in an occupied state.

Under normal operation, the Control Mode (***Run Status→VIEW→STAT***) will be **1** (Off Local) when the switch is in the Off position or in the Remote Control position with external contacts open, and will be **5** (On Local) when in the Enable position or Remote Control position with external contacts closed. If the machine is ON, the Control Type ***Configuration→OPT2→C.TYP*=5** (SPT Multi) is used, and the space

temperature is satisfied, the Control Mode **9** (SPT Satisfied) will be displayed.

OCCUPANCY SCHEDULE — With the control method set to Occupancy, ***CTRL*=2** (Occupancy), the Main Base Board will use the operating schedules as defined under the ***Time Clock*** mode in the scrolling marquee display. If ***Time Clock→SCH.N*** (Schedule Number) is set to **0**, the unit will remain in an occupied mode continuously.

In either case, and whether operating under a Local Schedule or under a CCN Schedule, under normal operation, ***Run Status→VIEW→STAT*** (Control Mode) will be **1** (Off Local) when the Enable/Off/Remote Control switch is Off or in Remote Control with the external contacts open. The control mode will be **3** (Off Time) when the Enable/Off/Remote Control switch is in Enable or Remote Control with external contacts closed and the time of day is during an unoccupied period. Similarly, the control mode will be **7** (On Time) when the time of day is during an occupied period. If the machine is ON, the Control Type ***Configuration→OPT2→C.TYP*=5** (SPT Multi) is used, and the space temperature is satisfied, Control Mode **9** (SPT Satisfied) will be displayed.

Local Schedule — Local Schedules are defined by schedule numbers from 1 to 64. All of these schedules are identical. The schedule number (***Time Clock→SCH.N***) must be set to a number greater than 0 for local schedule. For unit operation, the Enable/Off/Remote Control switch must be in the Enable or Remote Control position with external contacts closed.

For this option to function properly, the correct time, day and date must be set. See the section Time, Day, and Date on page 59. The time clock is programmed in a 24-hour format, 00.00 to 23.59. If configured, the 38AP controls can automatically adjust the time for daylight savings time. See the section Daylight Savings Time on page 59.

If holidays are to be used, they must be configured. Thirty holidays are provided as part of the local schedules, ***HD.01*** through ***HD.30***. Each holiday requires a Holiday Month, ***Time Clock→HOL.L→HD.xx→MON*** (Holiday Start Month) where "xx" is a number from 01 to 30; the Holiday Start Day of Month, ***Time Clock→HOL.L→HD.xx→DAY*** (Start Day) where "xx" is a number from 01 to 30; and the Holiday Duration, ***Time Clock→HOL.L→HD.xx→LEN*** (Duration [Days]) where "xx" is a number from 1 to 99. Holidays that do not occur on fixed dates will require annual programming.

In the example shown in Table 20, the following holidays are to be programmed: January 1 for one day, July 4 for one day, December 24 for two days.

Eight separate time periods, Period 1 through 8, are available as part of the local schedule. Each period has Monday through Sunday and a Holiday day flag, and occupied and unoccupied times. For example, an occupied time from 6:00 AM to 8:00 PM is desired from Monday through Friday. For Saturday an occupied period from 6:00 AM to 12:00 Noon is desired. On Sunday and holidays the unit is to remain unoccupied. This schedule is shown graphically in Fig. 79.

To program this schedule, ***Time Clock→SCH.N*** (Schedule Number) must change from 0 to a number between 1 and 64. In this example, the Schedule Number will be 1. Two of the eight time periods are required to create this schedule. See Table 21.

Table 20 — Holiday Required Configurations

TIME CLOCK MODE					
SUBMODE	**SUB-SUBMODE**	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
HOL.L	**HD.01**	MON	XX	Holiday Start Month	Default: 0 Range: 0 to 12 (0=Not Used, 1=January, 2=February, etc.) ***Example = 1***
		DAY	XX	Start Day	Default: 0 Range: 0-31 (0=Not Used) ***Example = 1***
		LEN	XX	Duration (Days)	Default: 0 Range: 0 to 99 (0=Not Used) ***Example = 1***
	HD.02	MON	XX	Holiday Start Month	Default: 0 Range: 0-12 (0=Not Used, 1=January, 2=February, etc.) ***Example = 7***
		DAY	XX	Start Day	Default: 0 Range: 0 to 31 (0=Not Used) ***Example = 4***
		LEN	XX	Duration (Days)	Default: 0 Range: 0 to 99 (0=Not Used) ***Example = 1***
	HD.03	MON	XX	Holiday Start Month	Default: 0 Range: 0 to 12 (0=Not Used, 1=January, 2=February, etc.) ***Example = 12***
		DAY	XX	Start Day	Default: 0 Range: 0 to 31 (0=Not Used) ***Example = 24***
		LEN	XX	Duration (Days)	Default: 0 Range: 0 to 99 (0=Not Used) ***Example = 2***

Table 21 — Occupancy Schedule Required Configurations

TIME CLOCK MODE					
SUBMODE	**SUB-SUBMODE**	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
SCH.N			XX	Schedule Number XX	Default: 0 Range: 0 to 99 ***Example = 1***
SCH.L	**PER.1**	OCC.1	XX.XX	Period Occupied Time	Default: 00.00 Range: 00.00 to 23.59 ***Example = 06.00***
		UNC.1	XX.XX	Period Unoccupied Time	Default: 00.00 Range: 00.00-23.59 ***Example = 20.00***
		MON.1	YES/NO	Monday in Period	Default: NO ***Example = YES***
		TUE.1	YES/NO	Tuesday in Period	Default: NO ***Example = YES***
		WED.1	YES/NO	Wednesday in Period	Default: NO ***Example = YES***
		THU.1	YES/NO	Thursday in Period	Default: NO ***Example = YES***
		FRI.1	YES/NO	Friday in Period	Default: NO ***Example = YES***
		SAT.1	YES/NO	Saturday in Period	Default: NO ***Example = NO***
		SUN.1	YES/NO	Sunday in Period	Default: NO ***Example = NO***
		HOL.1	YES/NO	Holiday in Period	Default: NO ***Example = NO***
	PER.2	OCC.2	XX.XX	Period Occupied Time	Default: 00.00 Range: 00.00-23.59 ***Example = 06.00***
		UNC.2	XX.XX	Period Unoccupied Time	Default: 00.00 Range: 00.00-23.59 ***Example = 12.00***
		MON.2	YES/NO	Monday in Period	Default: NO ***Example = NO***
		TUE.2	YES/NO	Tuesday in Period	Default: NO ***Example = NO***
		WED.2	YES/NO	Wednesday in Period	Default: NO ***Example = NO***
		THU.2	YES/NO	Thursday in Period	Default: NO ***Example = NO***
		FRI.2	YES/NO	Friday in Period	Default: NO ***Example = NO***
		SAT.2	YES/NO	Saturday in Period	Default: NO ***Example = YES***
		SUN.2	YES/NO	Sunday in Period	Default: NO ***Example = NO***
		HOL.2	YES/NO	Holiday in Period	Default: NO ***Example = NO***

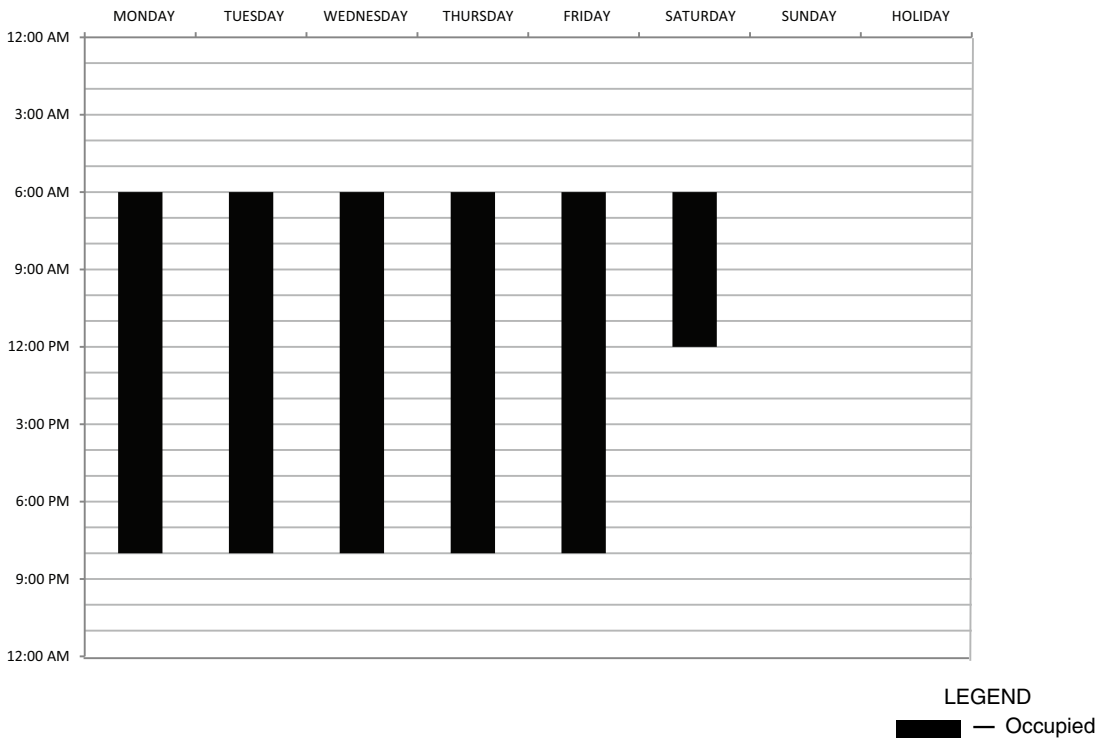


Fig. 79 — Example Schedule

CCN Global Schedule — Schedule Numbers, ***Time Clock→ SCH.N*** from 65 to 99 indicate operation under a CCN Global Schedule. For unit operation based on a CCN Global Schedule, the Enable/Off/Remote Control switch must be in the Enable or Remote Control position with external contacts closed.

In the example in Table 22, the CCN Global Schedule the unit is to follow is 65. To set up the unit to follow this schedule, ***Time Clock→SCH.N*** must be modified.

Any unit can be the Global Schedule Broadcaster. When using a Global Broadcast Schedule, the schedule broadcaster must have the Global Schedule Broadcast, ***Configuration→ BCST→G.S.BC*=ON** and all other devices on the network should have their Global Schedule Broadcast flag set to ***Configuration→BCST→G.S.BC*=OFF**. There can be only one broadcaster of a specific schedule. The unit set to be the schedule broadcaster must have a schedule number from 65 to 99, and the Local Schedule configured as described above. It will broadcast the internal time schedule once every 2 minutes.

Table 22 — CCN Global Schedule Required Configuration

TIME CLOCK MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
SCH.N		XX	Schedule Number XX	Default: 0 Range: 0 to 99 ***Example = 65***

Timed Override — There are several ways to override the occupancy schedule to keep the unit in an occupied period. Schedule overrides can be initiated at the unit's interface with either the scrolling marquee or Navigator™ device, from a space temperature sensor equipped with a timed override button (see unit Installation Instructions for selection and wiring information), or through CCN communications. Initiation of an override period can only be accomplished if the unit is in an unoccupied period. If Timed Override is in effect, ***Operating Modes→ MODE→MD06***, Timed Override in Effect will be active. Override expires after each initiation.

Timed Override from Scrolling Marquee/Navigator Device — A timed override period can be initiated with the unit's interface device. To initiate an override period from the unit's interface device, the number of hours requested must be set in ***Time Clock→ OVR→OVR.T*** (Timed Override Hours). See Table 23.

Once a non-zero value has been entered, the unit will resume an occupied period for the duration of the time programmed. The number of hours in the override time period will be displayed in ***OVR.T*** and will count down as the time period progresses. This value cannot be changed until the override period has expired or is cancelled. The override time period can be cancelled by changing the ***OVR.T*** value to 0. This can be done at the unit's interface device or through CCN communications by writing to the point OVR_EXT.

Table 23 — Timed Override Required Configuration

TIME CLOCK MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OVR	OVR.T	X	Timed Override Hours	Default: 0 Range: 0 to 4

Timed Override from Space Temperature Sensor with Override Button — A timed override period can be initiated using a space temperature sensor with an override button from the space.

NOTE: This feature requires a single space temperature sensor connected to the unit. It does not function when used with averaging space temperature sensor arrays.

To configure this feature, ***Time Clock→OVR→OVR.L*** (Override Time Limit) must be set to a non-zero value. This determines the maximum number of hours the override period can extend an occupied period when the override button is

pushed. This item has a range of 0 to 4 hours and should be set to the limit desired for the override period. See Table 24.

Pressing the override button on the Space Temperature Sensor will initiate an override period. The override button must be pressed for 2 to 4 seconds for the control to acknowledge the call. The control will ignore a momentary press of the override button. However, if the override button is held for longer than 4 seconds, a Space Temperature Thermistor Failure alarm will be generated. The number of hours in the override time period will be displayed in ***Time Clock→OVR→OVR.T*** (Timed Override Hours) and will count down as the time period progresses. See Table 23.

Once a non-zero value has been entered, the unit will resume an occupied period for the duration of the time programmed. The number of hours in the override time period will be displayed in ***OVR.T*** and will count down as the time period progresses. This value cannot be changed until the override period has expired or is cancelled. The override time period can be cancelled by changing the ***OVR.T*** value to **0**. This can be done at the unit's interface device or through CCN communications by writing to the point OVR_EXT.

Table 24 — Space Temperature Override Required Configuration

TIME CLOCK MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OVR	OVR.L	X	Override Time LImit	Default: 0 Range: 0 to 4

Timed Override from CCN — A timed override period can be initiated through CCN communications by writing to the point OVR_EXT. This point has a range of 0 to 4 hours and should be set for the desired amount of time.

The number of hours in the override time period will be displayed in ***Time Clock→OVR→OVR.T*** (Timed Override Hours) and will count down as the time period progresses. See Table 23.

Once a non-zero value has been entered, the unit will resume an occupied period for the duration of the time programmed. The number of hours in the override time period will be displayed in ***OVR.T*** and will count down as the time period progresses. This value cannot be changed until the override period has expired or is cancelled. The override time period can be cancelled by changing the ***OVR.T*** value to **0**. This can be done at the unit's interface device or through CCN communications by writing to the point OVR_EXT.

CCN CONTROL — With the control method set to CCN Control, ***CTRL*=3** (CCN), an external CCN device controls the On/Off state of the machine. This CCN device forces the point CHIL_S_S between Start/Stop to control the unit.

Under normal operation, ***Run Status→VIEW→STAT*** (Control Mode) will be **1** (Off Local) when the Enable/Off/Remote Control switch is in the Off position or in the Remote Control position with the remote external contacts open. With the Enable/Off/Remote Control switch in the Enable position or in Remote Control position with the remote external contacts closed, the Control Mode will be **2** (Off CCN) when the CHIL_S_S variable is "Stop." Similarly, the control mode will be **6** (On CCN) when the CHIL_S_S variable is "Start." If the machine is ON, Control Type ***Configuration→OPT2→ C.TYP*=5** (SPT Multi) is used, and the space temperature is satisfied, the Control Mode **9** (SPT Satisfied) will be displayed.

Units controlled via communications by a separate third-party building automation system through a translator or UPC Open Controller must be set to CCN Control, ***CTRL*=3**. If the unit is to be monitored only via communications, ***CTRL*=3** (CCN Control) is not required.

Emergency Stop — A controls feature exists to shut down the machine in the event of an emergency. Writing to the CCN Point EMSTOP, the command "EMSTOP" will force the machine to stop all mechanical cooling immediately and shut down. While this feature is enabled, the Control Mode ***Run Status→VIEW→STAT*=4** (Emergency) will be displayed. For the machine to operate normally, the EMSTOP point value should be "ENABLE."

Capacity Control — When mechanical cooling is required, the Main Base Board (MBB) can control the unit capacity by staging 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 variable air volume (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 from a space temperature sensor, thermostat, return air temperature, or directly from a 4 to 20 mA signal. 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 capacity input.

C.TYP* = 1** (VAV) — This configuration is the standard VAV operation. With this control type, the MBB capacity control routine stages compressor capacity to attempt to meet the current Control Point (Run Status→VIEW→CTPT***).

Recommended Applications — This control scheme is recommended for VAV applications with a single 38AP unit matched with a single air handler. It can be used for 38AP units with or without digital compressors; however, better temperature control will be achieved with the digital compressor option. Minimum Load Control is supported by this control scheme. Minimum Load Control and digital compressor operation are not supported simultaneously.

Hardware Requirements

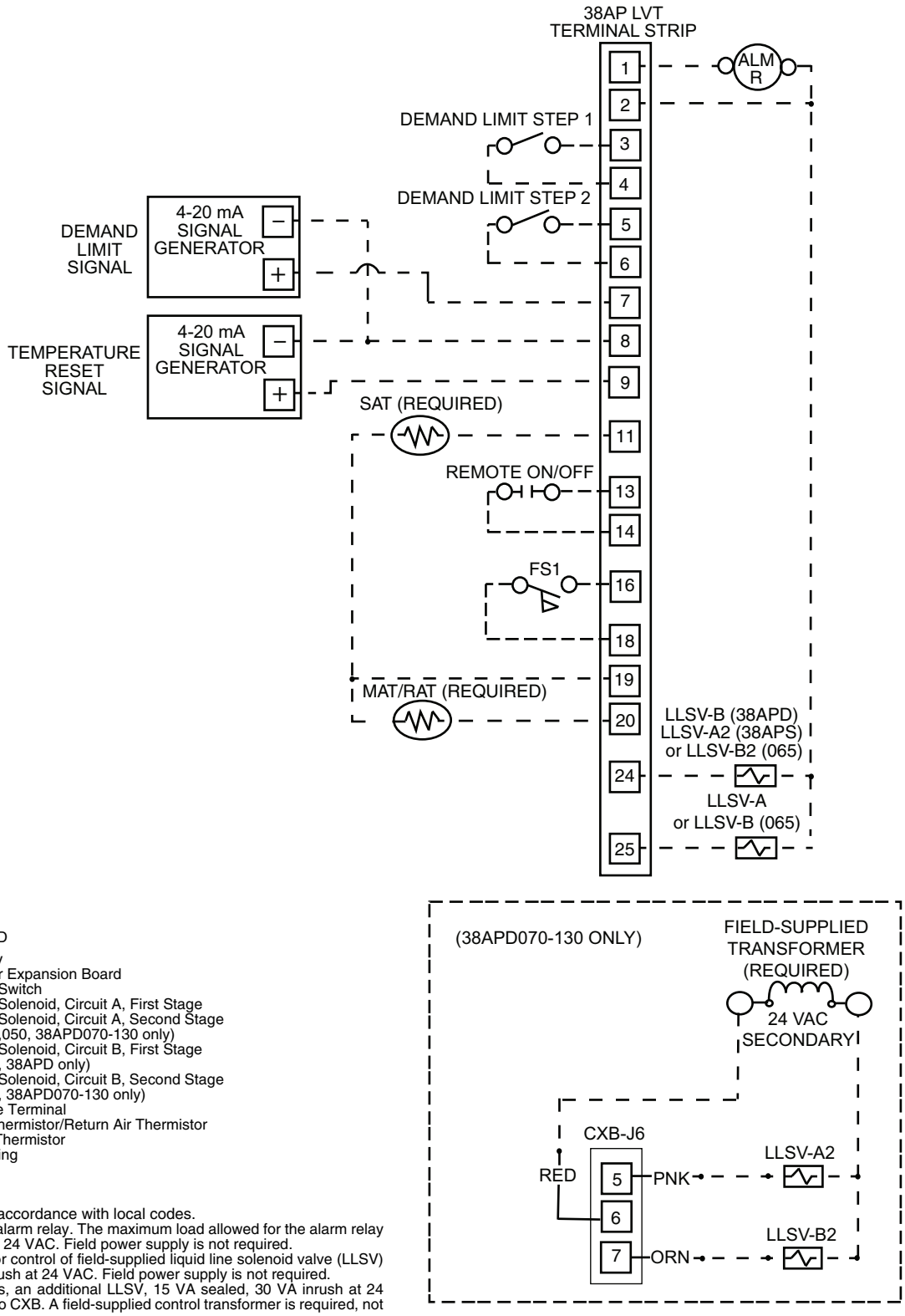
- supply air sensor
- return air sensor or mixed air sensor

In lieu of wiring sensors to the 38AP unit, both values can be communicated via CCN to the 38AP. For information on broadcasting values, see the Thermistors section on page 28. The Return Air Thermistor (***Configuration→OPT1→RAT.T***) and Supply Air Thermistor (***Configuration→OPT1→SAT.T***) must be configured for either **0** (5,000 Ω) or **1** (10,000 Ω) type sensors whether they are hard-wired or their values are communicated to the controller.

Required Configurations — Table 25 shows configurations required for proper operation.

Recommended Settings — ***CSP.1*** should be set to the design supply air temperature (SAT).

Wiring — See Fig. 80.



LEGEND

ALM R	—	Alarm Relay
CXB	—	Compressor Expansion Board
FS1	—	Fan Status Switch
LLSV-A	—	Liquid Line Solenoid, Circuit A, First Stage
LLSV-A2	—	Liquid Line Solenoid, Circuit A, Second Stage (38APS040,050, 38APD070-130 only)
LLSV-B	—	Liquid Line Solenoid, Circuit B, First Stage (38APS065, 38APD only)
LLSV-B2	—	Liquid Line Solenoid, Circuit B, Second Stage (38APS065, 38APD070-130 only)
LVT	—	Low Voltage Terminal
MAT/RAT	—	Mixed Air Thermistor/Return Air Thermistor
SAT	—	Supply Air Thermistor
———		Factory Wiring
– – –		Field Wiring

NOTES:
1. Field wiring must be in accordance with local codes.
2. LVT-1 and 2 are for the alarm relay. The maximum load allowed for the alarm relay is 5 VA sealed, 10 VA at 24 VAC. Field power supply is not required.
3. LVT-24, 25, and 2 are for control of field-supplied liquid line solenoid valve (LLSV) 15 VA sealed, 30 VA inrush at 24 VAC. Field power supply is not required.
4. For 38APD070-130 units, an additional LLSV, 15 VA sealed, 30 VA inrush at 24 VAC can be connected to CXB. A field-supplied control transformer is required, not to exceed 75 VA.
5. All discrete inputs are 24 VAC.
6. Installation of fan status switch (FS1) is recommended. If not used, a jumper must be installed.
7. Energy management module (EMM) is required for Demand Limit functions, 4 to 20 mA, Demand Limit Step 1 and 2, or 4 to 20 mA Temperature Reset.
8. The contacts for Remote On-Off, Fan Status Switch and Demand Limit must be rated for dry circuit applications capable of handling a 24 VAC load up to 50 mA.

Fig. 80 — C.TYP=1 (VAV) Wiring

Table 25 — C.TYP=1 (VAV) Required Configuration

CONFIGURATION MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OPT1	RAT.T	X	RAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
	SAT.T	X	SAT Thermistor Type	Default: 0 Range: 0-2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
OPT2	C.TYP	X	Machine Control Type	Default: 4 Range: 1 to 9 Set Item to 1 (VAV)
SETPOINTS MODE				
COOL	CSP.1	XX.X	Cooling Setpoint 1	Range: 40.0 to 80.0 °F (4.4 to 26.7 °C) Default: 60.0 °F (15.6 °C)

LEGEND

RAT — Return Air Thermistor
SAT — Supply Air Thermistor
VAV — Variable Air Volume

Sequence of Operation — The MBB uses Cooling Setpoint 1 (***Setpoints→COOL→CSP.1***) as the basis for the Active Set Point (***Run Status→VIEW→SETP***). The Control Point (***Run Status→VIEW→CTPT***) is the Active Set Point (***SETP***) or Cooling Set Point 1 (***CSP.1***) adjusted for any temperature reset that is applied. See Temperature Reset on page 129 for additional information.

For mechanical cooling, the unit's Control Method (***Configuration→ OPT2→CTRL***) and inputs must allow the machine to run. See Control Methods on page 60 for additional information.

On power up or changing from Off to Enabled, the machine will remain off until Minutes Off Time (***Configuration→ OPT2→DELY***) timer has expired. See Minutes Off Time on page 128 for additional information. Liquid Line Solenoid Valve operation is as described in Liquid Line Solenoid Valves on page 40. Time Guard is honored for all compressors. For specific information on Time Guard, see MDTG - Time Guard Active on page 135.

In this Control Type, Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=0** (Off Cool) as long as ***Run Status→VIEW→STAT*=1** (Off Local), **2** (Off CCN), **3** (Off Time) or **4** (Off Emrgcy). ***SPT.M*=3** (Cool On) exists when Control Mode, ***STAT*=5** (On Local), **6** (On CCN), or **7** (On Time). In this Control Type, if the Indoor Fan Status Switch opens, ***Inputs→GEN.I→ID.F.A*=OFF**, Control Mode (***STAT)*** will change to **8** (IDFS Not On); the unit will alarm and switch to **4** (Off Emrgcy). Table 26 shows the space temperature control mode response for ***C.TYP*=1**.

Table 26 — Space Temperature Control Mode Response for C.TYP=1 (VAV)

CONTROL MODE *STAT*	INDOOR FAN STATUS CIR A *ID.F.A*	SPACE TEMPERATURE CONTROL MODE *SPT.M*
1 (Off Local)	***Off*** or ***On***	***0*** (Cool Off)
2 (Off CCN)	***Off*** or ***On***	***0*** (Cool Off)
3 (Off Time)	***Off*** or ***On***	***0*** (Cool Off)
4 (Off Emrgcy)	***Off*** or ***On***	***0*** (Cool Off)
5 (On Local)	***On***	***3*** (Cool On)
6 (On CCN)	***On***	***3*** (Cool On)
7 (On Time)	***On***	***3*** (Cool On)
8 (IDFS Not On)	***Off***	***3*** (Cool On)
9 (SPT Satisfied)	Not Applicable	

38APD Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead circuit is determined (see Lead/Lag Determination on page 112). The lead compressor will be determined and started (see Circuit Compressor Staging on page 112). If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's supply air temperature meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. If additional capacity requires the lag circuit to start, the lag circuit's lead compressor will be determined and started. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor in a multiple compressor circuit (38APD040-130) operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

38APS Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's capacity meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

C.TYP* = 3** (TSTAT MULTI) — This configuration will allow the MBB to monitor the thermostat inputs to make a determination of supply air temperature. Unlike traditional 2-stage thermostat control, the unit is allowed to perform VAV style operation using multiple stages of cooling capacity to attempt to meet the current Control Point (Run Status→VIEW→CTPT***).

Recommended Applications — This control scheme is recommended for constant volume or 100% outdoor air applications. It can be used with or without digital compressors. This control method is recommended for 38APD,APS025-030 units with digital scroll option and 38APD,APS040-130 units with two-stage thermostat control. Minimum Load Control is supported by this control scheme. Minimum Load Control and digital compressor operation are not supported simultaneously.

Hardware Requirements

- supply air sensor
- return air sensor or mixed air sensor
- 2-stage thermostat

This control scheme requires a supply air sensor and a return air sensor or mixed air sensor. In lieu of wiring sensors to the 38AP unit, both values can be communicated via CCN to the 38AP. For information on broadcasting values, see the section Thermistors on page 28. ***Configuration→OPT1→RAT.T*** (RAT Thermistor Type) and ***Configuration→OPT1→SAT.T*** (SAT Thermistor Type) must be configured for either **0** (5 kΩ) or **1** (10 kΩ) type sensors whether they are hard wired or their values are communicated to the controller.

Required Configurations — Table 27 lists the configurations required for proper operation.

Recommended Settings — With this Control Type, ***CSP.2*** should be set to the design Supply Air Temperature. ***CSP.1*** will depend on the application. The difference between the default values for ***CSP.1*** and ***CSP.2*** is 5° F (2.8° C). In most cases, the default differential is acceptable, but the application may require a smaller or larger difference. For example, a face split coil may a larger differential. ***CSP.1*** should be set to a value that allows the unit to operate without rapid cycling. ***CSP.1*** should be greater than ***CSP.2*** to allow the unit to produce a lower supply air temperature when Y2 is made, if the unit has the available capacity.

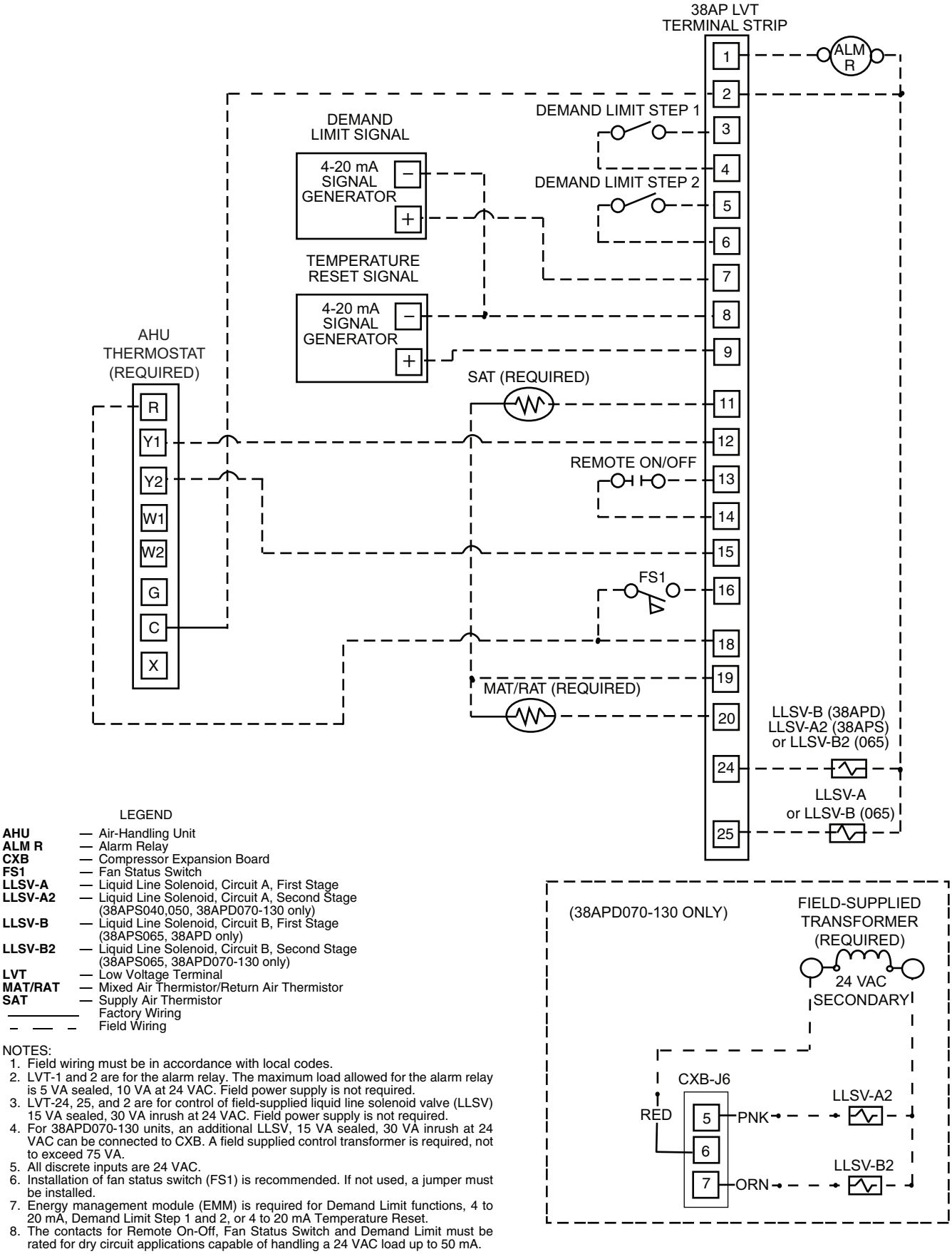
Wiring— See Fig. 81.

Sequence of Operation — The MBB monitors the thermostat inputs to make a determination of Active Set Point (***Run Status→VIEW→SETP***). The control will vary the Active Set Point based on Y1 and Y2 inputs. When Y1 is closed Cooling Setpoint 1 (***Setpoints→COOL→CSP.1***) will be used and when Y2 is closed Cooling Setpoint 2 (***Setpoints→COOL→CSP.2***) will be used as the basis for the Active Set Point, ***SETP***. Thermostat inputs can be monitored at the unit's interface device, Y1Thermostat Input (***Inputs→GEN.I→Y.1***) and Y2 Thermostat Input (***Inputs→GEN.I→Y.2***). With this type of control, the MBB capacity control routine stages compressor capacity to attempt to meet the current Control Point (***Run Status→VIEW→CTPT***). The Control Point (***Run Status→VIEW→CTPT***) is the Active Set Point (***SETP***) adjusted for any temperature reset that is applied. See Temperature Reset on page 129 for additional information.

For mechanical cooling, the unit's Control Method (***Configuration→OPT2→CTRL***) and inputs must allow the machine to run. See Control Methods on page 60 for additional information.

Table 27 — C.TYP=3 (Tstat Multi) Required Configuration

CONFIGURATION MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OPT1	RAT.T	X	RAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
	SAT.T	X	SAT Thermistor Type	Default: 0 Range: 0-2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
OPT2	C.TYP	X	Machine Control Type	Default: 4 Range: 1 to 9 Set Item to 3 (Tstat Multi)
SETPOINTS MODE				
COOL	CSP.1	XX.X	Cooling Setpoint 1	Range: 40.0 to 80.0 F (4.4 to 26.7 C) Default: 60.0 F (15.6 C) Set for desired Supply Air Temperature with Y1 input.
	CSP.2	XX.X	Cooling Setpoint 2	Range: 40.0 to 80.0 F (4.4 to 26.7 C) Default: 55.0 F (12.8 C) Set for desired Supply Air Temperature with Y2 input. Should be lower than CSP.1



LEGEND

AHU	—	Air-Handling Unit
ALM R	—	Alarm Relay
CXB	—	Compressor Expansion Board
FS1	—	Fan Status Switch
LLSV-A	—	Liquid Line Solenoid, Circuit A, First Stage
LLSV-A2	—	Liquid Line Solenoid, Circuit A, Second Stage (38APS040,050, 38APD070-130 only)
LLSV-B	—	Liquid Line Solenoid, Circuit B, First Stage (38APS065, 38APD only)
LLSV-B2	—	Liquid Line Solenoid, Circuit B, Second Stage (38APS065, 38APD070-130 only)
LVT	—	Low Voltage Terminal
MAT/RAT	—	Mixed Air Thermistor/Return Air Thermistor
SAT	—	Supply Air Thermistor
———		Factory Wiring
– — –		Field Wiring

NOTES:
1. Field wiring must be in accordance with local codes.
2. LVT-1 and 2 are for the alarm relay. The maximum load allowed for the alarm relay is 5 VA sealed, 10 VA at 24 VAC. Field power supply is not required.
3. LVT-24, 25, and 2 are for control of field-supplied liquid line solenoid valve (LLSV) 15 VA sealed, 30 VA inrush at 24 VAC. Field power supply is not required.
4. For 38APD070-130 units, an additional LLSV, 15 VA sealed, 30 VA inrush at 24 VAC can be connected to CXB. A field supplied control transformer is required, not to exceed 75 VA.
5. All discrete inputs are 24 VAC.
6. Installation of fan status switch (FS1) is recommended. If not used, a jumper must be installed.
7. Energy management module (EMM) is required for Demand Limit functions, 4 to 20 mA, Demand Limit Step 1 and 2, or 4 to 20 mA Temperature Reset.
8. The contacts for Remote On-Off, Fan Status Switch and Demand Limit must be rated for dry circuit applications capable of handling a 24 VAC load up to 50 mA.

Fig. 81 — C.TYP=3 (Tstat Multi) Wiring

On power up or changing from Off to Enabled, the machine will remain off until Minutes Off Time (***Configuration→OPT2→DELY***) timer has expired. See Minutes Off Time on page 128 for additional information. Liquid line solenoid valve operation is as described in Liquid Line Solenoid Valves on page 40. Time Guard is honored for all compressors. For specific information on Time Guard, see MDTG - Time Guard Active on page 135.

In this Control Type, Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=0** (Off Cool) as long as Control Mode ***Run Status→VIEW→STAT*=1** (Off Local), **2** (Off CCN), **3** (Off Time), **4** (Off Emrgcy), or **9** (SPT Satisfied). When the Control Mode ***STAT*=5** (On Local), **6** (On CCN), or **7** (On Time), ***SPT.M*=1** (Lo Cool) if Y1 is closed, ***Inputs→GEN.I→Y.1*=ON** or ***SPT.M*=2** (High Cool) if Y2 is closed, ***Inputs→GEN.I→Y.2*=ON**. If Y1 and Y2 are both open, ***Y.1*=OFF** and ***Y.2*=OFF**, ***STAT*=9** (SPT Satisfied) and ***SPT.M*=0** (Off Cool) will be displayed. In this Control Type, if the Indoor Fan Status Switch opens (***Inputs→GEN.I→ID.F.A*=OFF**), Control Mode (***STAT***) will change to **8** (IDFS Not On) as long as there is no call for cooling, ***Y.1*=OFF** and ***Y.2*=OFF**. If there is a call for cooling, ***Y.1*=ON** or ***Y.2*=ON** the unit will alarm and ***STAT*** switch to **4** (Off Emrgcy). Table 28 shows the space temperature control mode response for ***C.TYP*=3**.

Table 28 — Space Temperature Control Mode Response for C.TYP=3

CONTROL MODE *STAT*	Y1 STATUS *Y.1*	Y2 STATUS *Y.2*	INDOOR FAN STATUS CIR A *ID.F.A*	SPACE TEMPERATURE CONTROL MODE *SPT.M*
1 (Off Local)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
2 (Off CCN)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
3 (Off Time)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
4 (Off Emrgcy)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
5 (On Local)	***On***	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
6 (On CCN)	***On***	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
7 (On Time)	***On***	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
8 (IDFS Not On)	***Off*** or ***On***	***Off*** or ***On***	***Off***	***0*** (Cool Off)
9 (SPT Satisfied)	***Off***	***Off***	***On***	***0*** (Cool Off)

38APD — On a call for cooling, the Indoor Fan Status Cir A, (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead circuit is determined. See Lead/Lag Determination on page 112. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's capacity meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. If additional capacity requires the lag circuit to start, the lag circuit's lead compressor will be determined and started. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor in a multiple compressor circuit (38APD040-130) operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

38APS Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's capacity meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

***C.TYP* = 4** (TSTAT 2 STG) — This configuration allows the MBB to monitor the thermostat inputs to make capacity stage decisions. If Y1 input is closed, no more than 50% of the circuit capacity will be energized. If Y2 is closed, 100% of the circuit capacity will be energized for that circuit and air handler. Y1 closure is not required for 100% capacity.

Recommended Applications — This control type is recommended for constant volume, non-digital compressor applications with units with less than 3 stages of compression. It is not recommended for units with more than two stages of capacity.

This control scheme cannot be used with:

- Units with digital compressors. Digital operation is not supported with this control scheme.
- Minimum Load Control is not supported with this control scheme.

Hardware Requirements

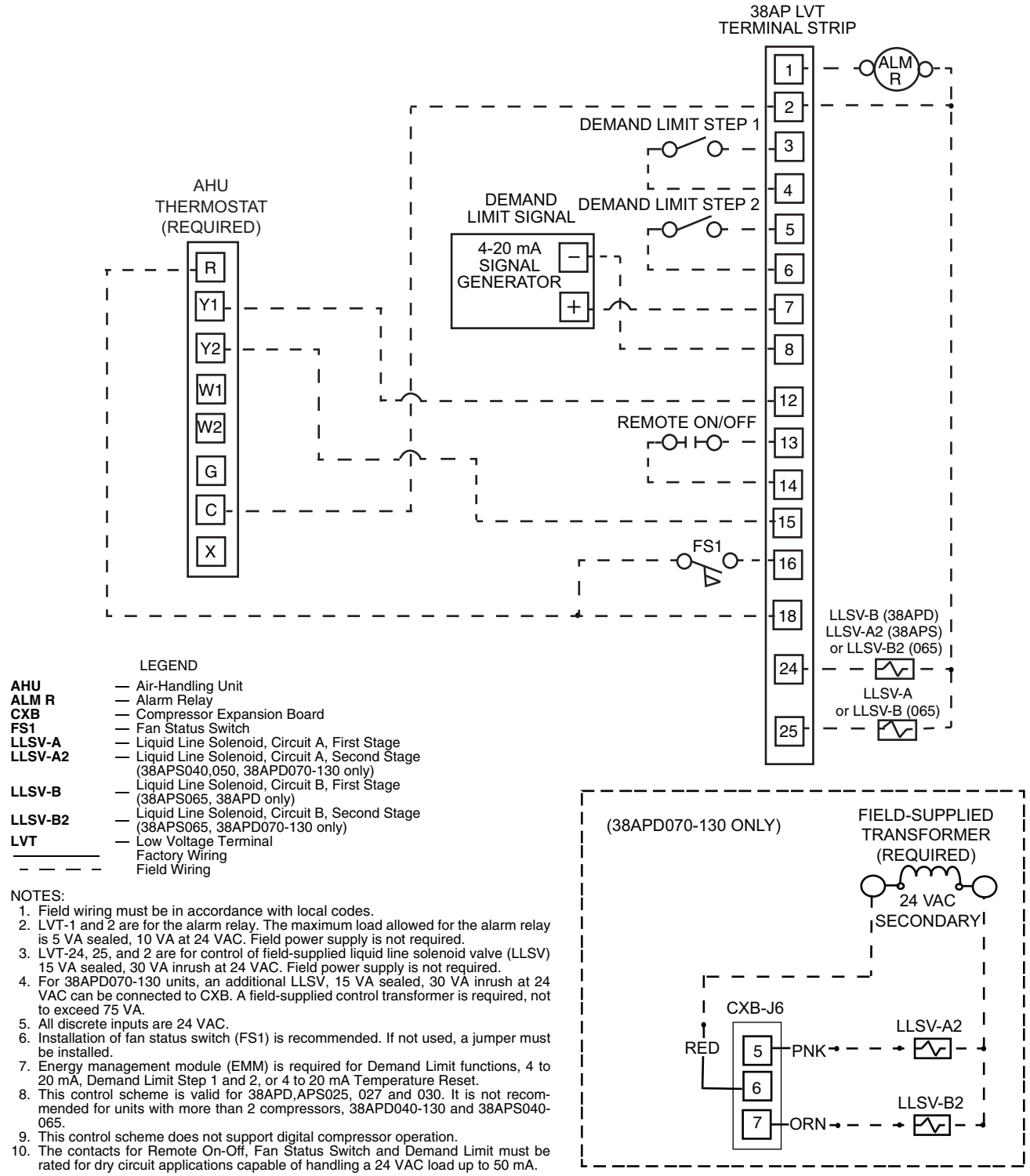
- 2-stage thermostat

Required Configurations — Table 29 lists the configurations required for proper operation.

Wiring — See Fig. 82.

Table 29 — C.TYP=4 (Tstat 2 Stg) Required Configuration

CONFIGURATION MODE				
SUBMODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
OPT2	C.TYP	X	Machine Control Type	Default: 4 Range: 1 to 9 Set item to 4 (Tstat 2 Stg)



LEGEND

AHU	—	Air-Handling Unit
ALM R	—	Alarm Relay
CXB	—	Compressor Expansion Board
FS1	—	Fan Status Switch
LLSV-A	—	Liquid Line Solenoid, Circuit A, First Stage
LLSV-A2	—	Liquid Line Solenoid, Circuit A, Second Stage (38APS040,050, 38APD070-130 only)
LLSV-B	—	Liquid Line Solenoid, Circuit B, First Stage (38APS065, 38APD only)
LLSV-B2	—	Liquid Line Solenoid, Circuit B, Second Stage (38APS065, 38APD070-130 only)
LVT	—	Low Voltage Terminal
———		Factory Wiring
– – – –		Field Wiring

NOTES:
1. Field wiring must be in accordance with local codes.
2. LVT-1 and 2 are for the alarm relay. The maximum load allowed for the alarm relay is 5 VA sealed, 10 VA at 24 VAC. Field power supply is not required.
3. LVT-24, 25, and 2 are for control of field-supplied liquid line solenoid valve (LLSV) 15 VA sealed, 30 VA inrush at 24 VAC. Field power supply is not required.
4. For 38APD070-130 units, an additional LLSV, 15 VA sealed, 30 VA inrush at 24 VAC can be connected to CXB. A field-supplied control transformer is required, not to exceed 75 VA.
5. All discrete inputs are 24 VAC.
6. Installation of fan status switch (FS1) is recommended. If not used, a jumper must be installed.
7. Energy management module (EMM) is required for Demand Limit functions, 4 to 20 mA, Demand Limit Step 1 and 2, or 4 to 20 mA Temperature Reset.
8. This control scheme is valid for 38APD,APS025, 027 and 030. It is not recommended for units with more than 2 compressors, 38APD040-130 and 38APS040-065.
9. This control scheme does not support digital compressor operation.
10. The contacts for Remote On-Off, Fan Status Switch and Demand Limit must be rated for dry circuit applications capable of handling a 24 VAC load up to 50 mA.

Fig. 82 — C.TYP=4 (Tstat 2 Stg) Wiring

Sequence of Operation — The MBB monitors the thermostat inputs to make a determination of capacity stage. When Y1 closes, no more than 50% of the unit's capacity will be energized. When Y2 closes, the remaining capacity will be energized. Thermostat inputs can be monitored at the unit's interface device: Y1 Thermostat Input (***Inputs→GEN.I→Y.1***) and Y2 Thermostat Input (***Inputs→GEN.I→Y.2***).

For mechanical cooling, the unit's Control Method, (***Configuration→OPT2→CTRL***), and inputs must allow the machine to run. See Control Methods on page 60 for additional information.

On power up or changing from Off to Enabled, the machine will remain off until Minutes Off Time (***Configuration→OPT2→DELY***) timer has expired. See Minutes Off Time on page 128 for additional information. Liquid line solenoid valve operation is described in Liquid Line Solenoid Valves on page 40. Time Guard is honored for all compressors. For specific information on Time Guard, see MDTG - Time Guard Active on page 135.

In this Control Type, Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=0** (Off Cool) as long as ***Run Status→VIEW→STAT*=1** (Off Local), **2** (Off CCN), **3** (Off Time), or **4** (Off Emrgcy). When the Control Mode ***STAT*=5** (On Local), **6** (On CCN), or **7** (On Time), ***SPT.M*=1** (Lo Cool) if Y1 is closed, ***Inputs→GEN.I→Y.1*=ON**, ***SPT.M*=2** (High Cool) if Y2 is closed, ***Inputs→GEN.I→Y.2*=ON**, or ***SPT.M*=0** (Off Cool) if Y1 and Y2 are both open, ***Y.1*=OFF** and ***Y.2*=OFF**. With this Control Type, if the Indoor Fan Status Switch opens (***Inputs→GEN.I→ID.F.A=OFF***), ***STAT*** will change to **8** (IDFS Not On), the unit will remain with ***SPT.M*=0** (Off Cool) if Y1 and Y2 are both open, ***Y.1*=OFF** and ***Y.2*=OFF**. If Y1 or Y2 close, ***Y.1*=ON** or ***Y.2*=ON,** the unit Control Mode will change from ***STAT*=8** (IDFS Not On), to **4** (Off Emrgcy) as an alarm is generated. Table 30 shows the space temperature control mode response for ***C.TYP*=4**.

Table 30 — Space Temperature Control Mode Response for C.TYP=4

CONTROL MODE *STAT*	Y1 STATUS *Y.1*	Y2 STATUS *Y.2*	INDOOR FAN STATUS CIR A *ID.F.A*	SPACE TEMPERATURE CONTROL MODE *SPT.M*
1 (Off Local)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
2 (Off CCN)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
3 (Off Time)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
4 (Off Emrgcy)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
5 (On Local)	***Off***	***Off***	***Off*** or ***On***	***0*** (Off Cool)
	On	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
6 (On CCN)	***Off***	***Off***	***Off*** or ***On***	***0*** (Off Cool)
	On	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
7 (On Time)	***Off***	***Off***	***On***	***0*** (Off Cool)
	On	***Off***	***Off*** or ***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
8 (IDFS Not On)	***Off*** or ***On***	***Off*** or ***On***	***Off***	***0*** (Cool Off)
9 (SPT Satisfied)	*Not Applicable*			

38APD Units — On a call for cooling, Y1 closure, Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead circuit is determined. See Lead/Lag Determination on page 112. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. The solenoid corresponding to the lead compressor circuit is opened 30 seconds after the Y1 closure. The lead compressor is started 20 seconds later. Compressors will be staged at 70-second intervals until the unit's capacity is as close as possible to 50% without exceeding it. If additional capacity requires the lag circuit to start, the lag circuit's lead compressor will be determined. The lag circuit solenoid valve will be energized. When the Y2 contact is closed, the remaining capacity will be started, staging compressors at 60-second intervals. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor in a multiple compressor circuit (38APD040-130) operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease and the Y2 contact opens, the machine controls will reduce the unit's capacity by removing compressors. The first compressor will turn off between 30 and 60 seconds following the loss of the Y2 signal. The remaining compressors will turn off in 90-second intervals until the unit is as close as possible to 50% capacity without exceeding it. Finally, as the Y1 contact opens, the remaining capacity is removed immediately.

38APS Units — On a call for cooling, Y1 closure, Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The solenoid is opened 30 seconds after the Y1 closure. The lead compressor will be determined and is started 20 seconds later. See Circuit Compressor Staging on page 112. Compressors will be staged at 70-second intervals until the unit's capacity is as close as possible to 50% without exceeding it. When the Y2 contact is closed, the remaining capacity will be started, staging compressors at 70-second intervals. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease and the Y2 contact opens, the machine controls will reduce the unit's capacity by removing compressors. The first compressor will turn off between 30 and 60 seconds following the loss of the Y2 signal. The remaining compressors will turn off in 90-second intervals until the unit is as close as possible to 50% capacity without exceeding it. Finally, as the Y1 contact opens, the remaining capacity is removed immediately.

C.TYP* = 5** (SPT MULTI) — This configuration will allow the MBB to monitor the space temperature sensor and compare it to the Space Temperature Set Point (Setpoints→COOL→SPS.P***) to make a capacity determination. The unit is allowed to use multiple stages of cooling control and perform VAV-style operation in an attempt to meet the current Control Point (***Run Status→VIEW→CTPT***).

The Control Point is the Active Set Point (***Run Status→VIEW→SETP***), either Cooling Setpoint 1 (***Setpoints→COOL→CSP.1***) or Cooling Set Point 2 (***Setpoints→COOL→CSP.2***) depending on the difference between the Space Temperature (***Run Status→VIEW→SPT***) and ***SPS.P***, adjusted for any temperature reset that is applied. See Temperature Reset on page 129 for information on Temperature Reset.

Additionally, with an appropriate space temperature sensor, a space temperature offset can be applied to the space temperature as sensed in the conditioned space. This offset adjusts the actual space temperature reading being sent to the 38AP controls, thereby changing the system's response.

Recommended Applications — This control scheme is recommended for constant volume applications and is compatible with both standard and digital compressor operation. Minimum Load Control is supported by this control scheme; however, Minimum Load Control and digital compressor operation cannot be supported simultaneously.

Hardware Requirements

- space temperature sensor
- return/mixed air sensor
- supply air sensor

This control scheme requires a supply air sensor and a return air sensor or mixed air sensor. In lieu of wiring sensors to the 38AP unit, both values can be communicated via CCN to the 38AP unit. For information on broadcasting values, see Thermistors on page 28. The Supply Air Thermistor (***Configuration→OPT1→SAT.T***) and Return Air Thermistor (***Configuration→OPT1→RAT.T***) must be configured for either **0** (5 kΩ) or **1** (10 kΩ) type sensors, whether they are hard wired or their values are communicated to the controller.

A space temperature sensor must be installed (T55, T56 or T59) and enabled (***Configuration→OPT1→SPT.S***). If a T56 or T59 sensor with space temperature offset is installed with the space temperature offset slider, it must be enabled (***Configuration→OPT1→SP.O.S***) to affect the unit control. If a T56 or T59 space temperature offset sensor is installed, it is possible to configure the range of the slider by adjusting this range configuration, Space Temperature Offset Range (***Configuration→OPT1→SP.O.R***). The range for this item is 1 to 10° F (0.6 to 5.6° C); the factory default is 5° F (2.8° C). With the slider in the neutral position, no offset is applied.

Required Configurations — Table 31 lists the configurations required for proper operation.

Recommended Settings — With this Control Type, ***CSP.2*** should be set to the design Supply Air Temperature. ***CSP.1*** will depend on the application. The difference between the default values for ***CSP.1*** and ***CSP.2*** is 5° F (2.8° C). In most cases, the default differential is acceptable, but the application may require a smaller or larger difference. For example, a face split coil may require a larger differential. ***CSP.1*** should be set to a value that allows the unit to operate without rapid cycling. ***CSP.1*** should be greater than ***CSP.2*** to allow the unit to produce a lower supply air temperature when a call for High Cool is made, if the unit has the available capacity.

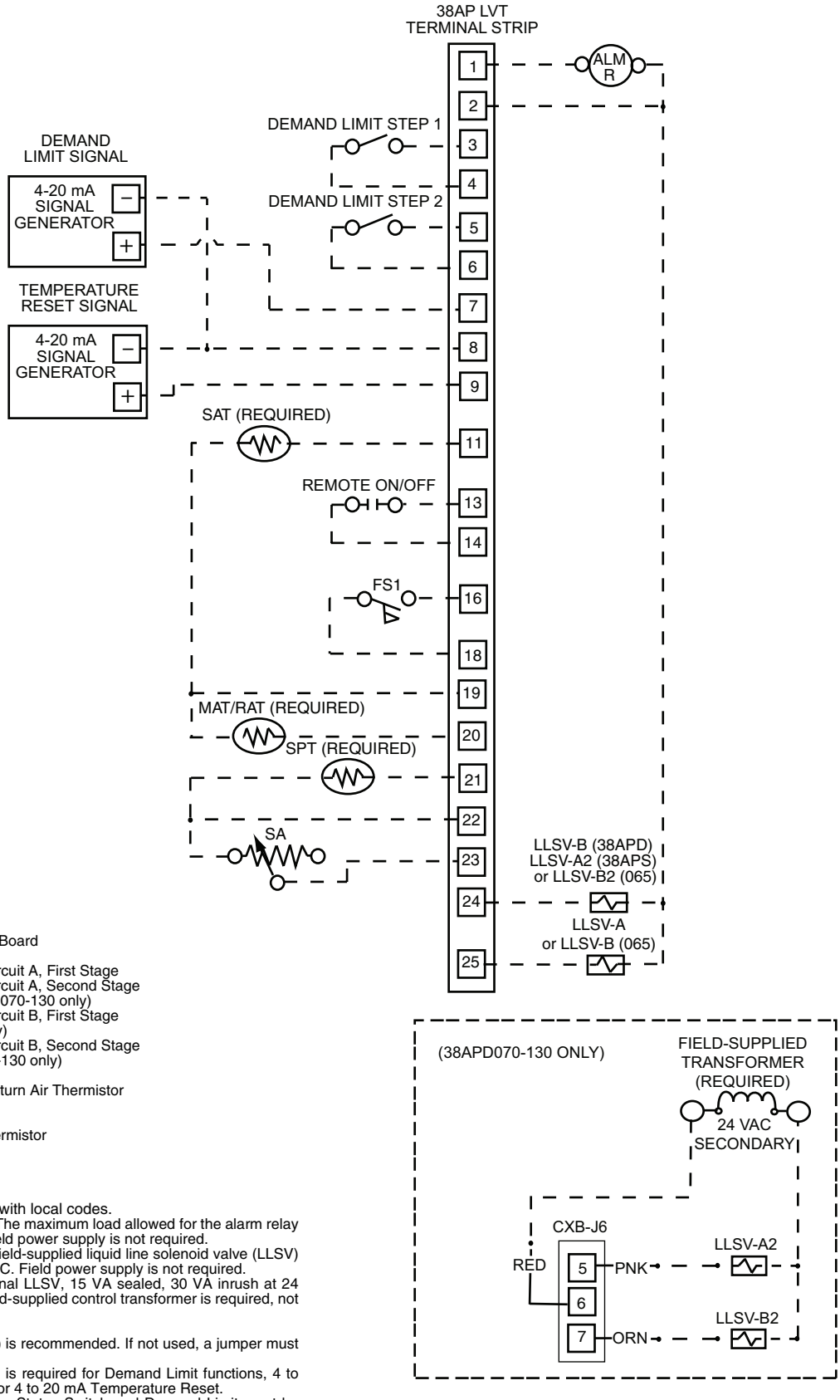
Space Temperature Cool Set Point (***SPS.P)*** should be the desired room temperature.

Wiring — See Fig. 83.

Table 31 — C.TYP=5 (SPT Multi) Required Configuration

CONFIGURATION MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OPT1	SPT.S	ENBL/DSBL	Space Temp Sensor	Default: DSBL Set to ENBL. Cannot be enabled until C.TYP=5. If C.TYP=5, this item is automatically enabled.
	SPT.O.S	ENBL/DSB	Space Temp Offset Enable	Default: DSBL Set to ENBL if T56 Thermostat is installed and temperature offset is to be used.
	SPT.O.R*	XX ΔF (ΔC)	Space Temp Offset Range	Range: 1 to 10 ΔF (0.6 to 5.6 ΔC) Default: 5 ΔF (2.8 ΔC)
	RAT.T	X	RAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
	SAT.T	X	SAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
OPT2	C.TYP	X	Machine Control Type	Default: 4 Range: 1 to 9 Set Item to 5 (SPT Multi)
SETPOINTS MODE				
COOL	CSP.1	XX.X	Cooling Setpoint 1	Default: 60.0 F (15.6 C) Range: 40.0 to 80.0 F (4.4 to 26.7 C)
	CSP.2	XX.X	Cooling Setpoint 2	Default: 55.0 F (12.8 C) Range: 40.0 to 80.0 F (4.4 to 26.7 C)
	SPS.P	XX.X	Space T Cool Setpoint	Default: 78.0 F (25.6 C) Range: 65.0 to 80.0 F (18.3 to 26.7 C)
	L.C.ON	X	Lo Cool On Setpoint	Default: 1 ΔF (0.6 ΔC) –1 to 2 ΔF (–0.6 to 1.1 ΔC)
	H.C.ON		Hi Cool On Setpoint	Default: 3 ΔF (1.7 ΔC) 0.5 to 20 ΔF (0.3 to 11.1 ΔC)
	L.C.OF		Lo Cool Off Setpoint	Default: 0.5 ΔF (0.3 ΔC) 0.5 to 2 ΔF (0.3 to 1.1 ΔC)

*If equipped.



LEGEND

ALM R	—	Alarm Relay
CXB	—	Compressor Expansion Board
FS1	—	Fan Status Switch
LLSV-A	—	Liquid Line Solenoid, Circuit A, First Stage
LLSV-A2	—	Liquid Line Solenoid, Circuit A, Second Stage (38APS040,050, 38APD070-130 only)
LLSV-B	—	Liquid Line Solenoid, Circuit B, First Stage (38APS065, 38APD only)
LLSV-B2	—	Liquid Line Solenoid, Circuit B, Second Stage (38APS065, 38APD070-130 only)
LVT	—	Low Voltage Terminal
MAT/RAT	—	Mixed Air Thermistor/Return Air Thermistor
SA	—	Set Point Adjustment
SAT	—	Supply Air Thermistor
SPT	—	Space Temperature Thermistor
———		Factory Wiring
– – –		Field Wiring

NOTES:
1. Field wiring must be in accordance with local codes.
2. LVT-1 and 2 are for the alarm relay. The maximum load allowed for the alarm relay is 5 VA sealed, 10 VA at 24 VAC. Field power supply is not required.
3. LVT-24, 25, and 2 are for control of field-supplied liquid line solenoid valve (LLSV) 15 VA sealed, 30 VA inrush at 24 VAC. Field power supply is not required.
4. For 38APD070-130 units, an additional LLSV, 15 VA sealed, 30 VA inrush at 24 VAC can be connected to CXB. A field-supplied control transformer is required, not to exceed 75 VA.
5. All discrete inputs are 24 VAC.
6. Installation of fan status switch (FS1) is recommended. If not used, a jumper must be installed.
7. Energy management module (EMM) is required for Demand Limit functions, 4 to 20 mA, Demand Limit Step 1 and 2, or 4 to 20 mA Temperature Reset.
8. The contacts for Remote On-Off, Fan Status Switch and Demand Limit must be rated for dry circuit applications capable of handling a 24 VAC load up to 50 mA.

Fig. 83 — C.TYP=5 (SPT Multi) Wiring

Sequence of Operation — The MBB monitors the space temperature input together with the unit configurations to make a determination of ***Control Point Run Status→VIEW→CTPT***. The control will call for a low cool set point, ***Setpoints→COOL→CSP.1*** (Cooling Setpoint 1) or high cool set point ***Setpoints→COOL→CSP.2*** (Cooling Setpoint 2) depending on the difference between the Space Temperature (***Run Status→VIEW→SPT***) and the space temperature set point (***Setpoints→COOL→SPS.P***). ***CSP.1*** should be greater than ***CSP.2***. ***CSP.1*** or ***CSP.2*** will be used as the basis for the Active Set Point (***Run Status→VIEW→SETP***) based on the configuration settings, Low Cool On Set Point (***Setpoints→COOL→L.C.ON***), High Cool On Set Point (***Setpoints→COOL→H.C.ON***), and Low Cool Off Set Point (***Setpoints→COOL→L.C.OF***) to determine the control point.

If the Space Temperature rises above the ***SPS.P*** + ***L.C.ON***, the system will start with ***CSP.1*** as the Control Point. Space Temperature Control Mode (***Run Status→VIEW→SPT.M***) will indicate **1** (Lo Cool). As long as the Space Temperature does not rise above ***SPS.P*** + ***L.C.ON*** + ***H.C.ON***, the unit will continue to supply conditioned air with ***CSP.1*** as the Control Point until the Space Temperature falls below ***SPS.P*** + ***L.C.ON*** – ***L.C.OF***. If the Space Temperature falls below ***SPS.P*** + ***L.C.ON*** – ***L.C.OF***, mechanical cooling will cease. Space Temperature Control Mode, ***SPT.M*** will indicate **0** (Cool Off). If the Space Temperature rises above ***SPS.P*** + ***L.C.ON*** + ***H.C.ON***, the unit will change the Control Point to ***CSP.2***. Space Temperature Control Mode, ***SPT.M*** will indicate **2** (Hi Cool). ***CSP.2*** will remain the Control Point until the Space Temperature falls below ***SPS.P*** + ***L.C.ON*** – (***L.C.OF***/2) at which time the Control Point will change to ***CSP.1***. ***CSP.1*** will remain the Control Point until the Space Temperature falls below ***SPS.P*** + ***L.C.ON*** – ***L.C.OF***. Space Temperature Control Mode, ***SPT.M*** will indicate **0** (Cool Off).

The following example illustrates this control scheme. Given:

SPS.P = 72 F,

L.C.ON = 1,

H.C.ON = 3,

L.C.OF = 2 F,

CSP.1 = 60 F,

CSP.2 = 55 F

If Space Temperature equals 73 F (***SPS.P*** + ***L.C.ON*** [Low Cool On]) cooling will begin and the Control Point equals 60 F (***CSP.1)***. As long as Space Temperature does not exceed the High Cool On setting (***SPS.P*** + ***L.C.ON*** + ***H.C.ON***), ***CSP.1*** will remain the Control Point until the Space Temperature falls below 71 F (***SPS.P*** + ***L.C.ON*** – ***L.C.OF*** [Low Cool Off]) when mechanical cooling will cease.

If space temperature rises above 76 F (***SPS.P*** + ***L.C.ON*** + ***H.C.ON*** [High Cool On]), control point set point changes to 55 F (***CSP.2***). ***CSP.2*** will remain the Control Point until the Space Temperature falls below 72 F (***SPS.P*** + ***L.C.ON*** – ***L.C.OF***/2 [High Cool Off]), control point transitions back to 60 F (***CSP.1***). If space continues to fall below 71 F (***SPS.P*** + ***L.C.ON*** – ***L.C.OF*** [Low Cool Off]), the unit is shut off.

Figure 84 summarizes this example.

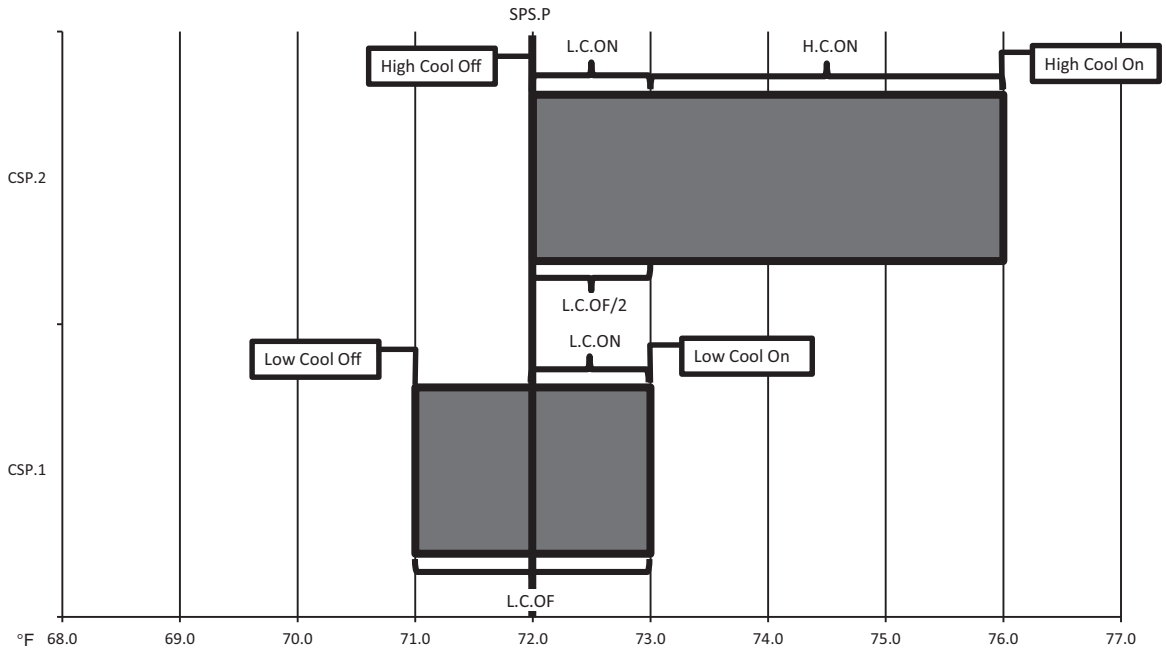


Fig. 84 — C-TYP=5, Space Temperature Control Example

For mechanical cooling, the unit's Control Method (***Configuration→OPT2→CTRL***) and inputs must allow the machine to run. See Control Methods on page 60 for additional information.

On power up or changing from Off to Enabled, the machine will remain off until Minutes Off Time ***Configuration→OPT2→DELY*** timer has expired. See Minutes Off Time on page 128 for additional information. Liquid Line Solenoid Valve operation is as described in Liquid Line Solenoid Valves on page 40. Time Guard is honored for all compressors. For specific information on Time Guard, see MDTG - Time Guard Active on page 135.

In this Control Type, Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=0** (Off Cool) as long as ***Run Status→VIEW→STAT*=1** (Off Local), **2** (Off CCN), **3** (Off Time), or **4** (Off Emrgcy). When the Control Mode, ***STAT*=5** (On Local), **6** (On CCN), or **7** (On Time), ***SPT.M*=1** (Lo Cool) if Y1 is closed (***Inputs→GEN.I→Y.1*=ON**), ***SPT.M*=2** High Cool if Y2 is closed (***Inputs→GEN.I→Y.2*=ON**), or ***SPT.M*=0** (Off Cool) if Y1 and Y2 are both open, ***Y.1*=OFF** and ***Y.2*=OFF**. With this Control Type, if the Indoor Fan Status Switch opens, ***Inputs→GEN.I→ID.F.A*=OFF**, ***STAT*** will change to **8** (IDFS Not On), the unit will remain with ***SPT.M*=0** (Off Cool) if Y1 and Y2 are both open, ***Y.1*=OFF** and ***Y.2*=OFF**. If Y1 or Y2 close, ***Y.1*=ON** or ***Y.2*=ON** the unit Control Mode will change from ***STAT*=8** (IDFS Not On), to **4** (Off Emrgcy) as an alarm is generated. Table 32 shows the space temperature control mode response for ***C.TYP*=5**.

Table 32 — Space Temperature Control Mode Response for C.TYP=5

CONTROL MODE *STAT*	SPACE TEMPERATURE SPT	INDOOR FAN STATUS CIR A *ID.F.A*	SPACE TEMPERATURE CONTROL MODE *SPT.M*
1 (Off Local)	*Not Applicable*	***Off*** or ***On***	***0*** (Off Cool)
2 (Off CCN)	*Not Applicable*	***Off*** or ***On***	***0*** (Off Cool)
3 (Off Time)	*Not Applicable*	***Off*** or ***On***	***0*** (Off Cool)
4 (Off Emrgcy)	*Not Applicable*	***Off*** or ***On***	***0*** (Off Cool)
5 (On Local)	***SPS.P + LC.ON – L.C.OF < SPT < SPS.P + LC.ON***	***On***	***1*** (Lo Cool)*
	SPS.P + L.C.OF/2 < SPT < SPS.P + L.C.ON + H.C.ON	***On***	***2*** (Hi Cool)*
6 (On CCN)	***SPS.P + LC.ON – L.C.OF < SPT < SPS.P + LC.ON***	***On***	***1*** (Lo Cool)*
	SPS.P + L.C.OF/2 < SPT < SPS.P + L.C.ON + H.C.ON	***On***	***2*** (Hi Cool)*
7 (On Time)	***SPS.P + LC.ON – L.C.OF < SPT < SPS.P + LC.ON***	***On***	***1*** (Lo Cool)*
	SPS.P+L.C.OF/2 < SPT < SPS.P + L.C.ON + H.C.ON	***On***	***2*** (Hi Cool)*
8 (IDFS Not On)	*Not Applicable*	***Off***	***0*** (Cool Off)*
9 (SPT Satisfied)	***< SPS.P + LC.ON – L.C.OF***	***On***	***0*** (Cool Off)*

*There is built-in overlap of the High Cool and Low Cool Operation. Actual Space Temperature Control Mode depends on the direction of space temperature change (positive or negative) and its starting point.

38APD Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead circuit is determined. See Lead/Lag Determination on page 112. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's supply air temperature meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. If additional capacity requires the lag circuit to start, the lag circuit's lead compressor will be determined and started. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor in a multiple compressor circuit (38APD040-130) operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

38APS — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's supply air temperature meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity. The liquid line solenoid valve is de-energized 5 seconds after the circuit stops.

C.TYP* = 7** (PCT CAP) — This configuration will allow the main base board (MBB) to monitor the 4-20 mA cooling demand signal ***Inputs→4-20→CL.MA input to the energy management module and translate this into desired percent capacity for the unit.

Recommended Applications — This configuration is compatible with both standard and digital compressors. This application is intended for direct capacity control by a third-party control system. All safeties remain in effect (minimum run time, time guard, low saturated suction, high condensing temperature, low superheat, etc.).

Hardware Requirements — The following hardware is required:

- energy management module
- 4 to 20 mA generator

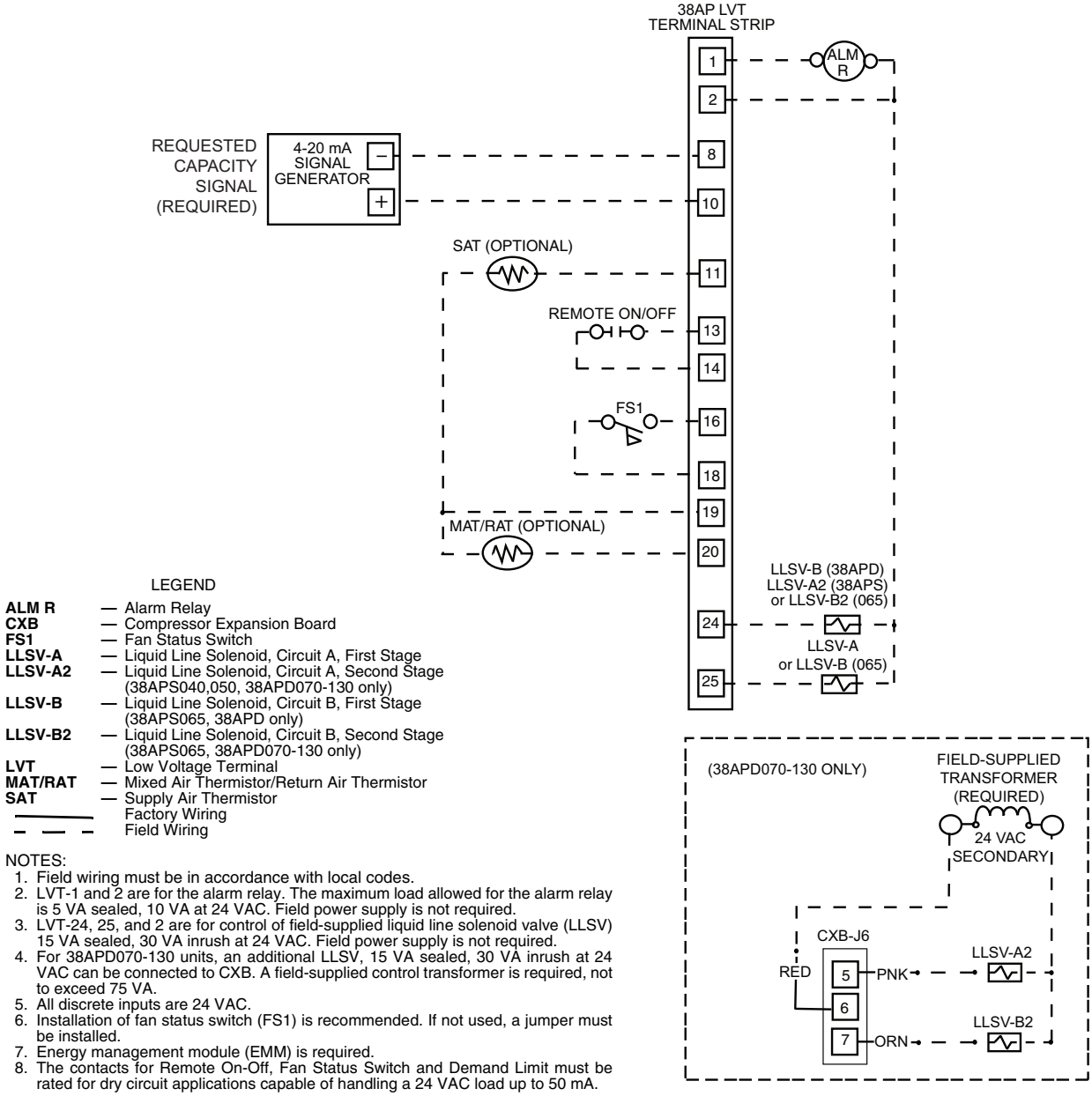
Required Configurations — Table 33 lists the configurations required for proper operation.

Wiring — See Fig. 85.

Table 33 — C.TYP=7 (Pct Cap) Required Configuration

CONFIGURATION MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OPT1	RAT.T	X	RAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None*
	SAT.T	X	SAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None*
OPT2	C.TYP	X	Machine Control Type	Default: 4 Range: 1 to 9 Set Item to 7 (Pct Cap)

*Although return air and supply air thermistors are not required, they can be configured. If they are not installed, the values for ***RAT.T*** and ***SAT.T*** must be set to **2**.



LEGEND

ALM R	— Alarm Relay
CXB	— Compressor Expansion Board
FS1	— Fan Status Switch
LLSV-A	— Liquid Line Solenoid, Circuit A, First Stage
LLSV-A2	— Liquid Line Solenoid, Circuit A, Second Stage (38APS040,050, 38APD070-130 only)
LLSV-B	— Liquid Line Solenoid, Circuit B, First Stage (38APS065, 38APD only)
LLSV-B2	— Liquid Line Solenoid, Circuit B, Second Stage (38APS065, 38APD070-130 only)
LVT	— Low Voltage Terminal
MAT/RAT	— Mixed Air Thermistor/Return Air Thermistor
SAT	— Supply Air Thermistor
	Factory Wiring
	Field Wiring

NOTES:
1. Field wiring must be in accordance with local codes.
2. LVT-1 and 2 are for the alarm relay. The maximum load allowed for the alarm relay is 5 VA sealed, 10 VA at 24 VAC. Field power supply is not required.
3. LVT-24, 25, and 2 are for control of field-supplied liquid line solenoid valve (LLSV) 15 VA sealed, 30 VA inrush at 24 VAC. Field power supply is not required.
4. For 38APD070-130 units, an additional LLSV, 15 VA sealed, 30 VA inrush at 24 VAC can be connected to CXB. A field-supplied control transformer is required, not to exceed 75 VA.
5. All discrete inputs are 24 VAC.
6. Installation of fan status switch (FS1) is recommended. If not used, a jumper must be installed.
7. Energy management module (EMM) is required.
8. The contacts for Remote On-Off, Fan Status Switch and Demand Limit must be rated for dry circuit applications capable of handling a 24 VAC load up to 50 mA.

Fig. 85 — C.TYP=7 (Pct Cap) Wiring

Sequence of Operation — Capacity control is determined by the signal provided by the Building Management System. The field-supplied 4 to 20 mA signal is converted to a linear scale for percent capacity vs. 4 to 20 mA input as shown in Fig. 86.

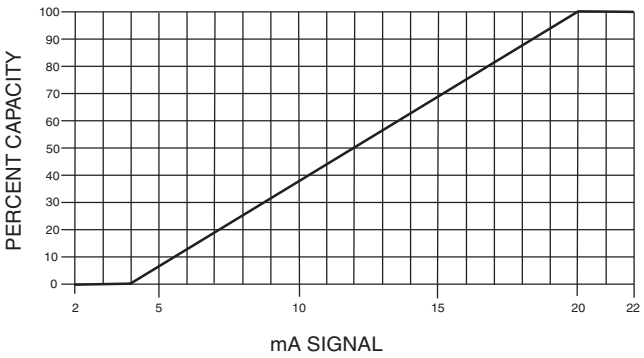


Fig. 86 — Percent Capacity vs. 4 to 20 mA Signal

While using this control method, the control algorithm sending the 4 to 20 mA signal must be properly tuned to avoid rapid cycling or hunting. The machine controls will select the capacity stage with the least amount of error relative to the Building Management System's requested percent capacity. This may result in a capacity stage greater than the requested percent capacity. Circuit loading methods are illustrated in Fig. 87-139.

If the unit has a digital compressor and the Building Management System is requesting a capacity percentage less than the capacity that the first compressor can provide, the MBB waits until the error between the requested capacity and the unit's capacity with the first compressor is less than the requested capacity and zero percent capacity before the control will start the digital compressor.

Error is calculated by the following formula:

([% Capacity – Requested % Capacity]/Requested Percent Capacity) x 100

For simplicity to illustrate this point, the 38APD030 is used. This unit uses two compressors of the same capacity. In order to get the digital compressor to start, the requested percent capacity signal must be above 8 mA corresponding to 25% capacity. At 8 mA, the error between 0% and 25% is the same as the error between 25% and 50% (the compressor's percent capacity contribution is the same). Once the signal exceeds the 8 mA value, the first compressor is allowed to start. See Fig. 88. The digital compressor will start and operate at full capacity for 90 seconds before reducing the compressor capacity to meet the 25% unit capacity (8 mA) request.

The digital compressor will run at full capacity for 90 seconds before adjusting the capacity to the requested stage, for oil return. Following the 90-second period the control will begin to duty cycle the digital compressor to better match the load. Once the digital compressor reaches full load, the control will begin adding or subtracting compressors every 90 seconds to reach the desired capacity stage. If the 4 to 20 mA signal is lost, the MBB will reduce the capacity stage to 0, and generate an alarm.

For mechanical cooling, the unit's Control Method (***Configuration→OPT2→CTRL***) and inputs must allow the machine to run. See Control Methods on page 60 for additional information.

On power up or changing from Off to Enabled, the machine will remain off until Minutes Off Time (***Configuration→OPT2→DELY***) timer has expired. See Minutes Off Time on page 128 for additional information. Liquid Line Solenoid Valve operation is as described in Liquid Line Solenoid Valves on page 40. Time Guard is honored for all compressors. For specific information on Time Guard, see MDTG - Time Guard Active on page 135.

In this Control Type, Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=0** (Off Cool) as long as ***Run Status→VIEW→STAT*=1** (Off Local), **2** (Off CCN), **3** (Off Time) or **4** (Off Emrgcy). **SPT.M=3** (Cool On) as long as Control Mode, **STAT=5** (On Local), **6** (On CCN), or **7** (On Time). In this Control Type, if the Indoor Fan Status Switch opens (***Inputs→GEN.I→ID.F.A=OFF***), Control Mode (***STAT***) will change to **8** (IDFS Not On) as long as there is no call for cooling (***CL.MA*** < 4 mA). If there is a call for cooling (***CL.MA*** > 4 mA), the unit will alarm and ***STAT*** switch to **4** (Off Emrgcy). Table 34 shows the space temperature control mode response for ***C.TYP*=7**.

Table 34 — Space Temperature Control Mode Response for C.TYP=7

CONTROL MODE *STAT*	INDOOR FAN STATUS CIR A *ID.F.A*	SPACE TEMPERATURE CONTROL MODE *SPT.M*
1 (Off Local)	***Off*** or ***On***	***0*** (Cool Off)
2 (Off CCN)	***Off*** or ***On***	***0*** (Cool Off)
3 (Off Time)	***Off*** or ***On***	***0*** (Cool Off)
4 (Off Emrgcy)	***Off*** or ***On***	***0*** (Cool Off)
5 (On Local)	***On***	***3*** (Cool On)
6 (On CCN)	***On***	***3*** (Cool On)
7 (On Time)	***On***	***3*** (Cool On)
8 (IDFS Not On)	***Off***	***3*** (Cool On)
9 (SPT Satisfied)	*Not Applicable*	

38APD Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead circuit is determined. See Lead/Lag Determination on page 112. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded.

The unit will stage compressors every 90 seconds to meet the requested capacity. With every change in capacity that occurs, a 90-second time delay is initiated and the capacity stage is held during this time delay. If the capacity change is a change of the digital compressor only, the compressor will be modulated to the requested capacity without moving in increments. For example, if the requested capacity requires a change to the compressor unload time from 8 to 2 seconds, that change will occur without the intermediate steps of 7, 6, 5, 4, and 3 seconds. If additional capacity requires the lag circuit to start, the lag circuit's lead compressor will be determined and started. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor in a multiple compressor circuit (38APD040-130) operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity in response to the requested capacity signal. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

38APS Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A)*** is checked. The switch must be closed before the capacity routine will start. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded.

The unit will stage compressors every 90 seconds to meet the requested capacity. With every change in capacity that occurs, a 90-second time delay is initiated and the capacity stage is held during this time delay. If the capacity change is a change of the digital compressor only, the compressor will be modulated to the requested capacity without moving in increments. For example, if the requested capacity requires a change to the compressor unload time from 8 to 2 seconds, that change will occur without the intermediate steps of 7, 6, 5, 4, and 3 seconds. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity in response to the requested capacity signal. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

See Fig. 87-139 for capacity loading, ***C.TYP=7***.

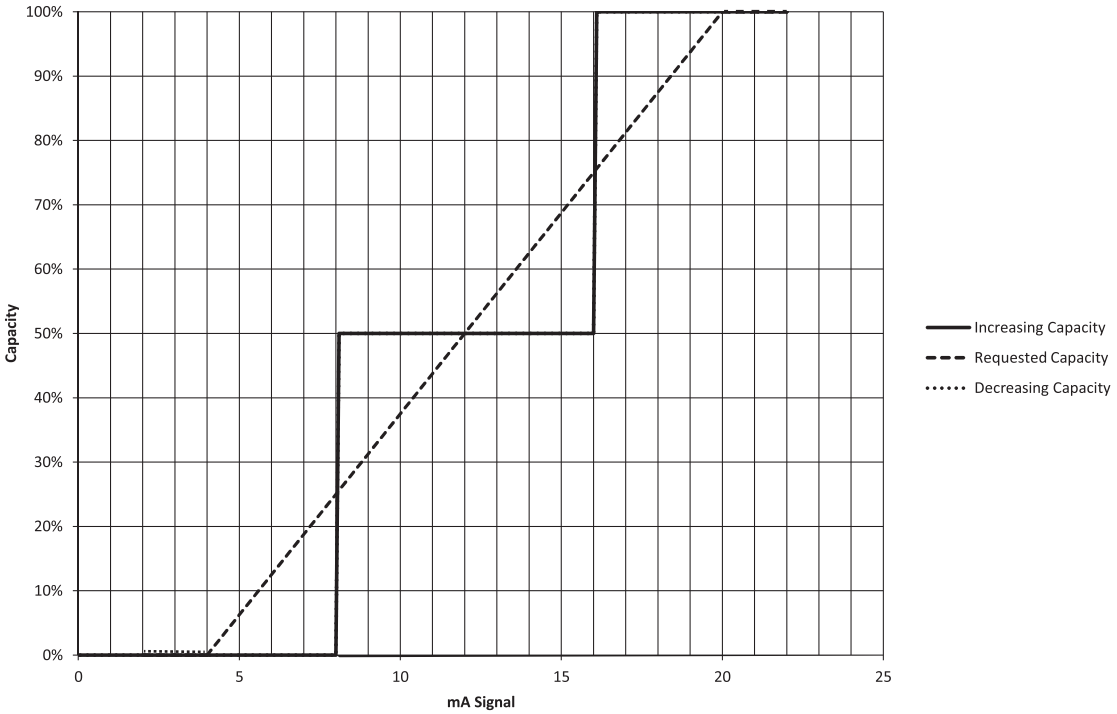


Fig. 87 — Capacity Loading, C.TYP=7
38APD,APS025-030, Non-Digital, Equal (Default) or Staged Circuit Loading, Circuit A or B (38APD Only) Leads

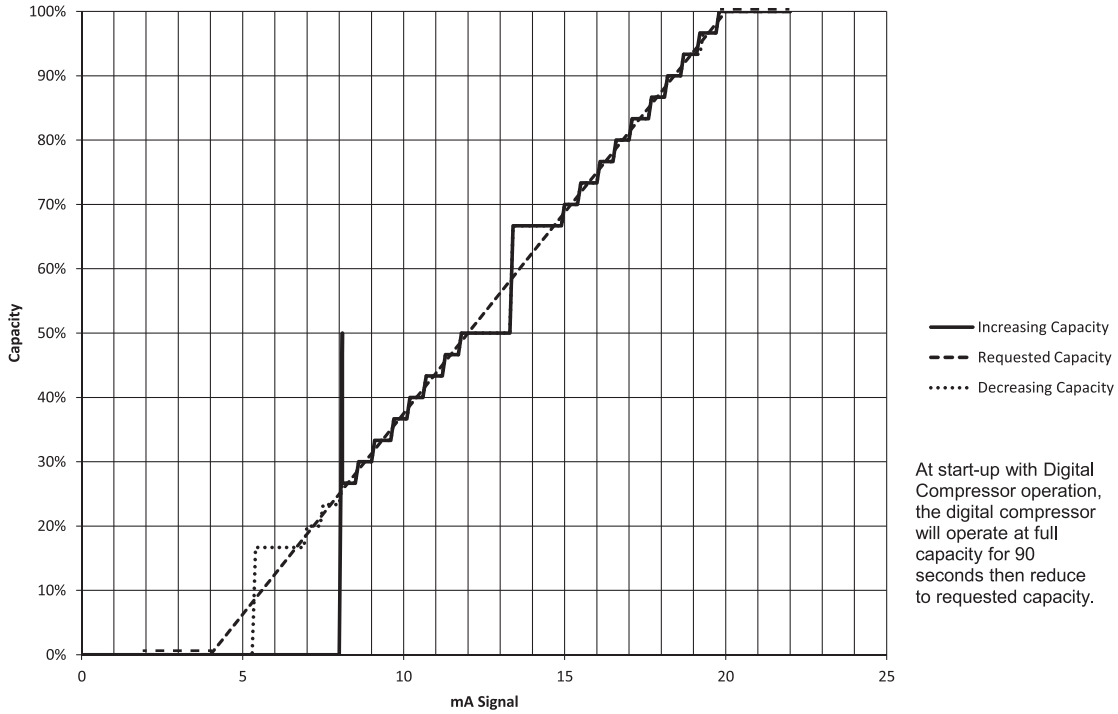


Fig. 88 — Capacity Loading, C.TYP=7
38APD,APS025-030, Digital, Equal (Default) or Staged Circuit Loading, Circuit A (38APD Only) Leads

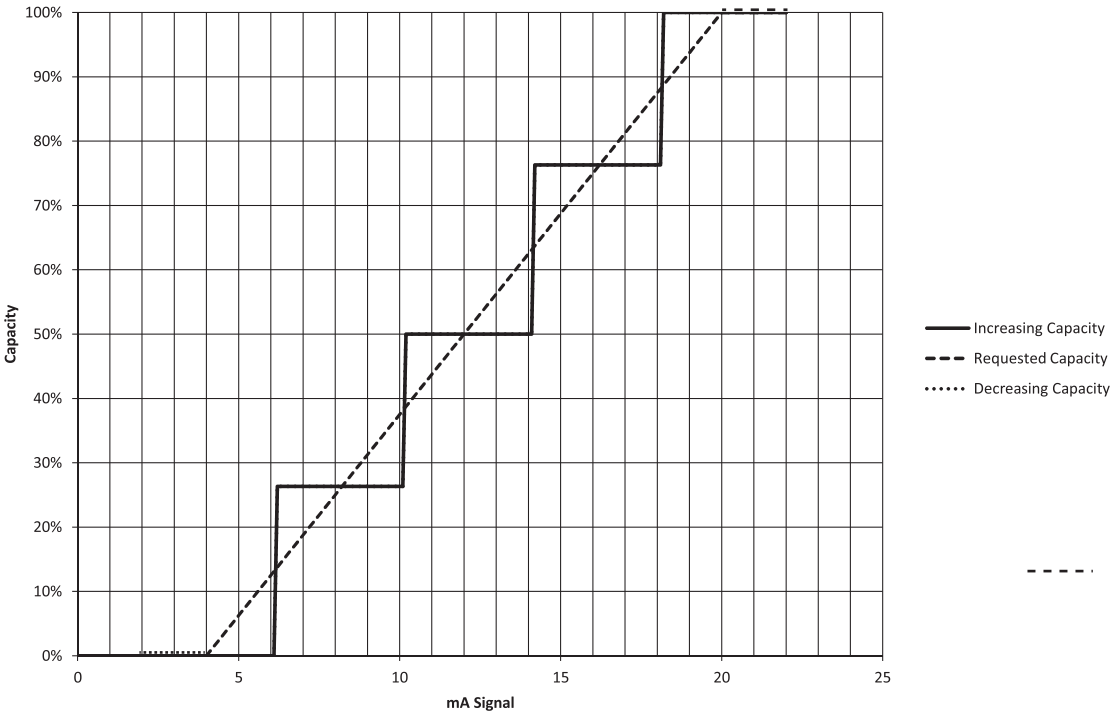


Fig. 89 — Capacity Loading, C.TYP=7
38APD040, Non-Digital, Equal (Default) Circuit Loading, Circuit A Leads

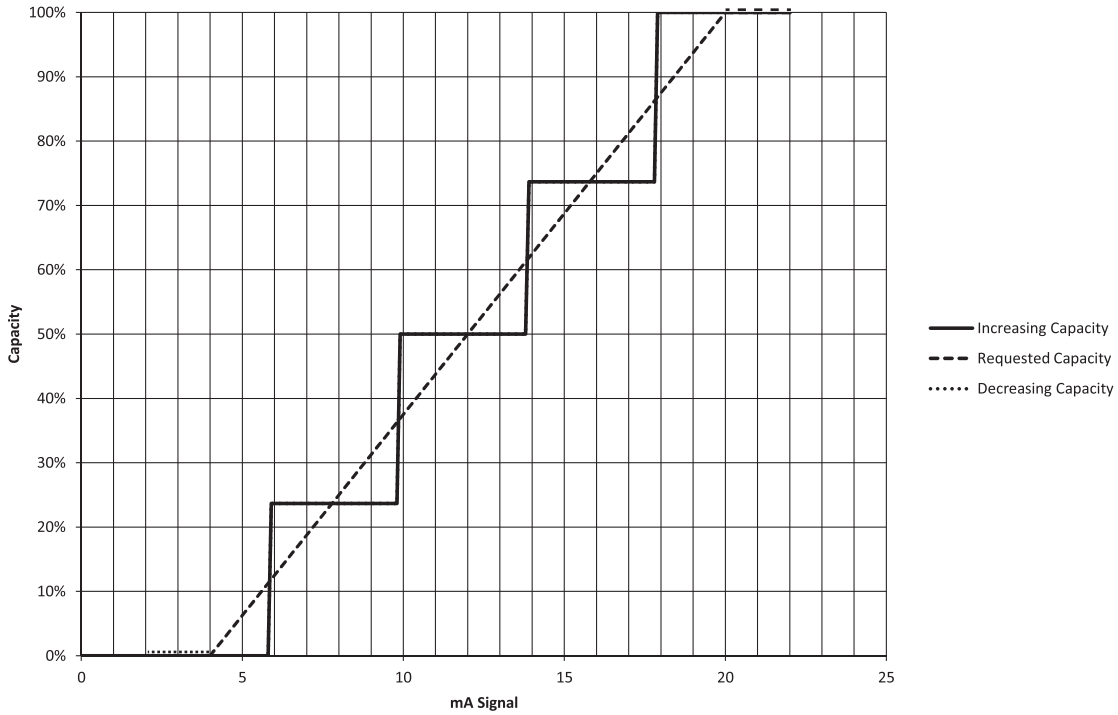


**Fig. 90 — Capacity Loading, C.TYP=7
38APD040, Non-Digital, Equal (Default) Circuit Loading,
Circuit B Leads**

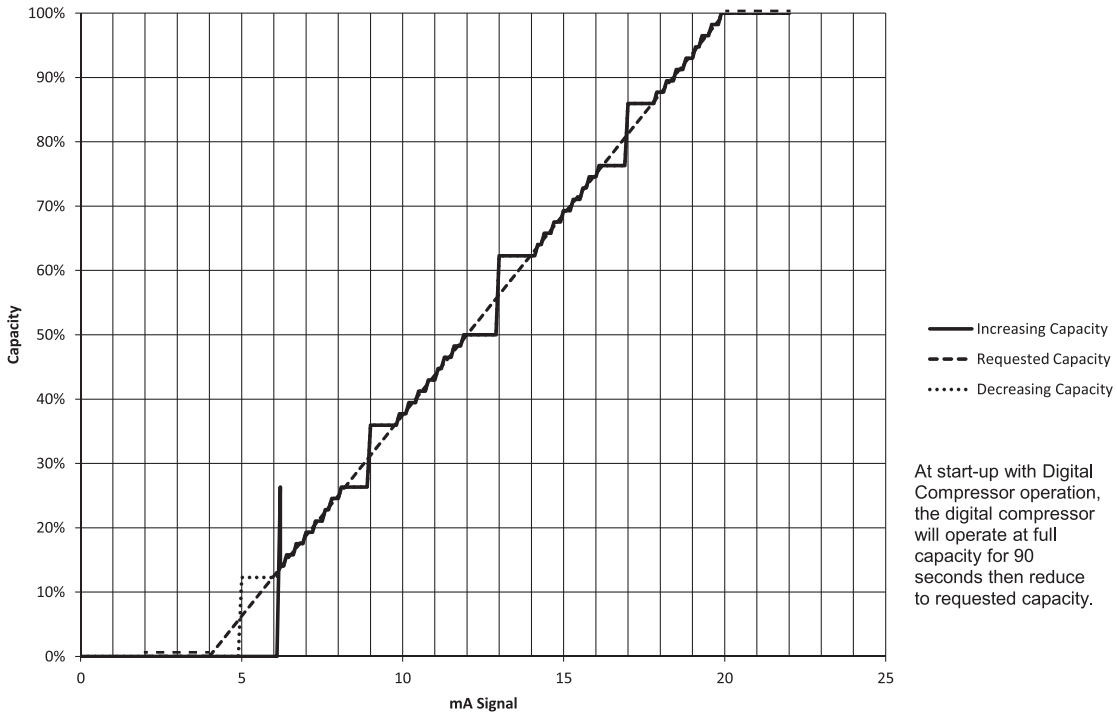


**Fig. 91 — Capacity Loading, C.TYP=7
38APD040, Digital, Equal (Default) Circuit Loading,
Circuit A Leads**

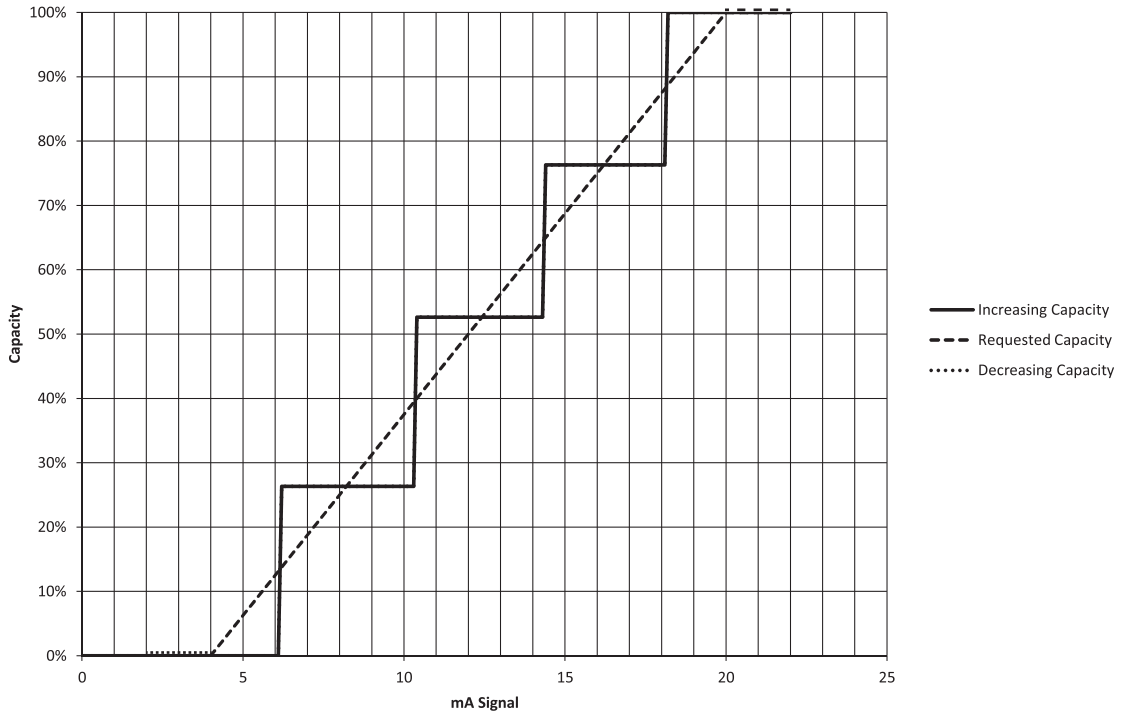


Fig. 92 — Capacity Loading, C.TYP=7 38APD040, Non-Digital, Staged Circuit Loading, Circuit A Leads

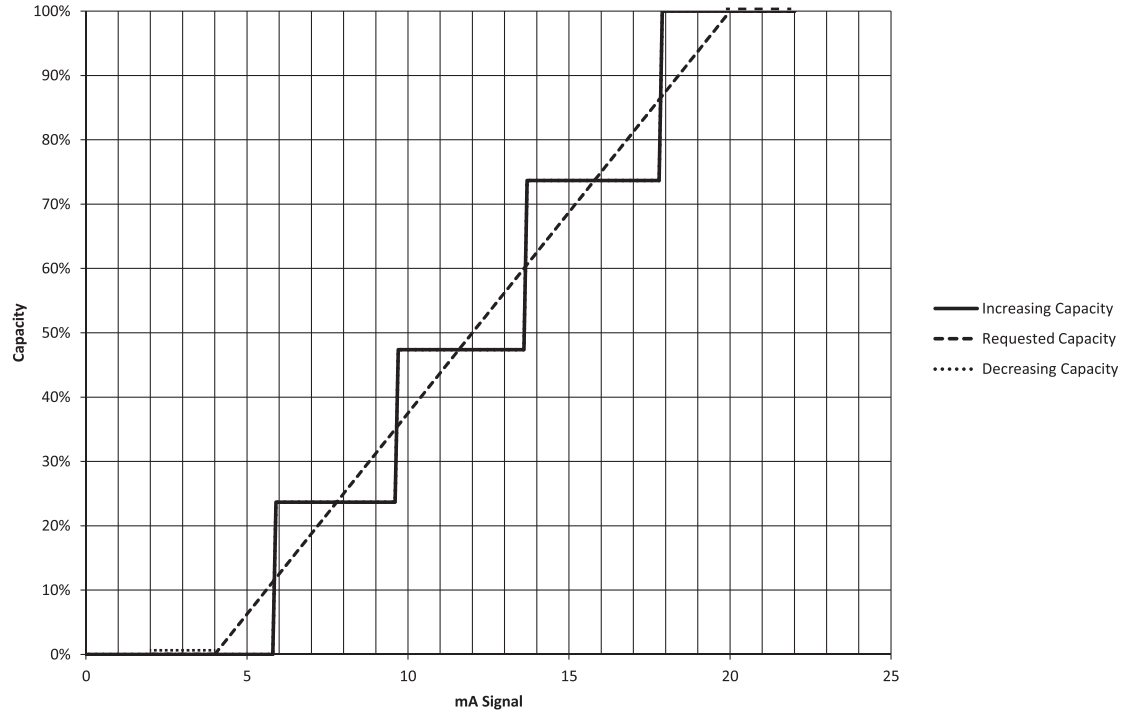


Fig. 93 — Capacity Loading, C.TYP=7 38APD040, Non-Digital, Staged Circuit Loading, Circuit B Leads

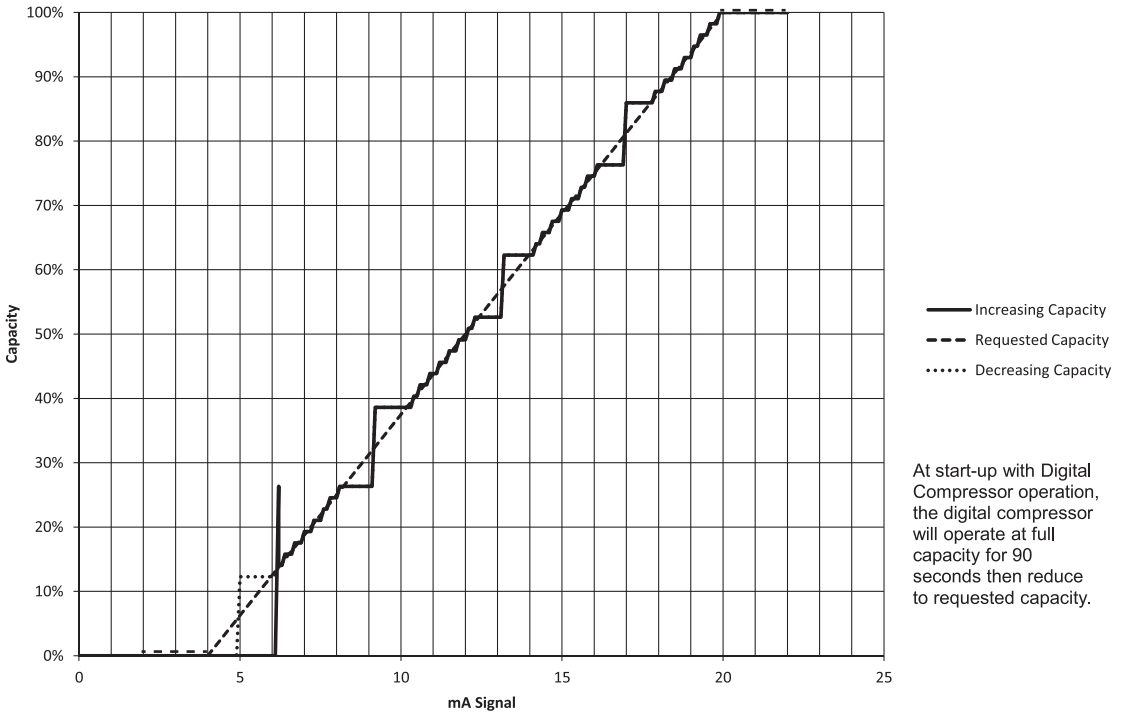


Fig. 94 — Capacity Loading, C.TYP=7 38APD040, Digital, Staged Circuit Loading, Circuit A Leads

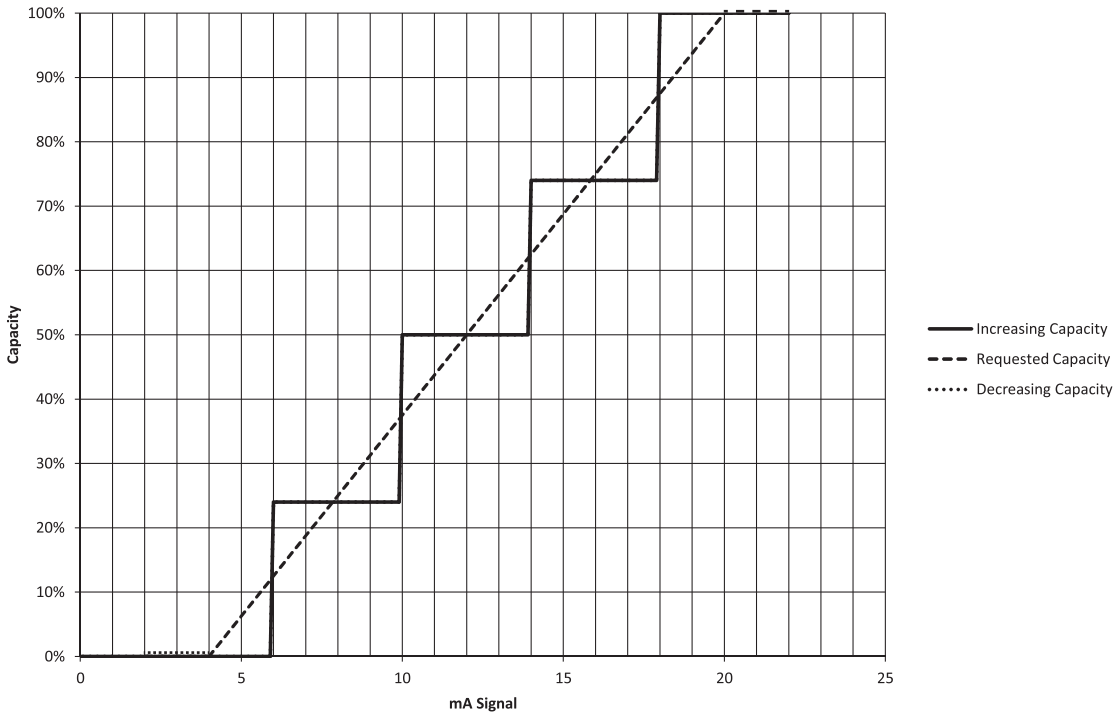


Fig. 95 — Capacity Loading, C.TYP=7 38APD050, Non-Digital, Equal (Default) Circuit Loading, Circuit A Leads

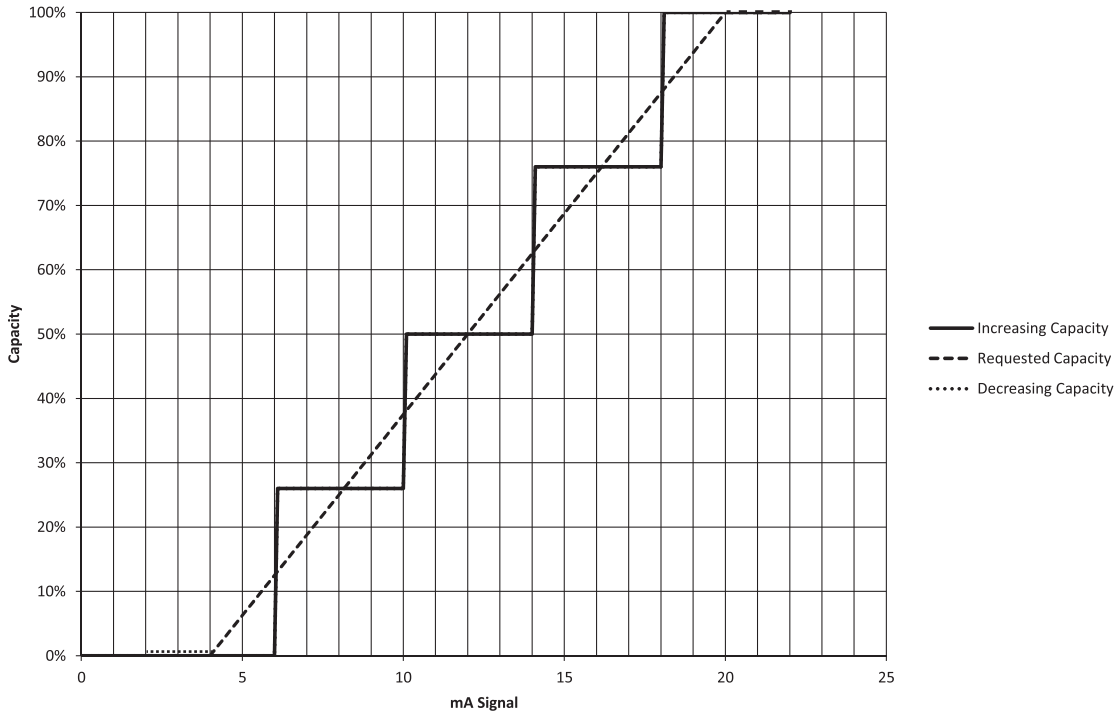
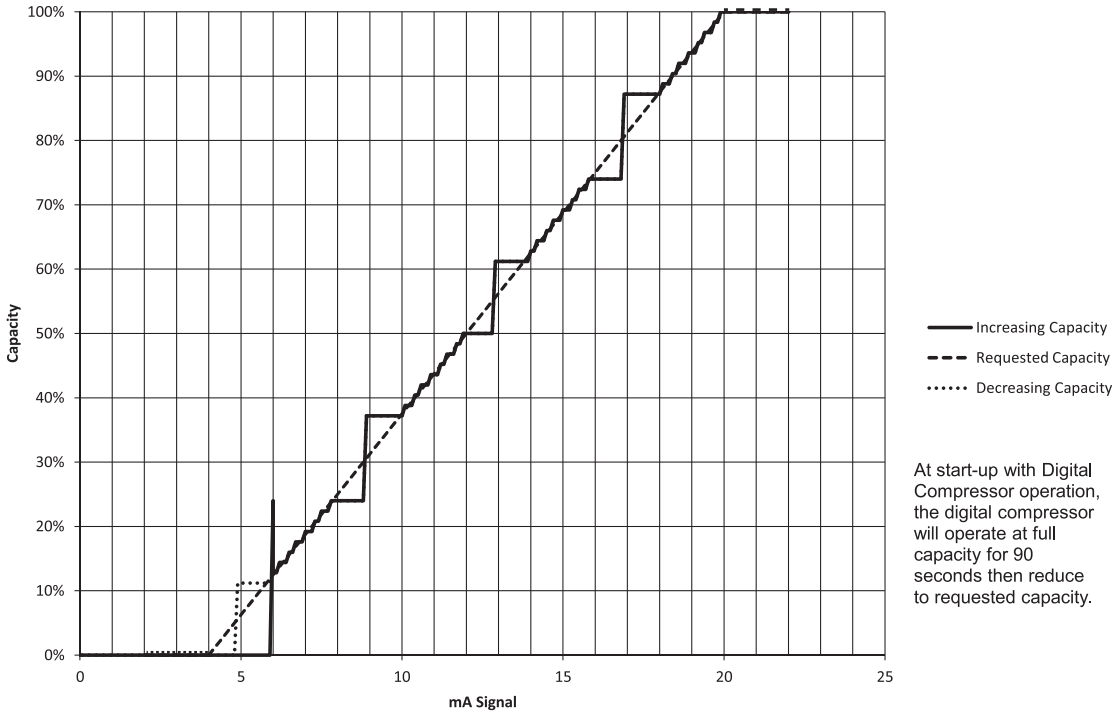


Fig. 96 — Capacity Loading, C.TYP=7 38APD050, Non-Digital, Equal (Default) Circuit Loading, Circuit B Leads



At start-up with Digital Compressor operation, the digital compressor will operate at full capacity for 90 seconds then reduce to requested capacity.

Fig. 97 — Capacity Loading, C.TYP=7 38APD050, Digital, Equal (Default) Circuit Loading, Circuit A Leads

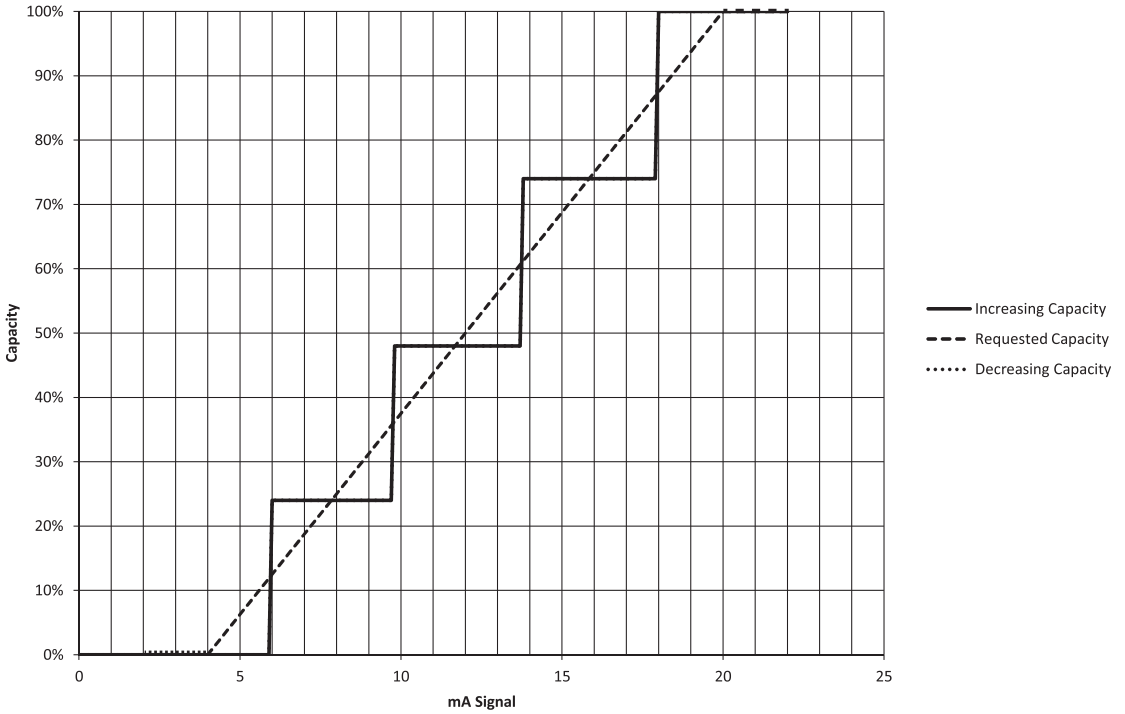


**Fig. 98 — Capacity Loading, C.TYP=7
38APD050, Non-Digital, Staged Circuit Loading,
Circuit A Leads**

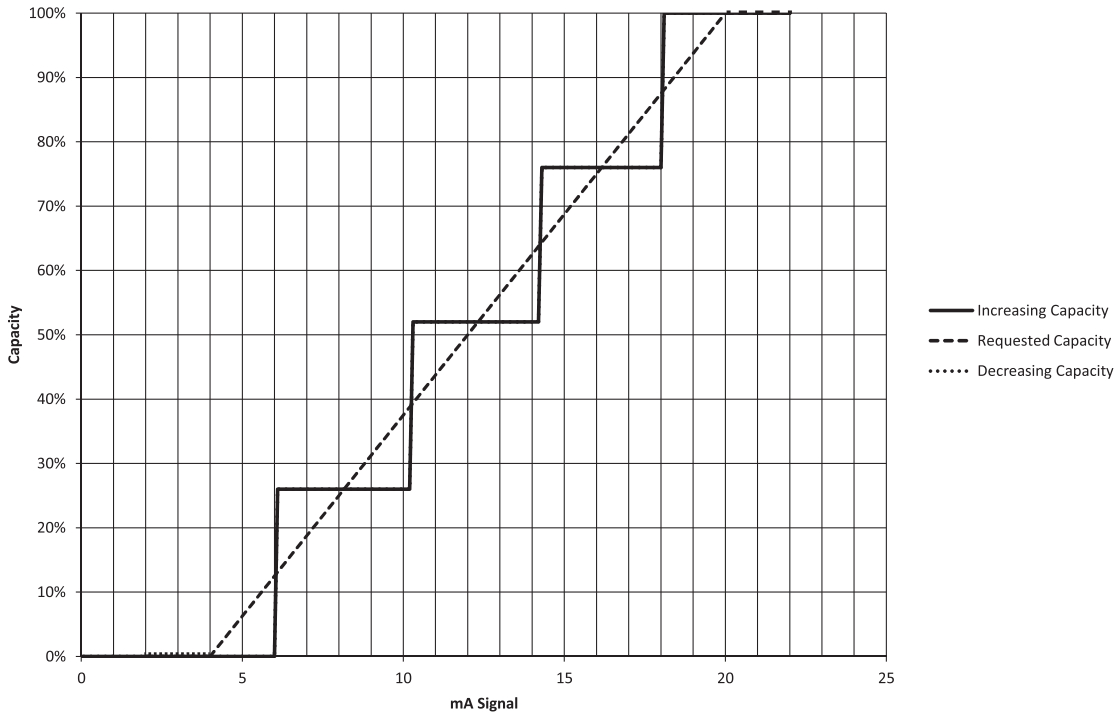


**Fig. 99 — Capacity Loading, C.TYP=7
38APD050, Non-Digital, Staged Circuit Loading,
Circuit B Leads**

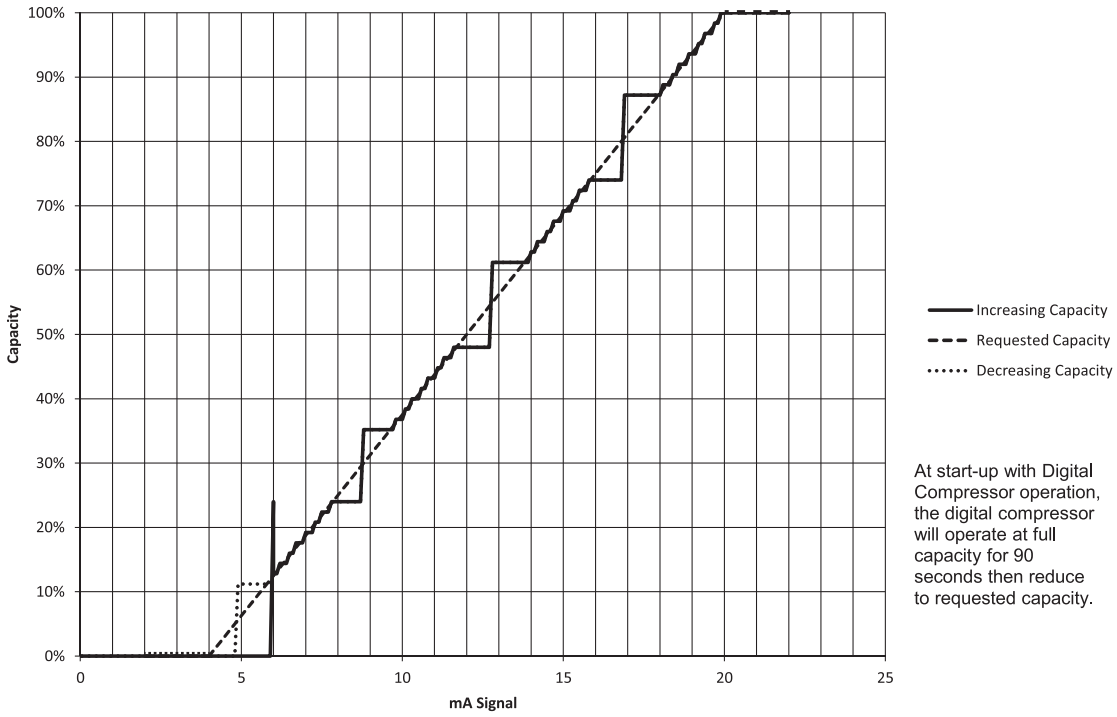


Fig. 100 — Capacity Loading, C.TYP=7 38APD050, Digital, Staged Circuit Loading, Circuit A Leads

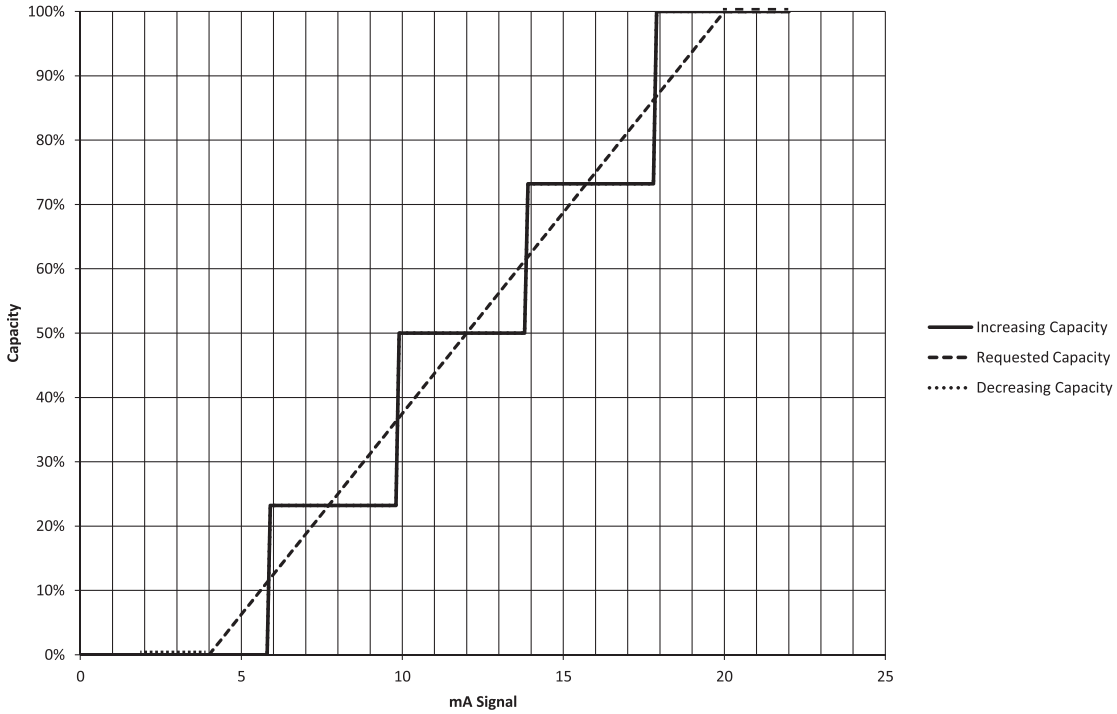


Fig. 101 — Capacity Loading, C.TYP=7 38APD060, Non-Digital, Equal (Default) Circuit Loading, Circuit A Leads

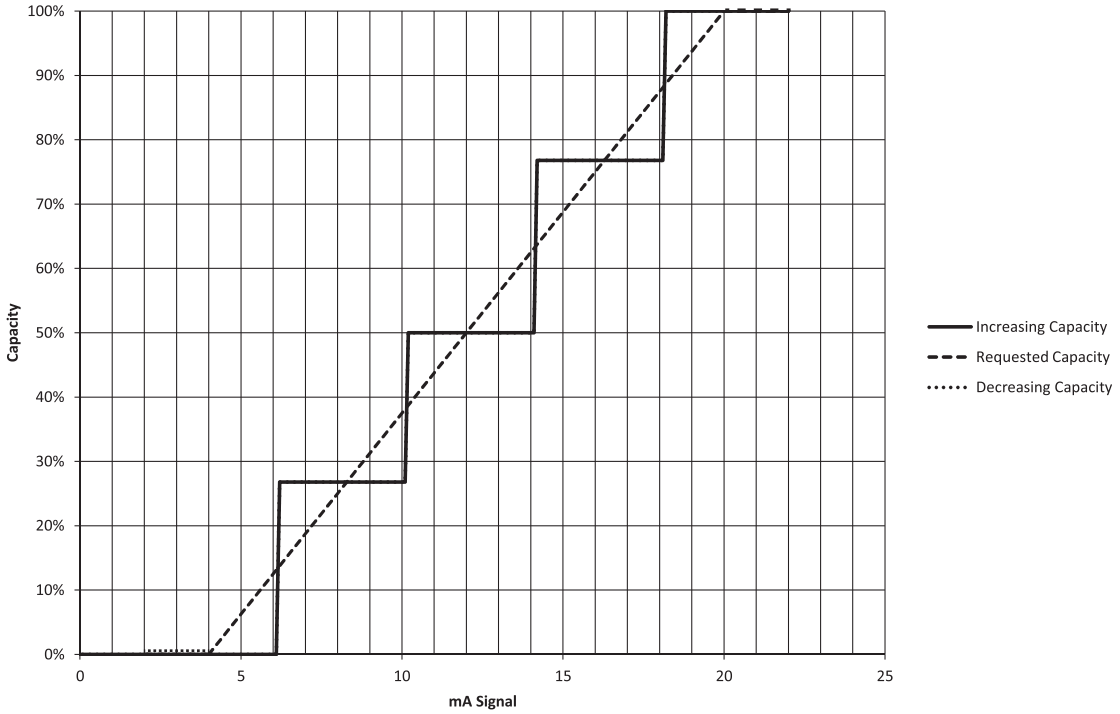
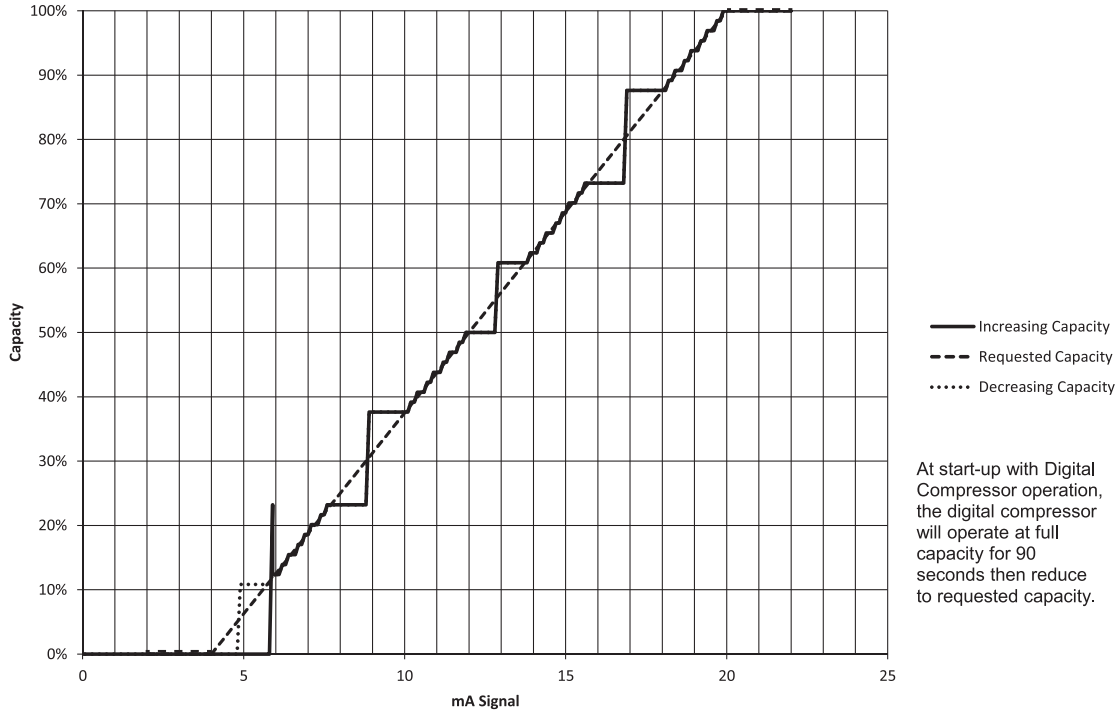


Fig. 102 — Capacity Loading, C.TYP=7
38APD060, Non-Digital, Equal (Default) Circuit Loading, Circuit B Leads



At start-up with Digital Compressor operation, the digital compressor will operate at full capacity for 90 seconds then reduce to requested capacity.

Fig. 103 — Capacity Loading, C.TYP=7
38APD060, Digital, Equal (Default) Circuit Loading, Circuit A Leads

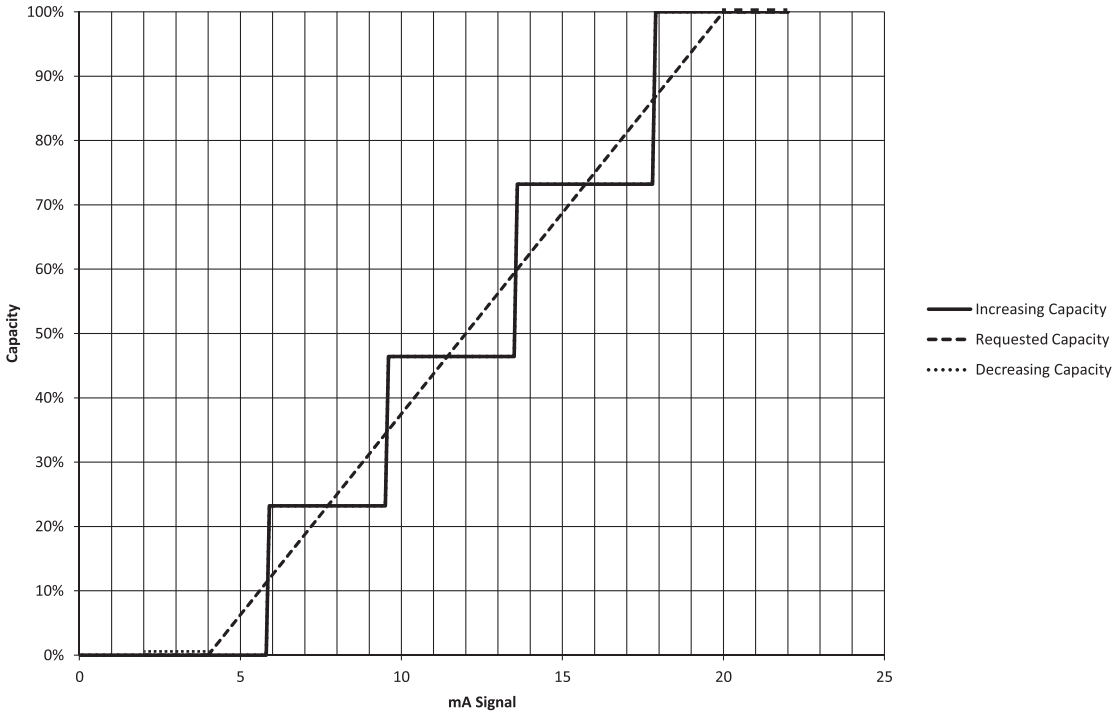


**Fig. 104 — Capacity Loading, C.TYP=7
38APD060, Non-Digital, Staged Circuit Loading,
Circuit A Leads**

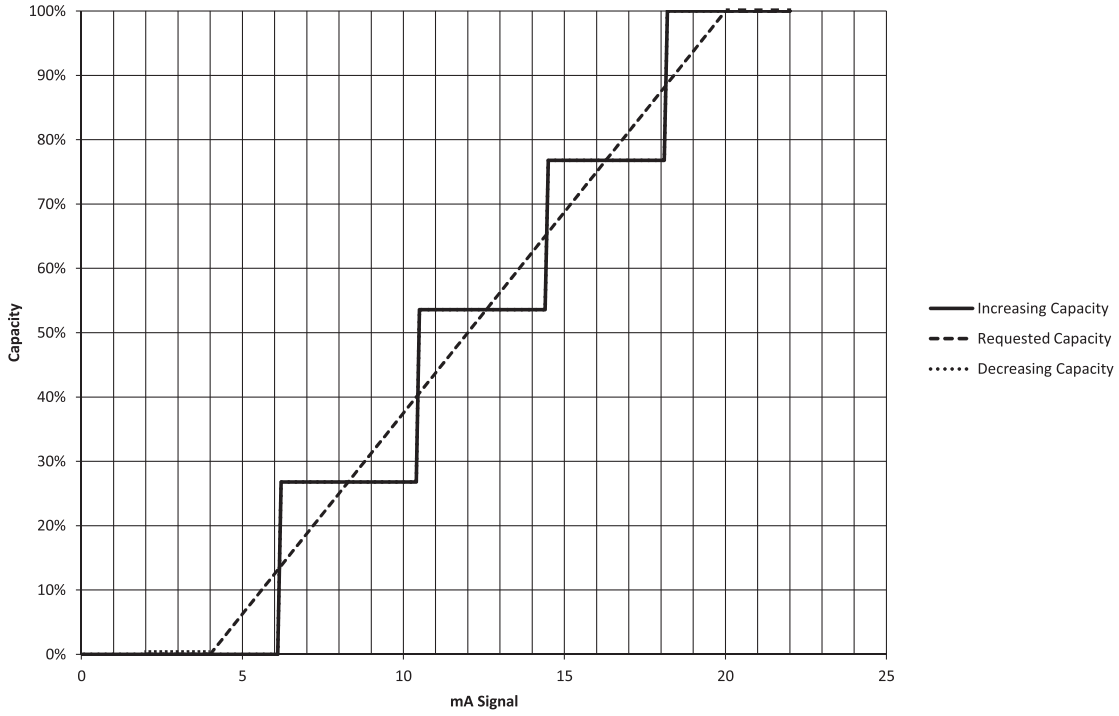


**Fig. 105 — Capacity Loading, C.TYP=7
38APD060, Non-Digital, Staged Circuit Loading,
Circuit B Leads**

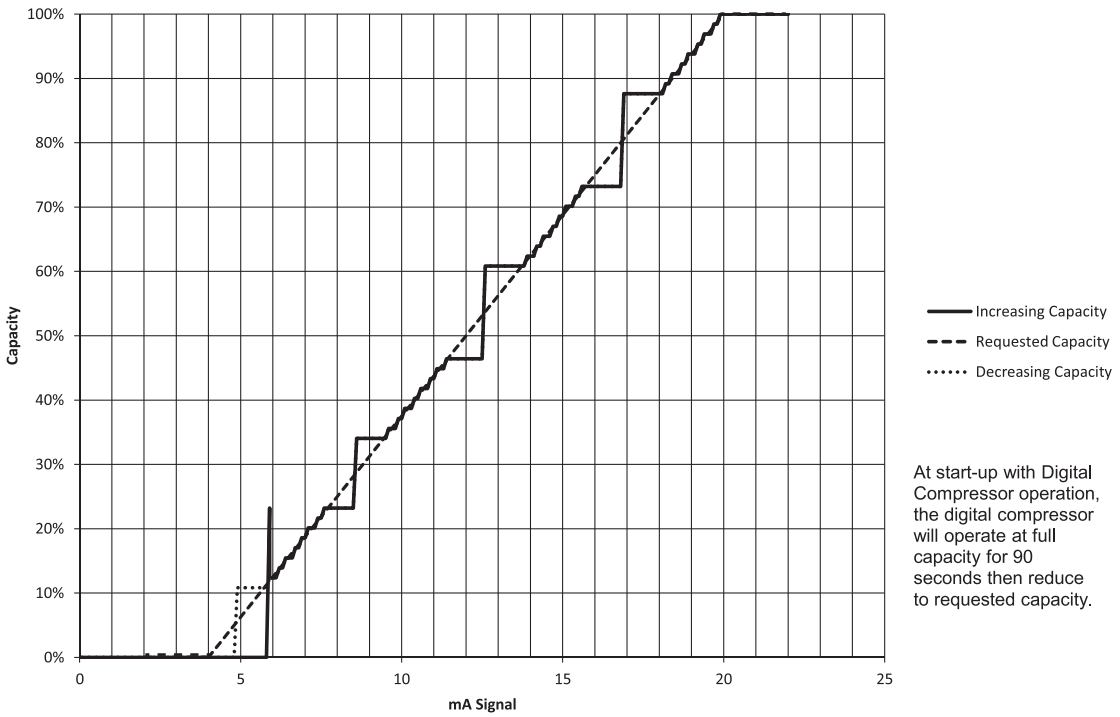


Fig. 106 — Capacity Loading, C.TYP=7 38APD060, Digital, Staged Circuit Loading, Circuit A Leads

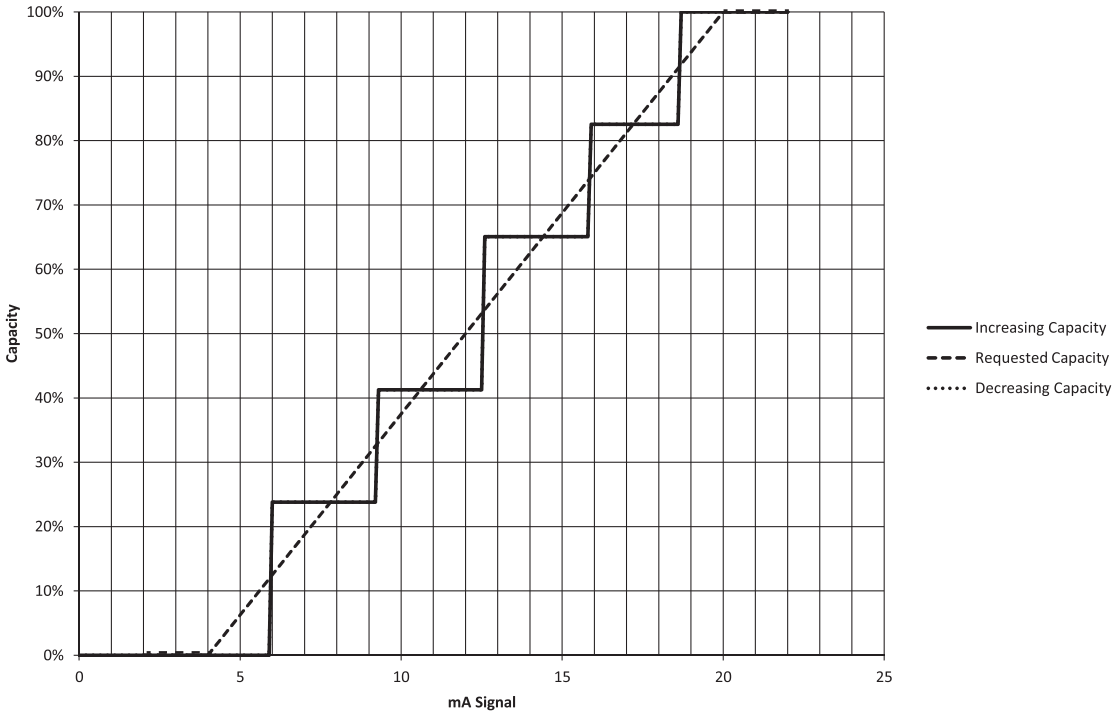


Fig. 107 — Capacity Loading, C.TYP=7 38APD070, Non-Digital, Equal (Default) Circuit Loading, Circuit A Leads

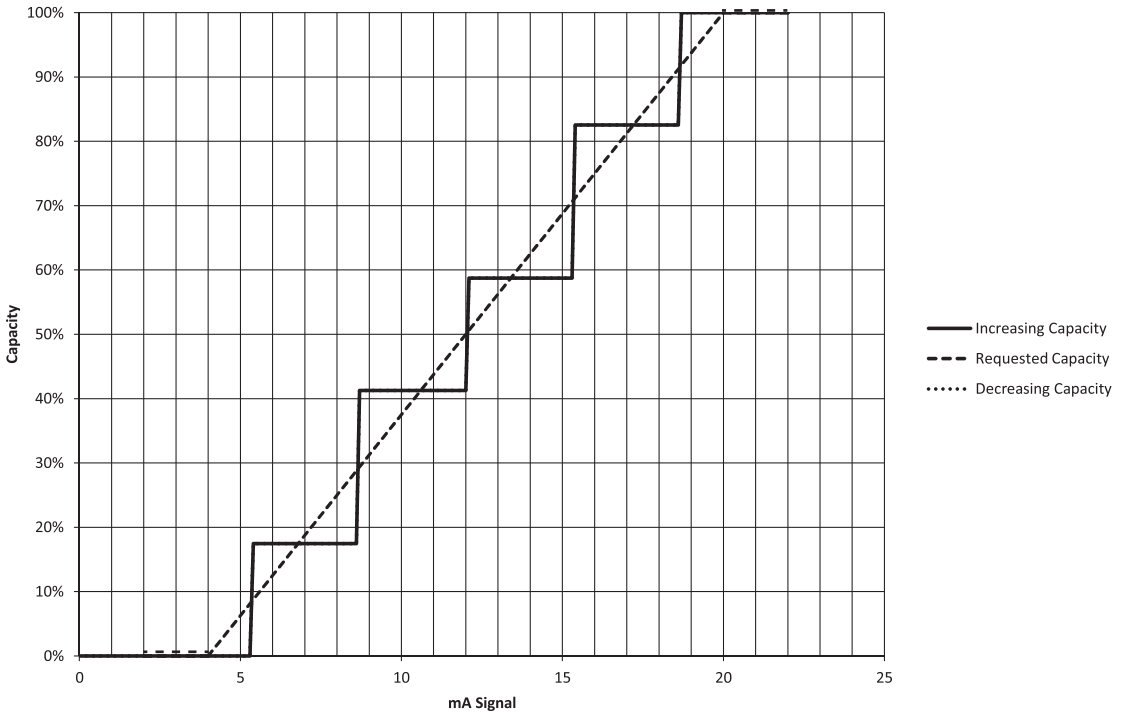
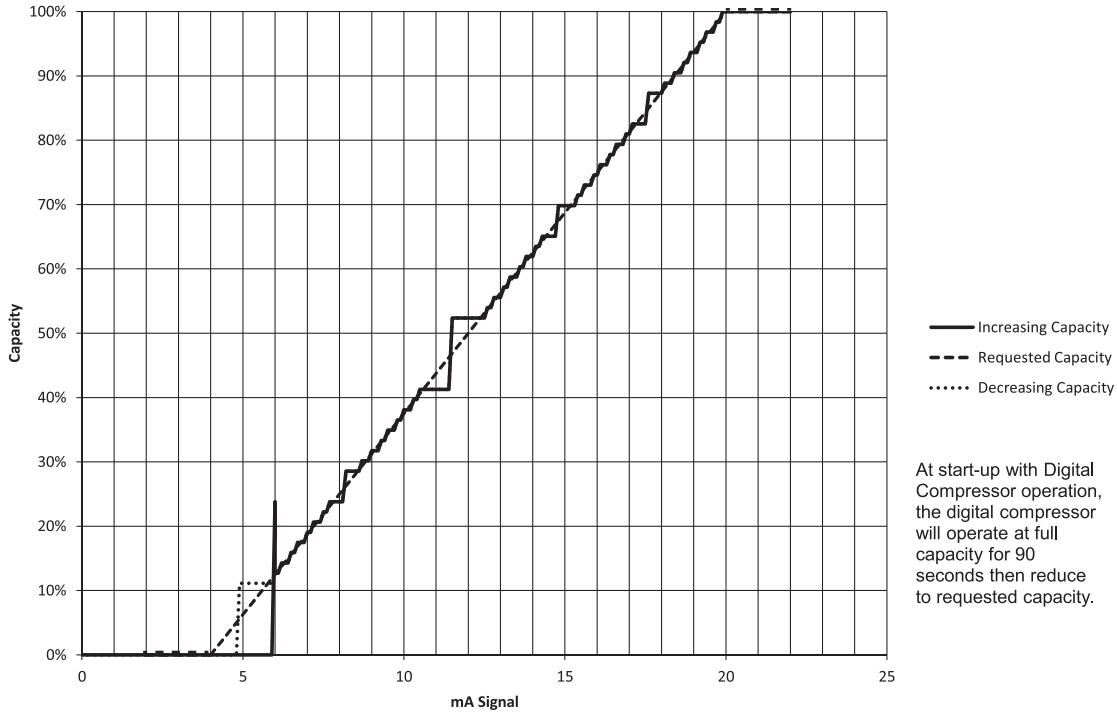


Fig. 108 — Capacity Loading, C.TYP=7 38APD070, Non-Digital, Equal (Default) Circuit Loading, Circuit B Leads



At start-up with Digital Compressor operation, the digital compressor will operate at full capacity for 90 seconds then reduce to requested capacity.

Fig. 109 — Capacity Loading, C.TYP=7 38APD070, Digital, Equal (Default) Circuit Loading, Circuit A Leads

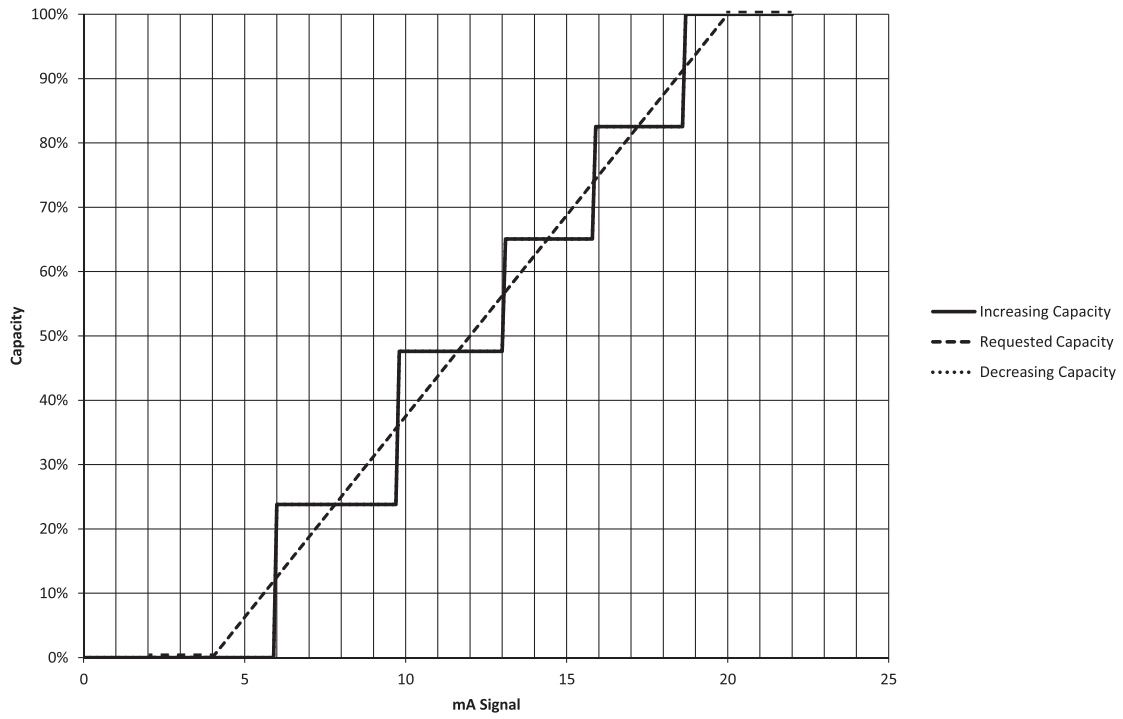


**Fig. 110 — Capacity Loading, C.TYP=7
38APD070, Non-Digital, Staged Circuit Loading,
Circuit A Leads**

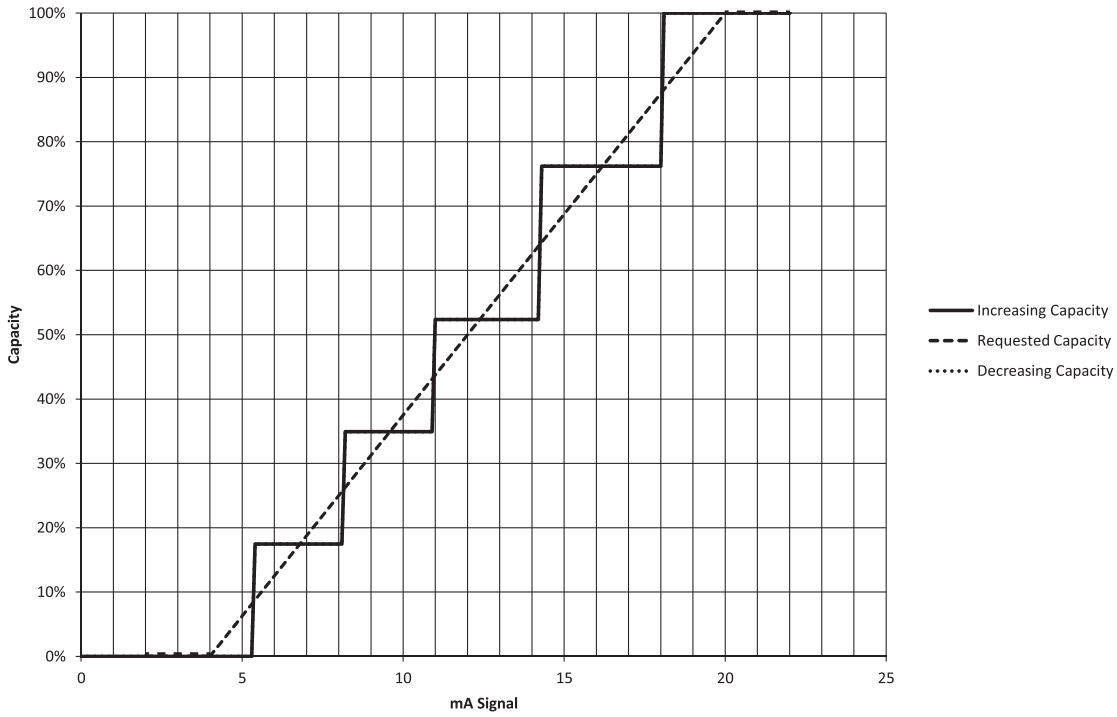


**Fig. 111 — Capacity Loading, C.TYP=7
38APD070, Non-Digital, Staged Circuit Loading,
Circuit B Leads**

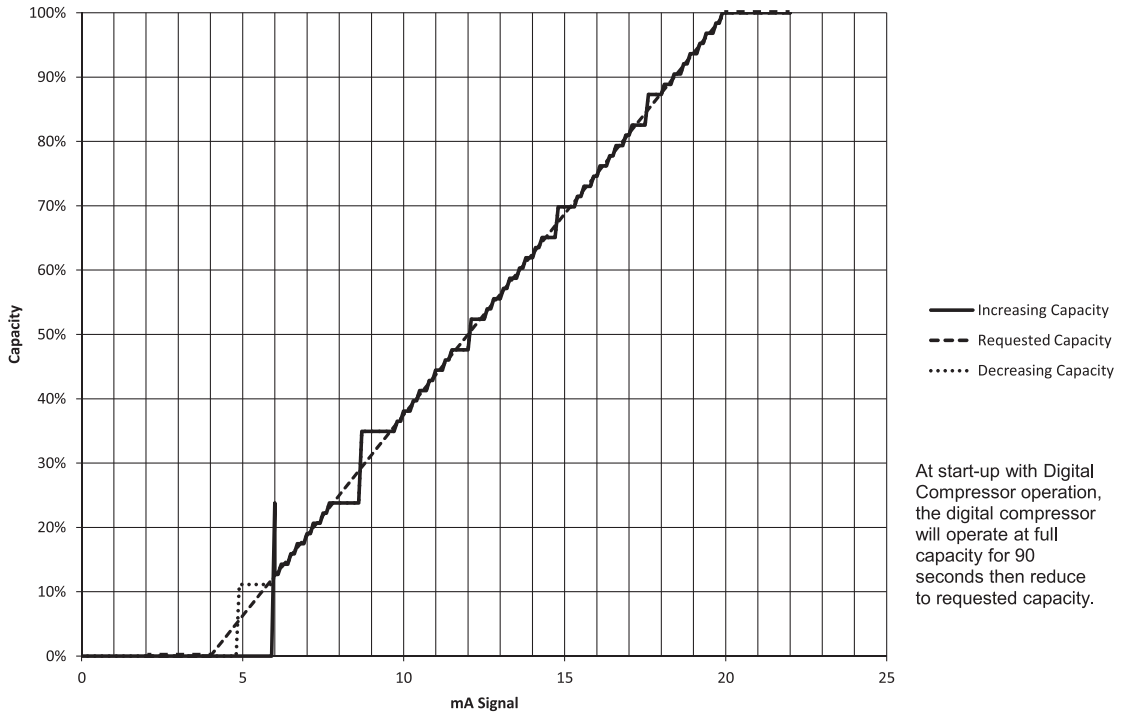


Fig. 112 — Capacity Loading, C.TYP=7 38APD070, Digital, Staged Circuit Loading, Circuit A Leads

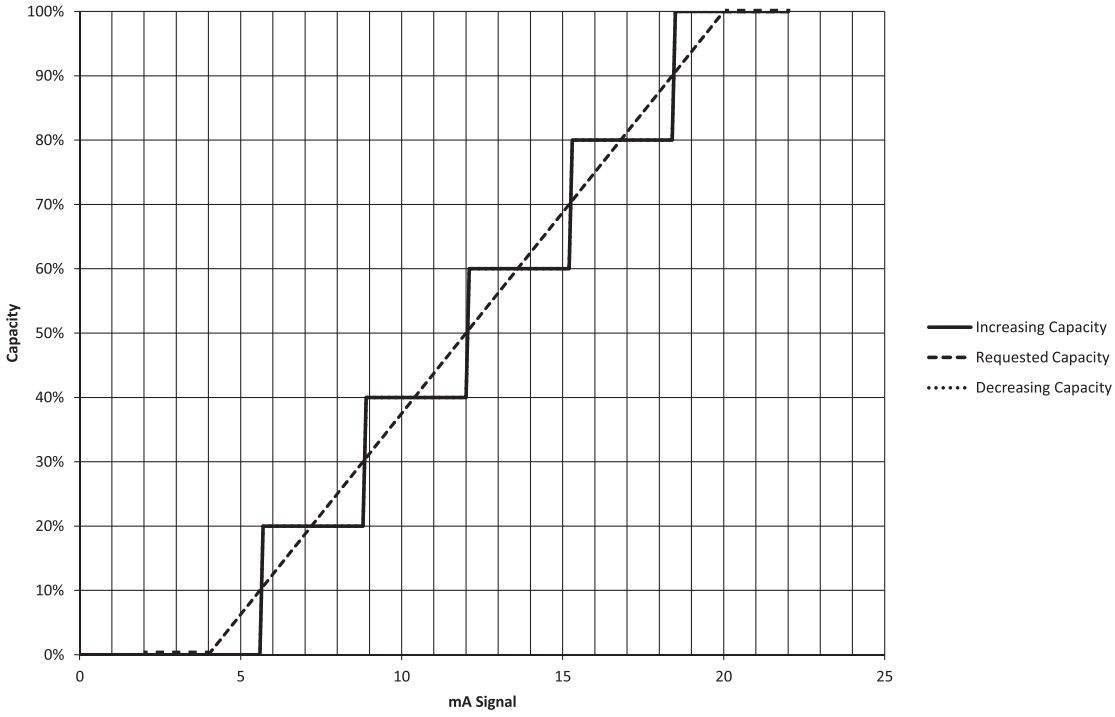


Fig. 113 — Capacity Loading, C.TYP=7 38APD080, Non-Digital, Equal (Default) Circuit Loading, Circuit A Leads

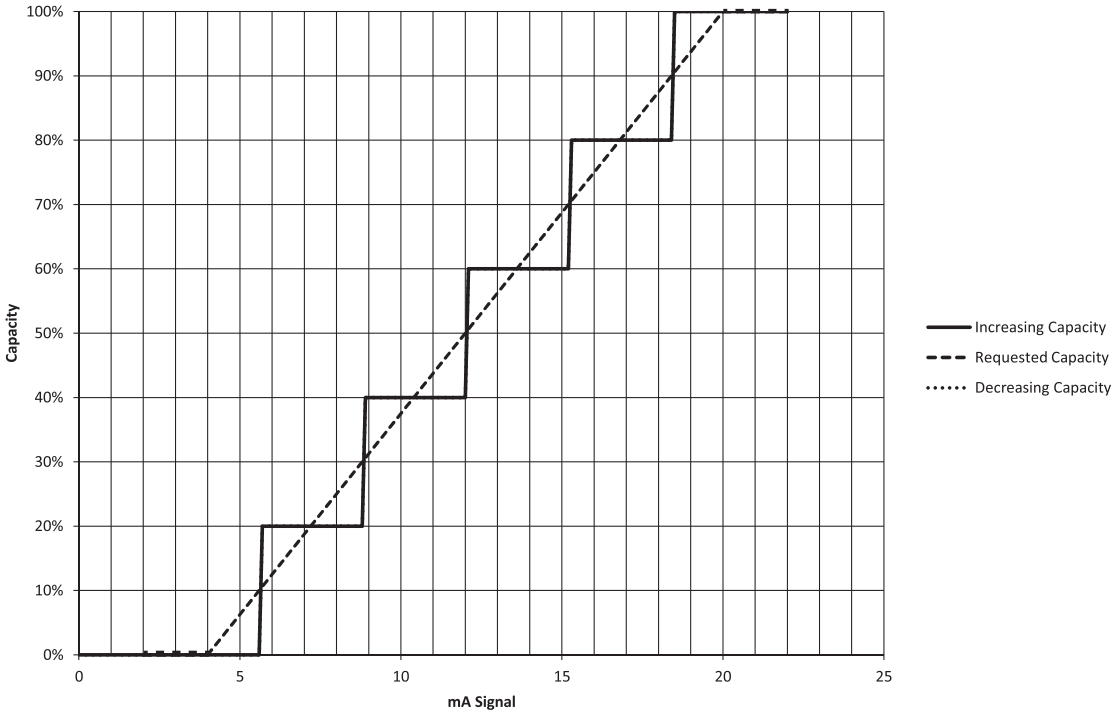
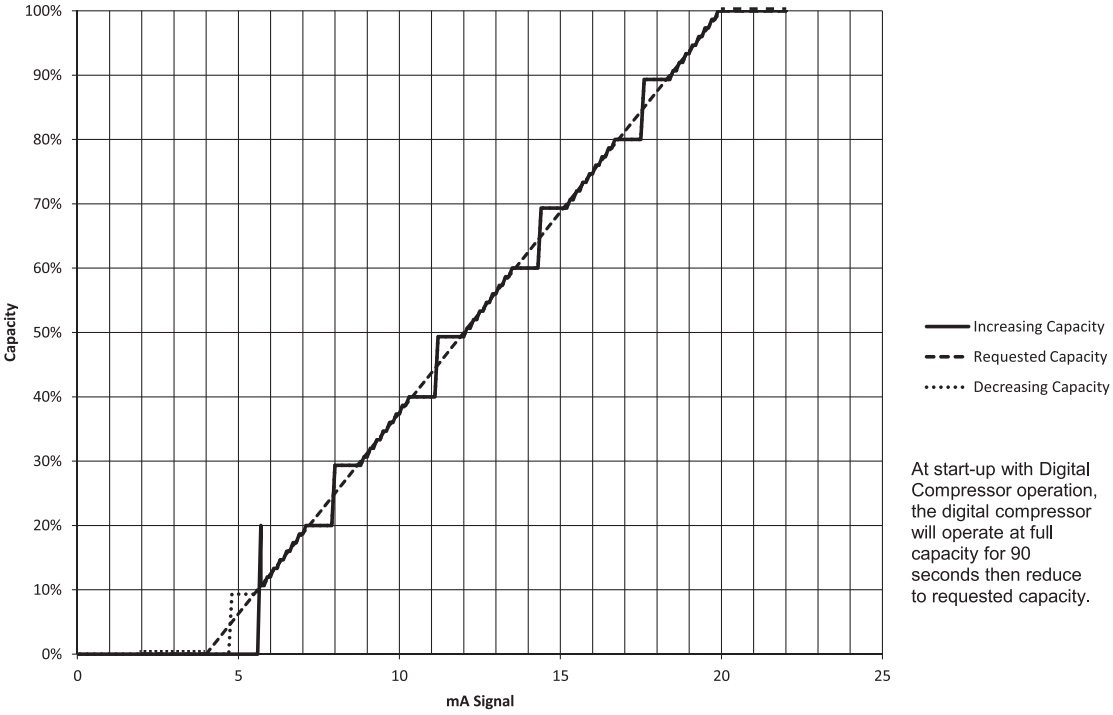


Fig. 114 — Capacity Loading, C.TYP=7
38APD080, Non-Digital, Equal (Default) Circuit Loading, Circuit B Leads



At start-up with Digital Compressor operation, the digital compressor will operate at full capacity for 90 seconds then reduce to requested capacity.

Fig. 115 — Capacity Loading, C.TYP=7
38APD080, Digital, Equal (Default) or Staged Circuit Loading, Circuit A Leads

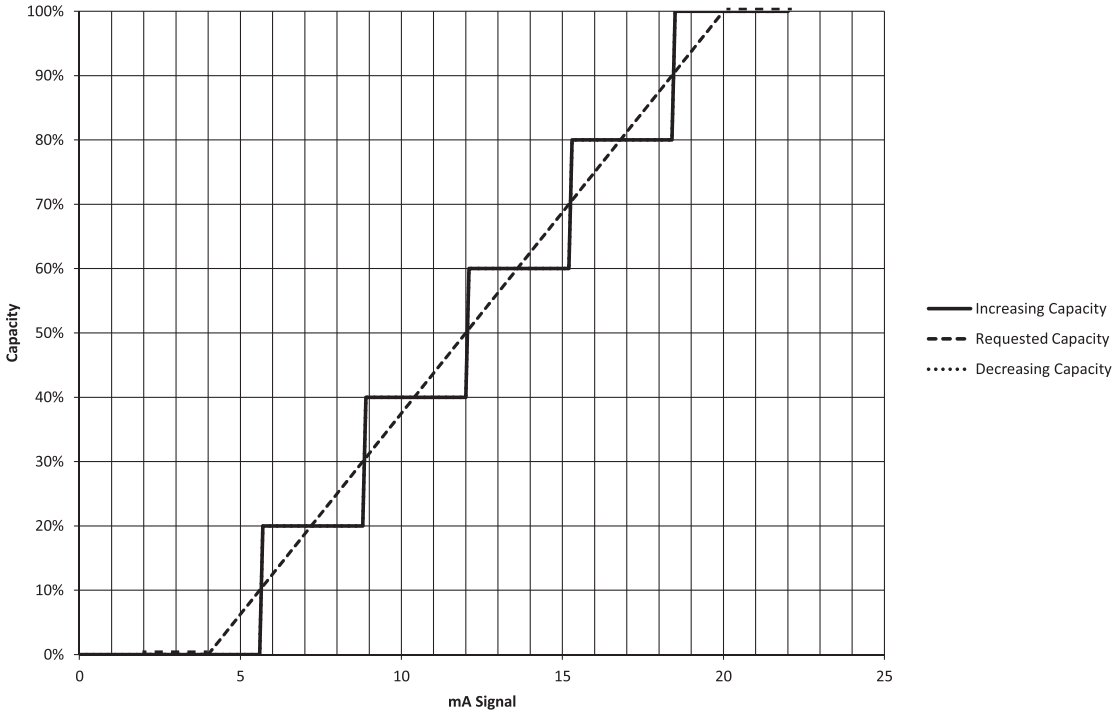


Fig. 116 — Capacity Loading, C.TYP=7 38APD080, Non-Digital, Staged Circuit Loading, Circuit A Leads

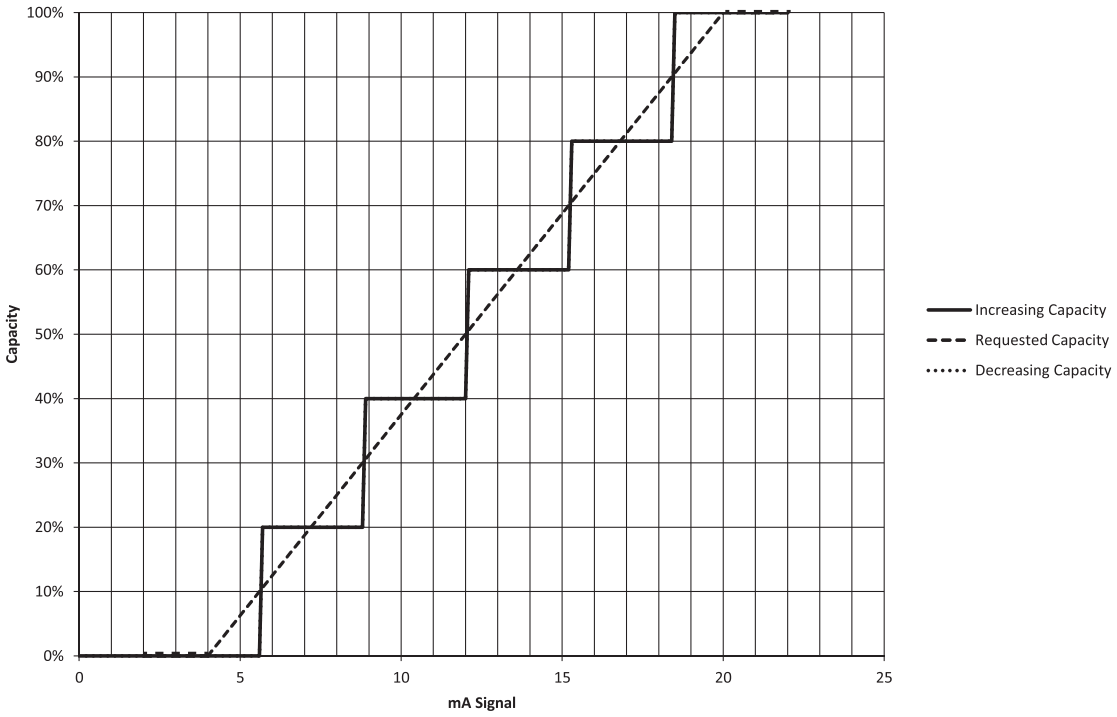


Fig. 117 — Capacity Loading, C.TYP=7 38APD080, Non-Digital, Staged Circuit Loading, Circuit B Leads

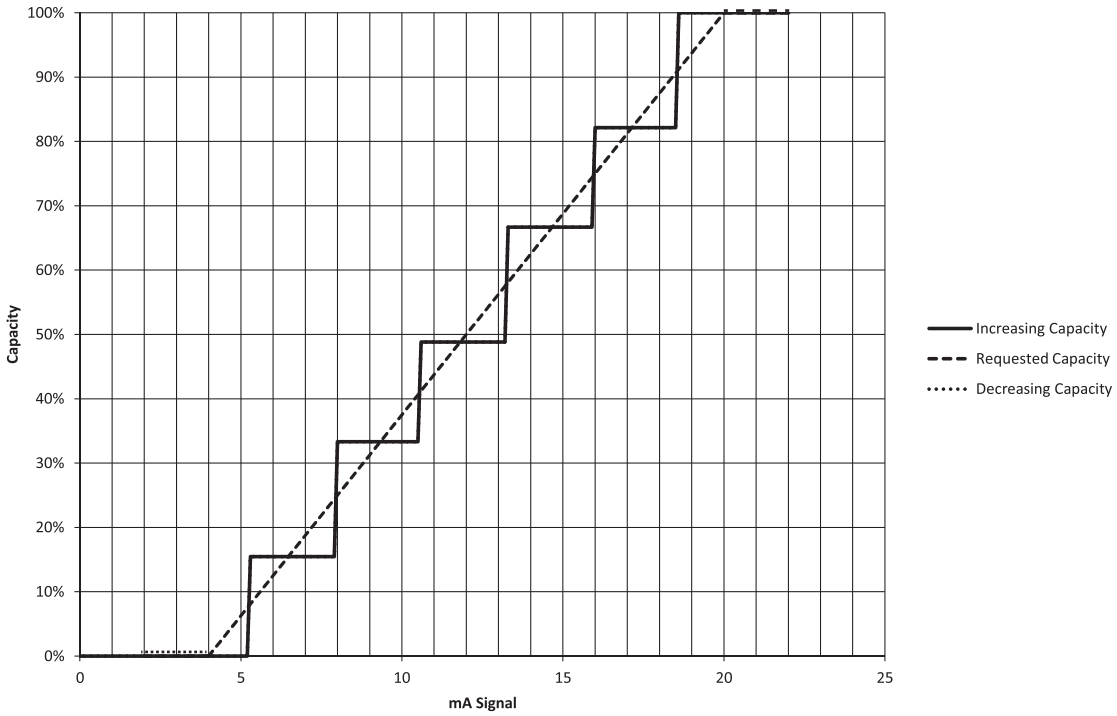


Fig. 118 — Capacity Loading, C.TYP=7
38APD090, Non-Digital, Equal (Default) Circuit Loading,
Circuit A Leads

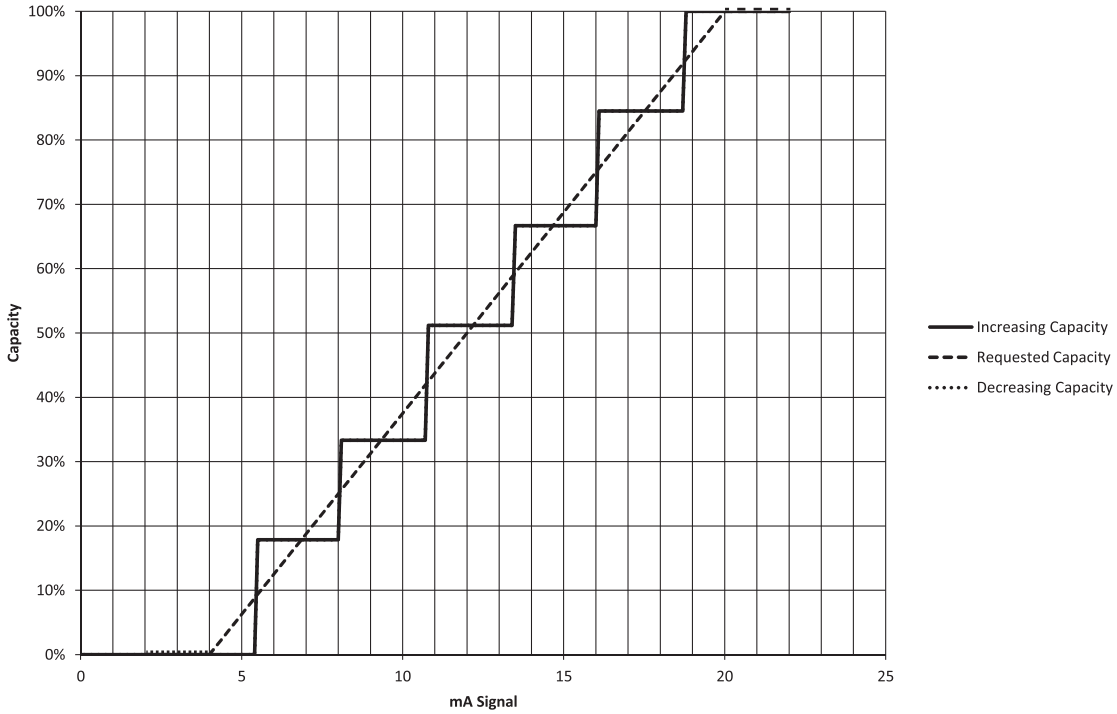


Fig. 119 — Capacity Loading, C.TYP=7
38APD090, Non-Digital, Equal (Default) Circuit Loading,
Circuit B Leads

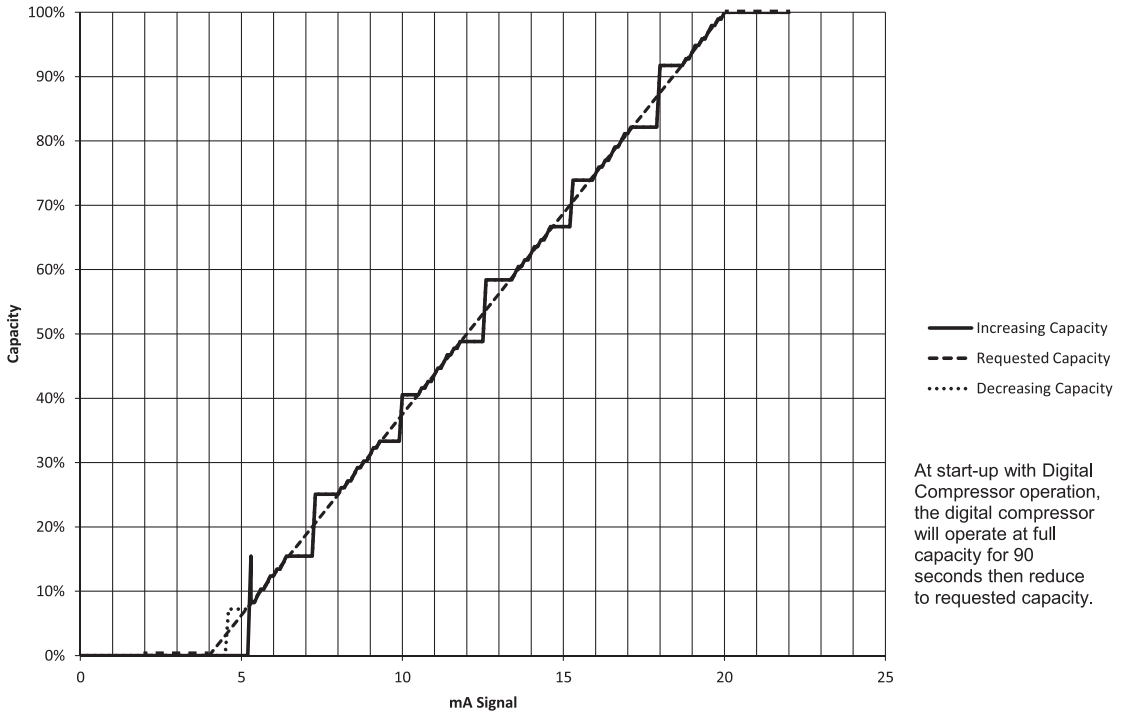


Fig. 120 — Capacity Loading, C.TYP=7 38APD090, Digital, Equal (Default) Circuit Loading, Circuit A Leads

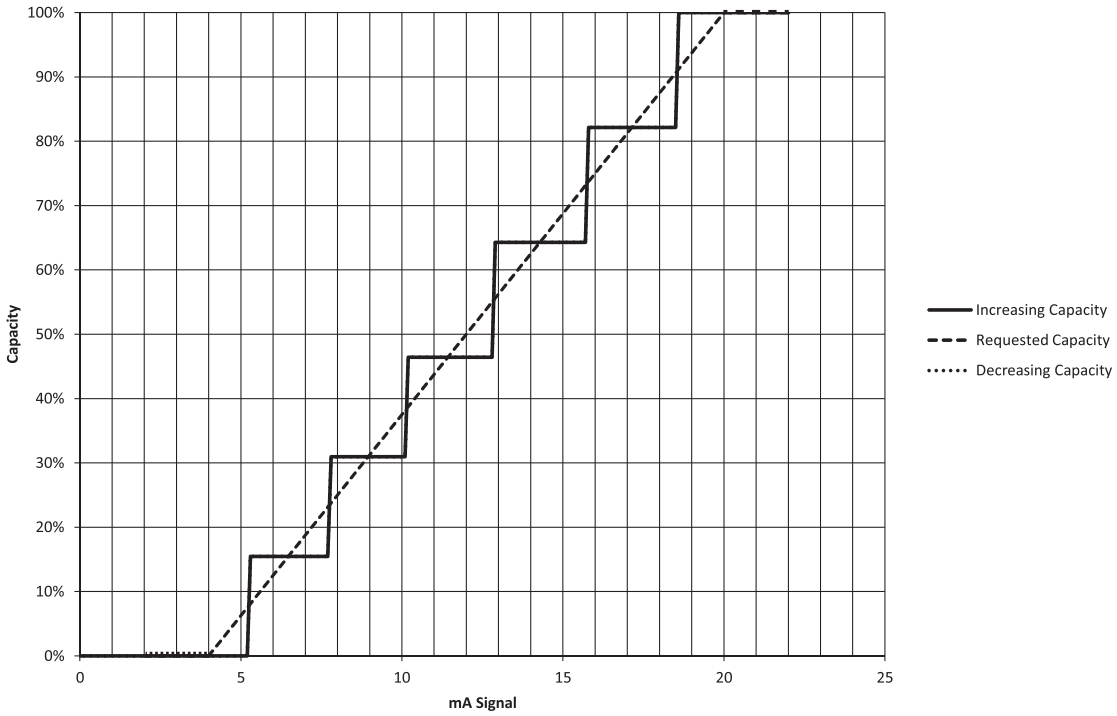


Fig. 121 — Capacity Loading, C.TYP=7 38APD090, Non-Digital, Staged Circuit Loading, Circuit A Leads

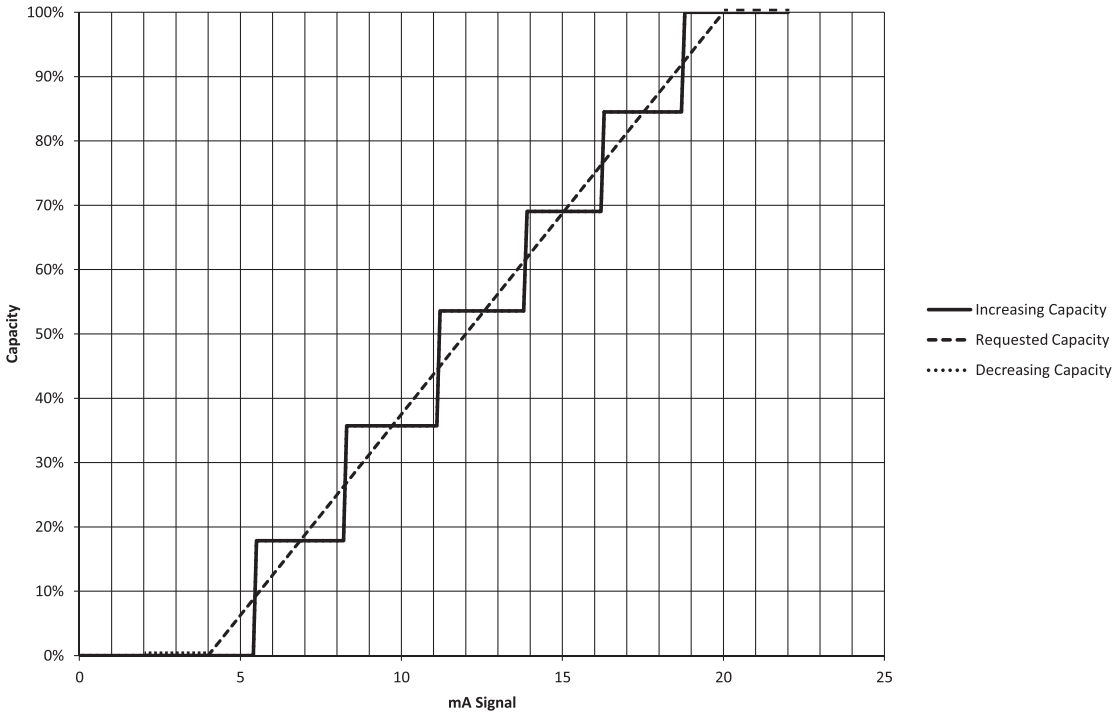


Fig. 122 — Capacity Loading, C.TYP=7 38APD090, Non-Digital, Staged Circuit Loading, Circuit B Leads

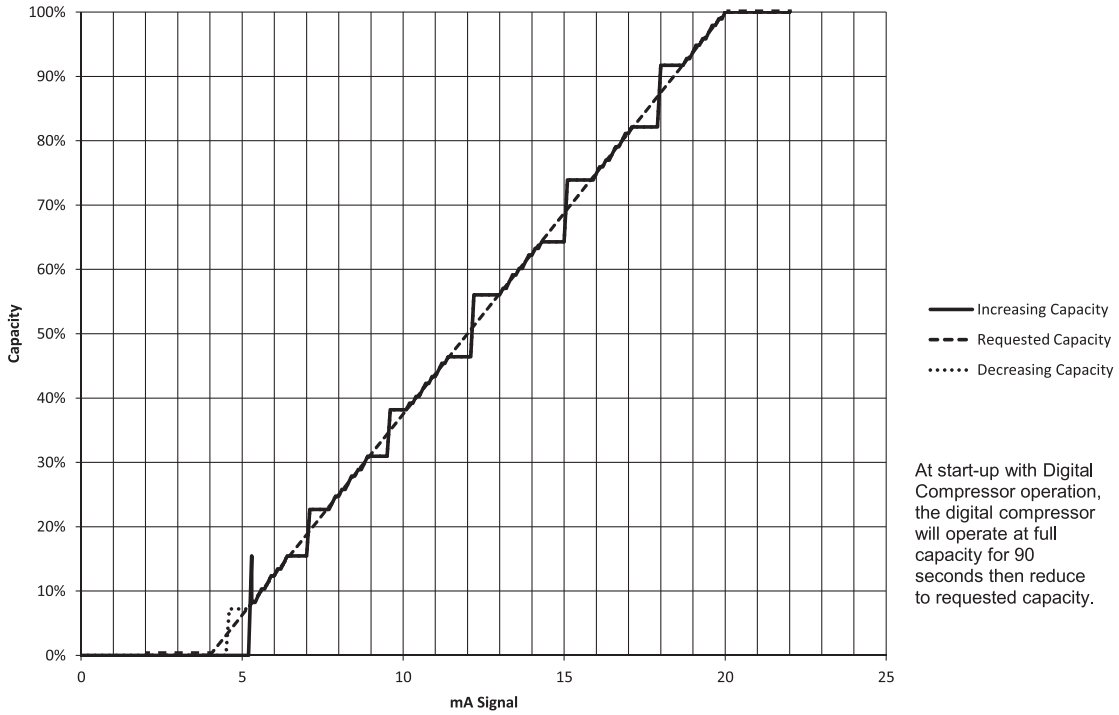


Fig. 123 — Capacity Loading, C.TYP=7 38APD090, Digital, Staged Circuit Loading, Circuit A Leads

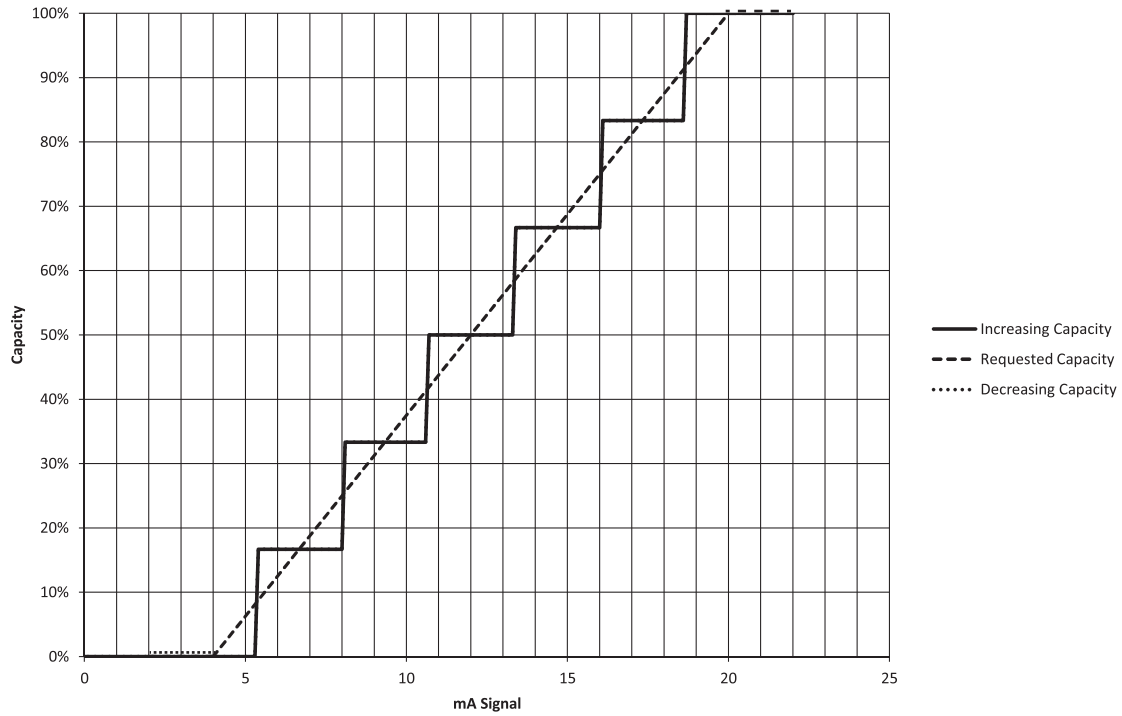


Fig. 124 — Capacity Loading, C.TYP=7
38APD100, Non-Digital, Equal (Default) or Staged Circuit Loading, Circuit A or B Leads

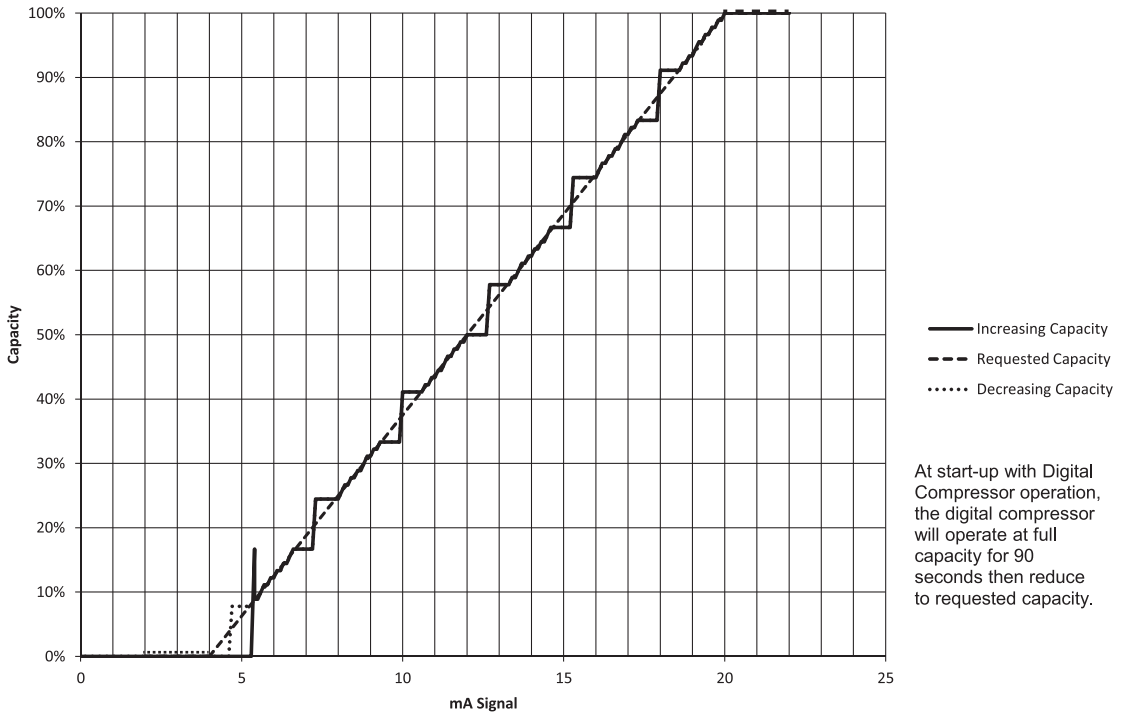


Fig. 125 — Capacity Loading, C.TYP=7
38APD100, Digital, Equal (Default) or Staged Circuit Loading, Circuit A Leads

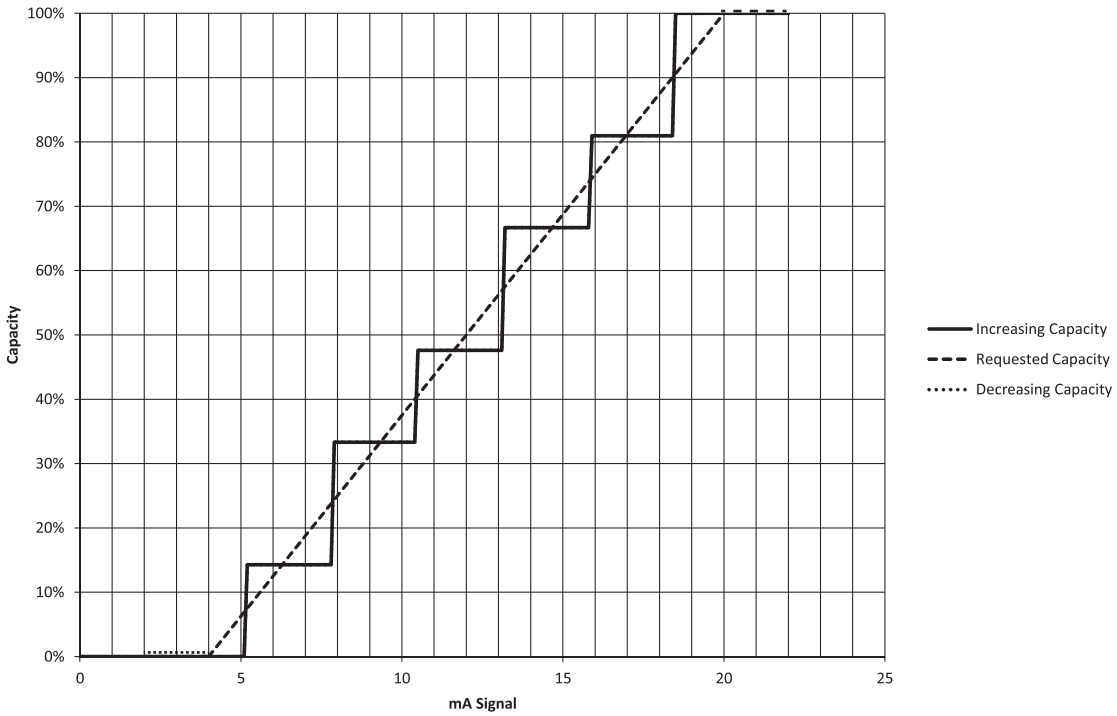


Fig. 126 — Capacity Loading, C.TYP=7
38APD115, Non-Digital, Equal (Default) Circuit Loading, Circuit A Leads

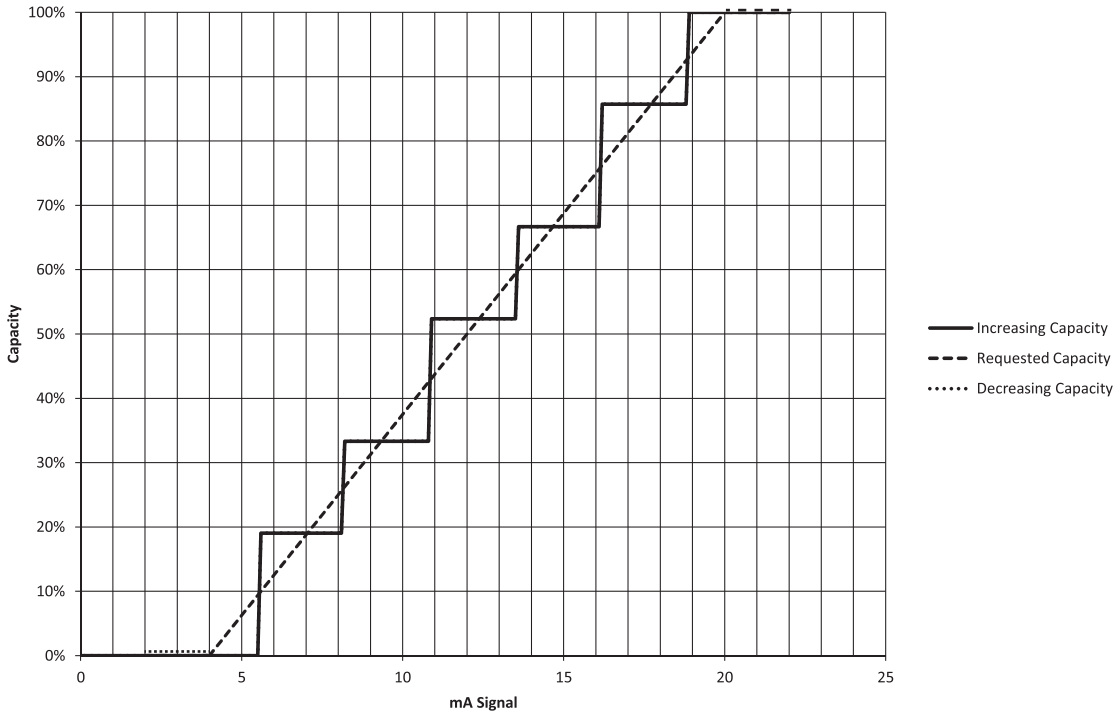


Fig. 127 — Capacity Loading, C.TYP=7
38APD115, Non-Digital, Equal (Default) Circuit Loading, Circuit B Leads

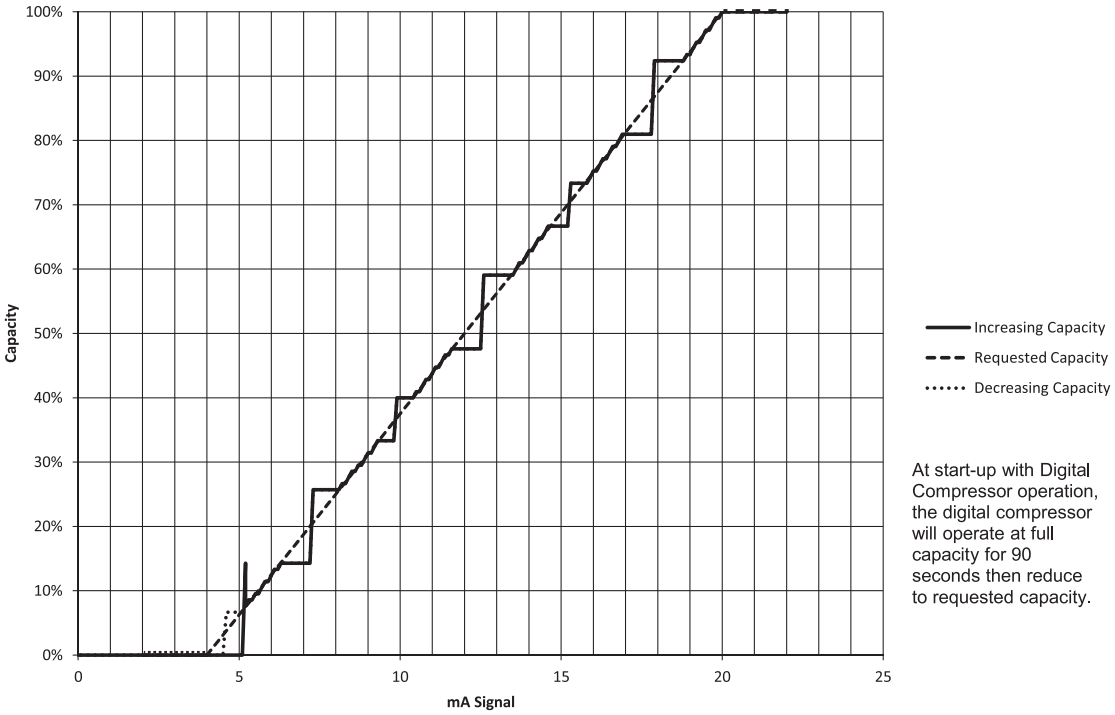


Fig. 128 — Capacity Loading, C.TYP=7 38APD115, Digital, Equal (Default) Circuit Loading, Circuit A Leads

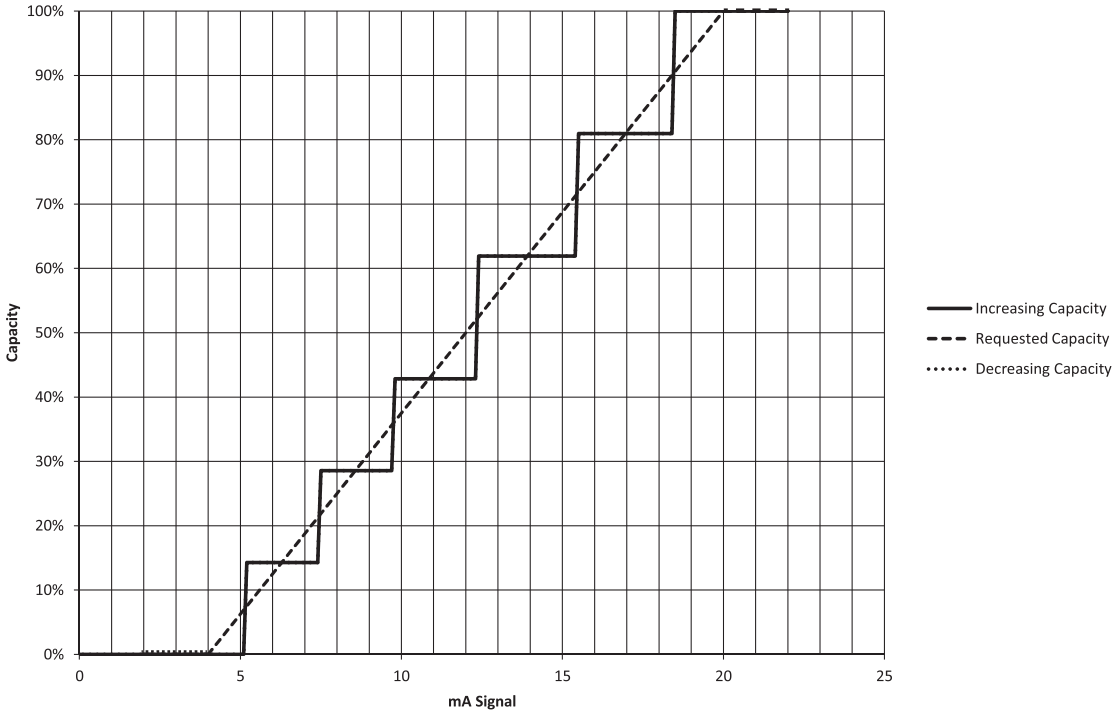


Fig. 129 — Capacity Loading, C.TYP=7 38APD115, Non-Digital, Staged Circuit Loading, Circuit A Leads

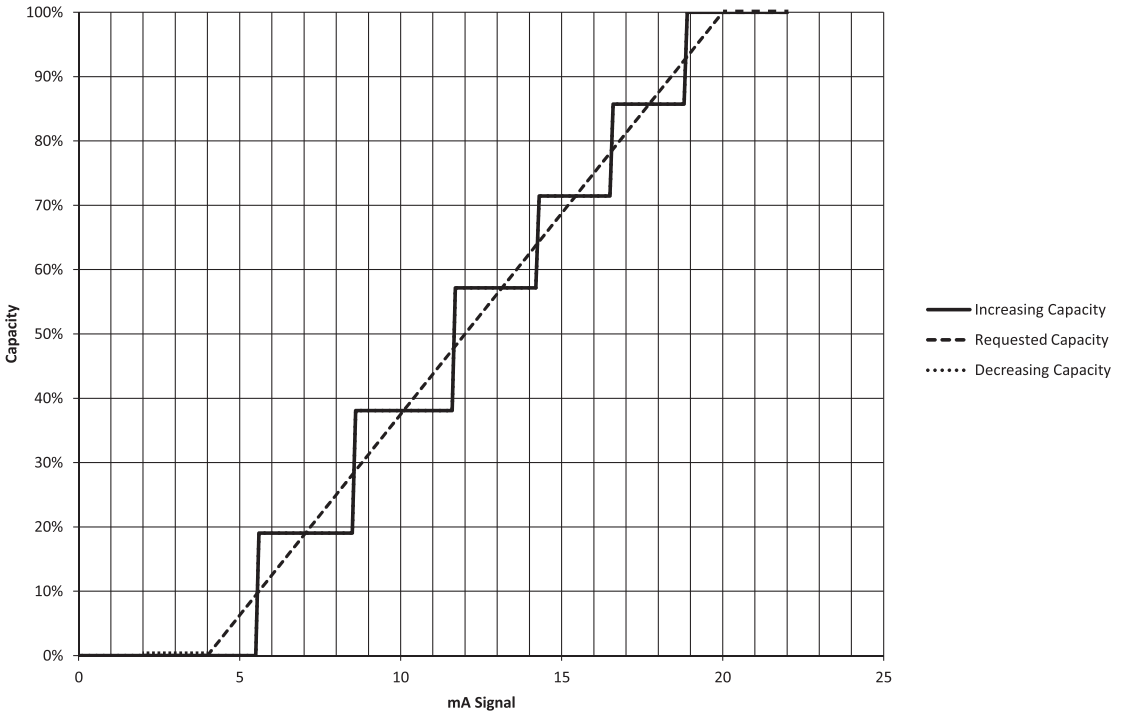
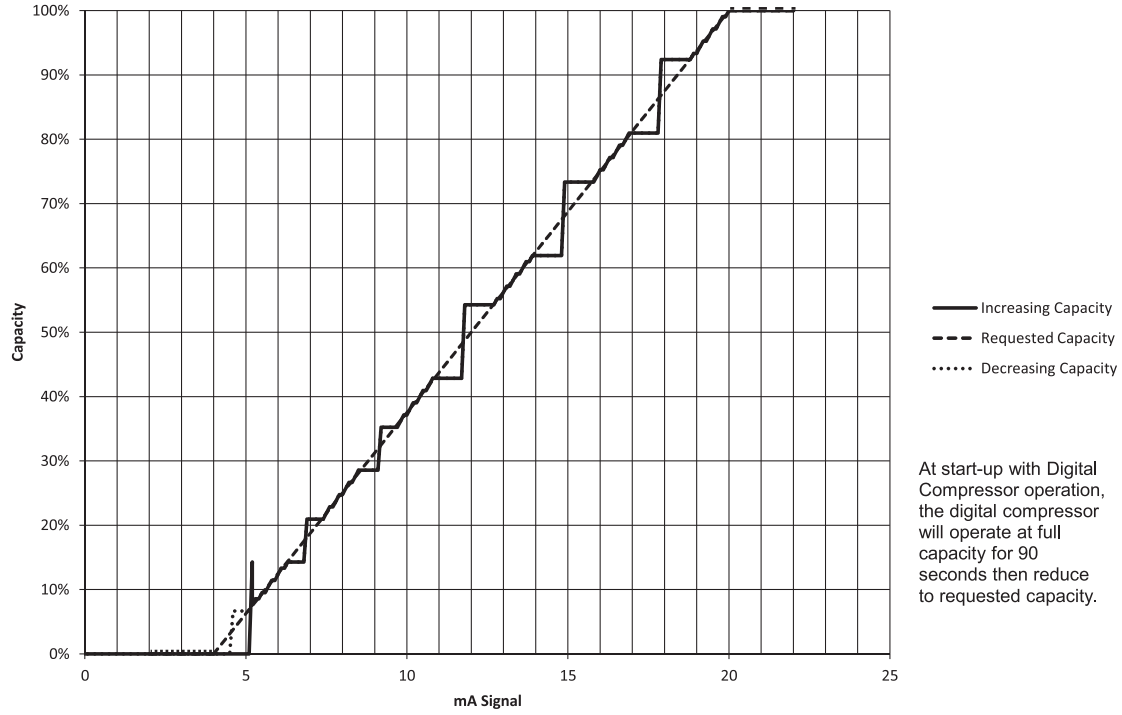


Fig. 130 — Capacity Loading, C.TYP=7 38APD115, Non-Digital, Staged Circuit Loading, Circuit B Leads



At start-up with Digital Compressor operation, the digital compressor will operate at full capacity for 90 seconds then reduce to requested capacity.

Fig. 131 — Capacity Loading, C.TYP=7 38APD115, Digital, Staged Circuit Loading, Circuit A Leads

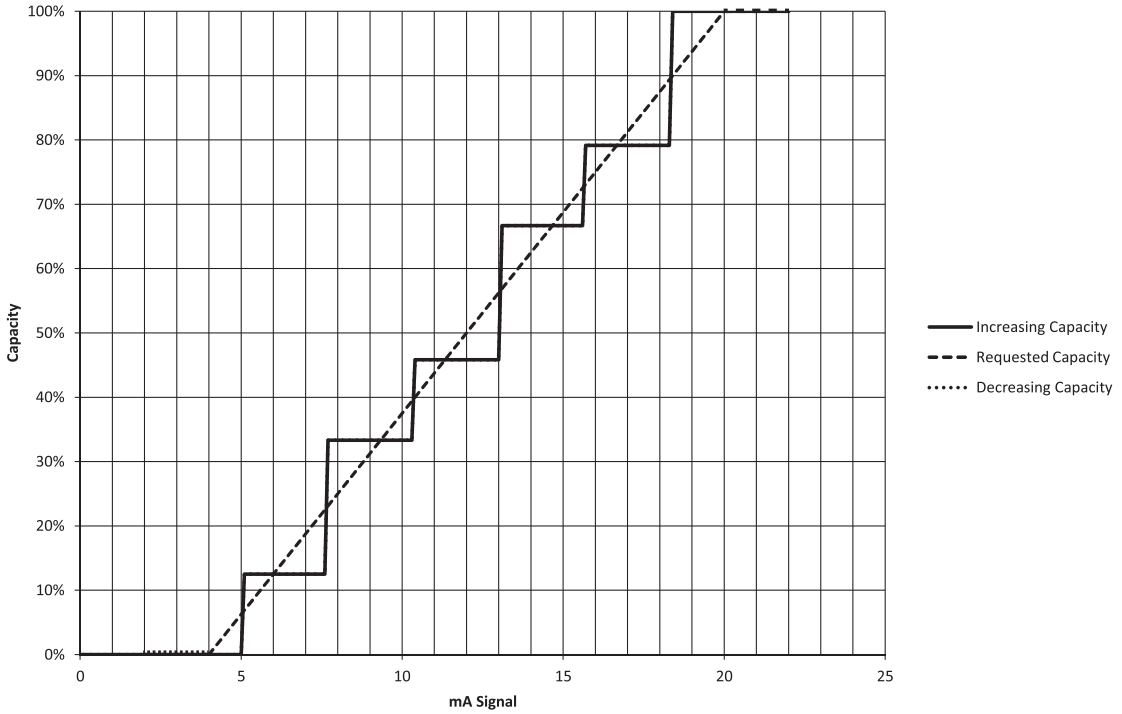


Fig. 132 — Capacity Loading, C.TYP=7
38APD130, Non-Digital, Equal (Default) Circuit Loading, Circuit A Leads

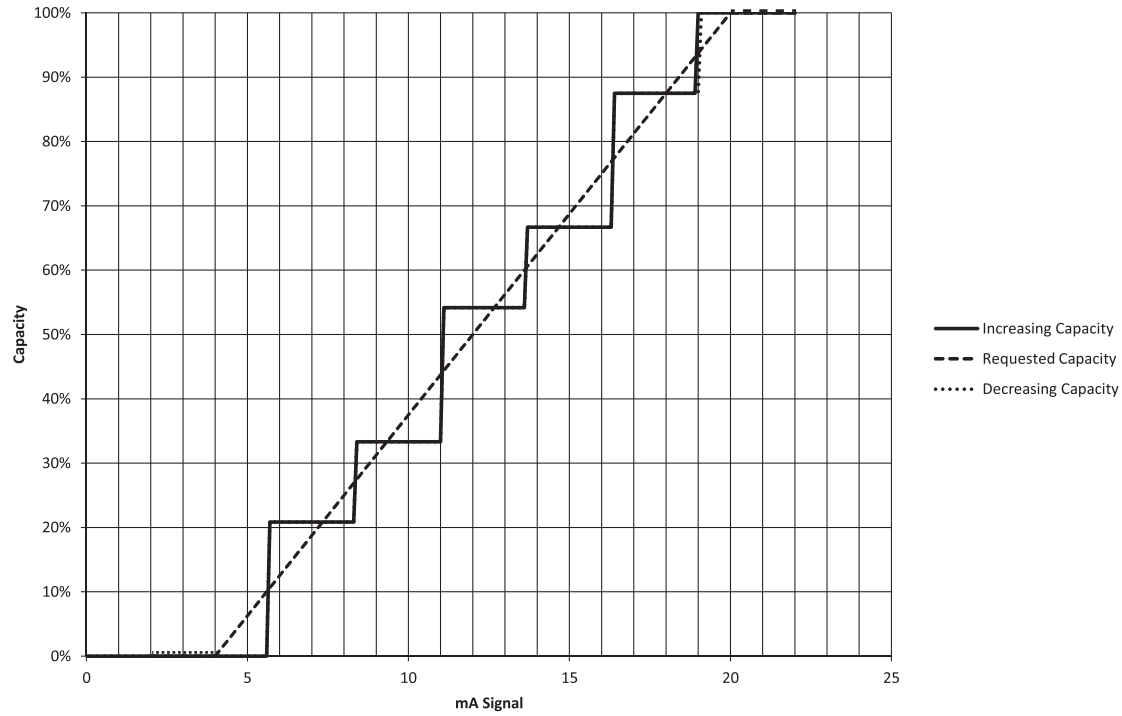


Fig. 133 — Capacity Loading, C.TYP=7
38APD130, Non-Digital, Equal (Default) Circuit Loading, Circuit B Leads

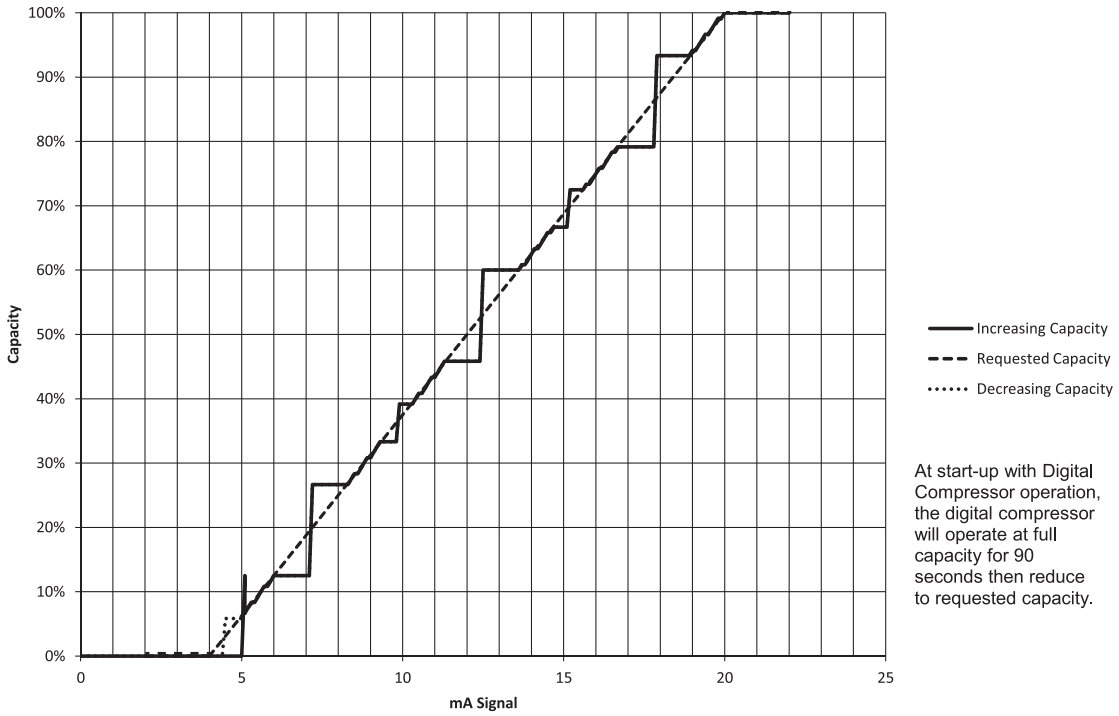


Fig. 134 — Capacity Loading, C.TYP=7 38APD130, Digital, Equal (Default) Circuit Loading, Circuit A Leads

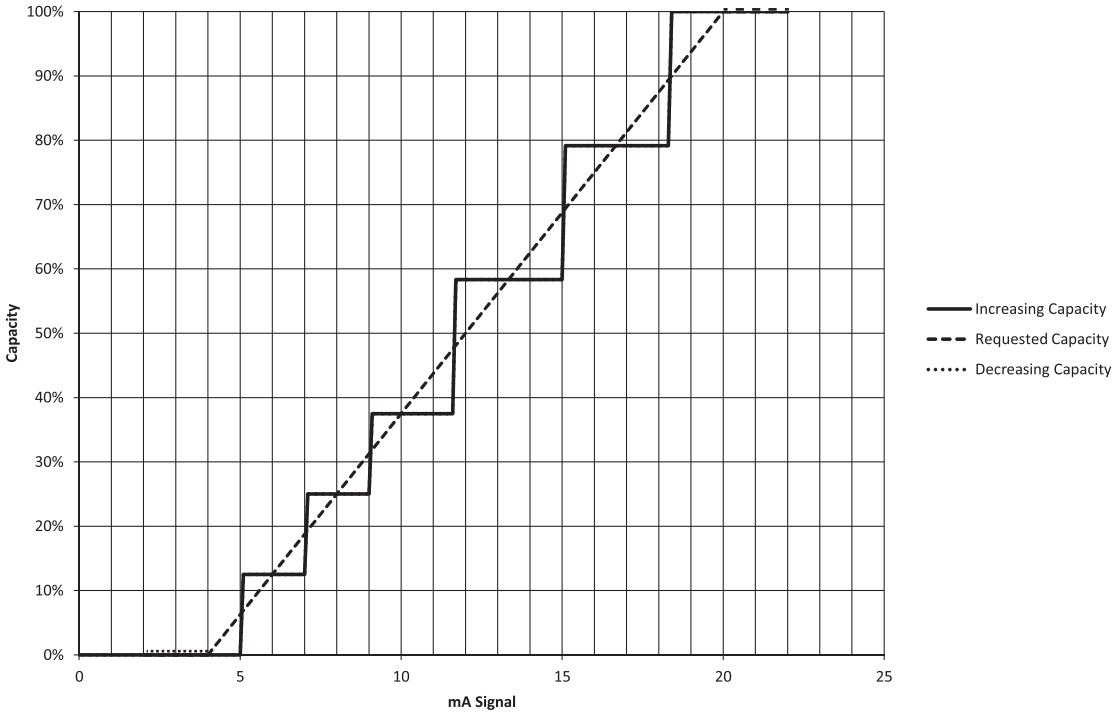


Fig. 135 — Capacity Loading, C.TYP=7 38APD130, Non-Digital, Staged Circuit Loading, Circuit A Leads

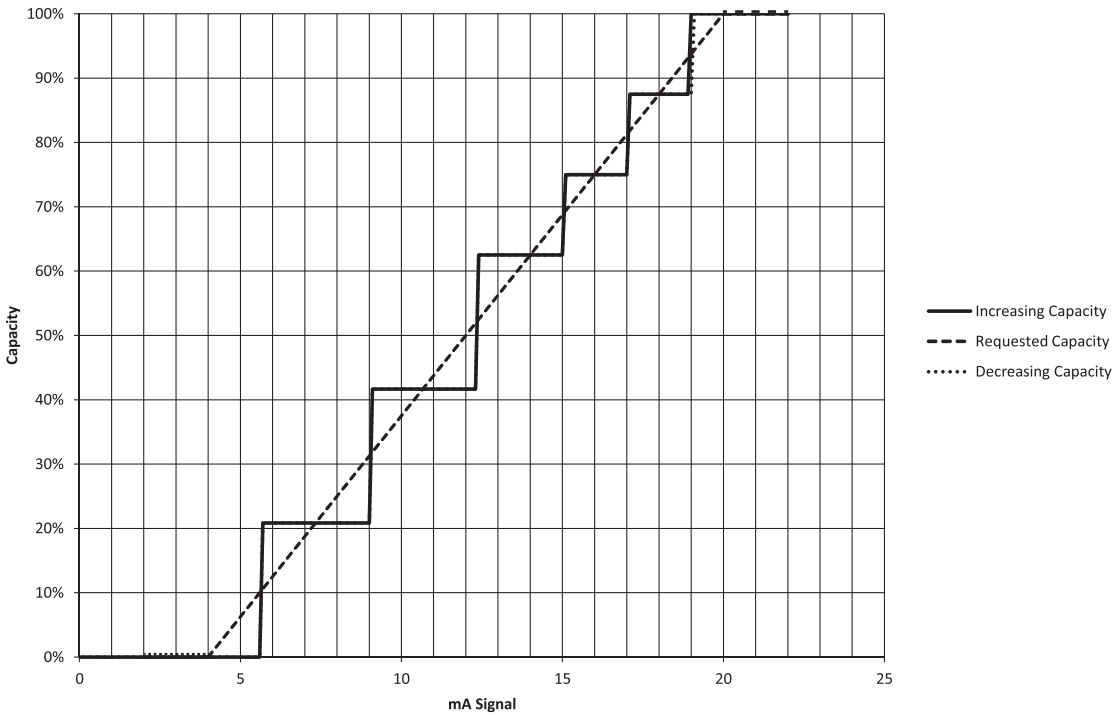
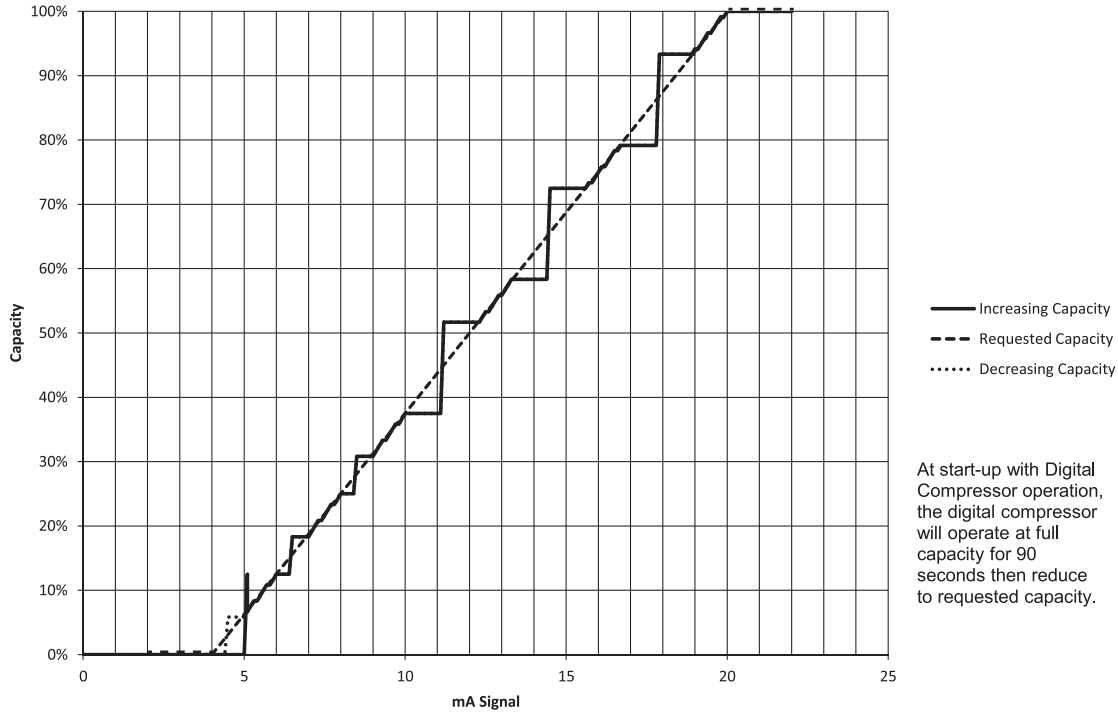


Fig. 136 — Capacity Loading, C.TYP=7 38APD130, Non-Digital, Staged Circuit Loading, Circuit B Leads



At start-up with Digital Compressor operation, the digital compressor will operate at full capacity for 90 seconds then reduce to requested capacity.

Fig. 137 — Capacity Loading, C.TYP=7 38APD130, Digital, Staged Circuit Loading, Circuit A Leads

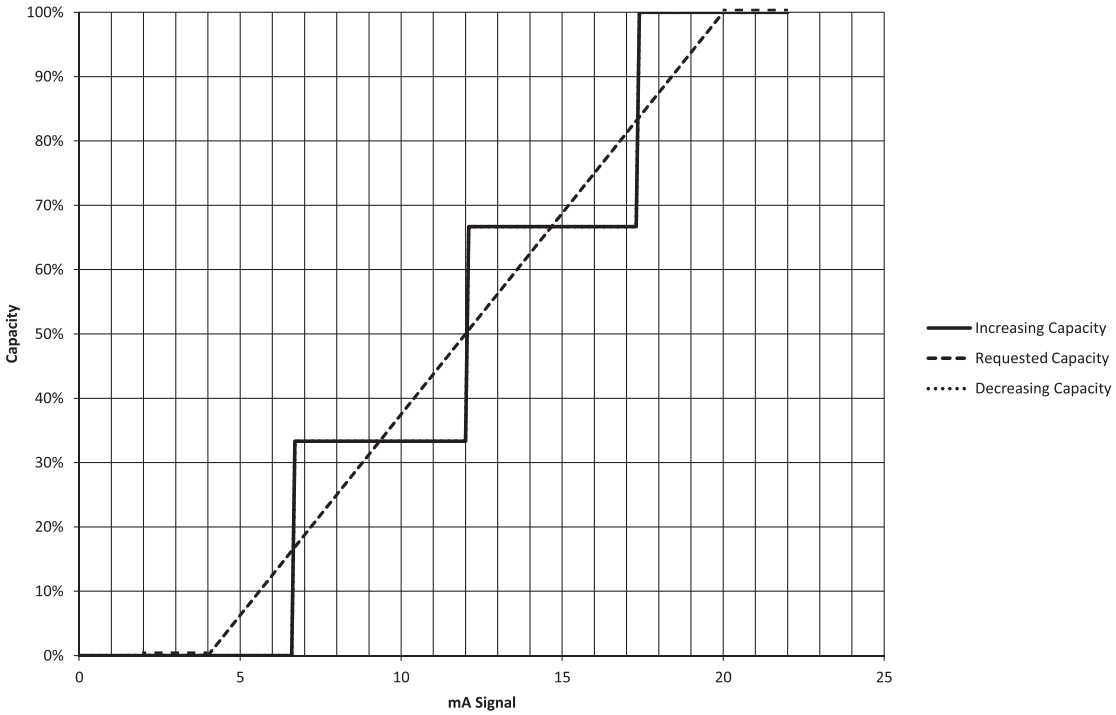


Fig. 138 — Capacity Loading, C.TYP=7
38APS040-065, Non-Digital, Equal (Default) or Staged Circuit Loading, Circuit A Leads (38APS040-050), Circuit B Leads (38APS065)

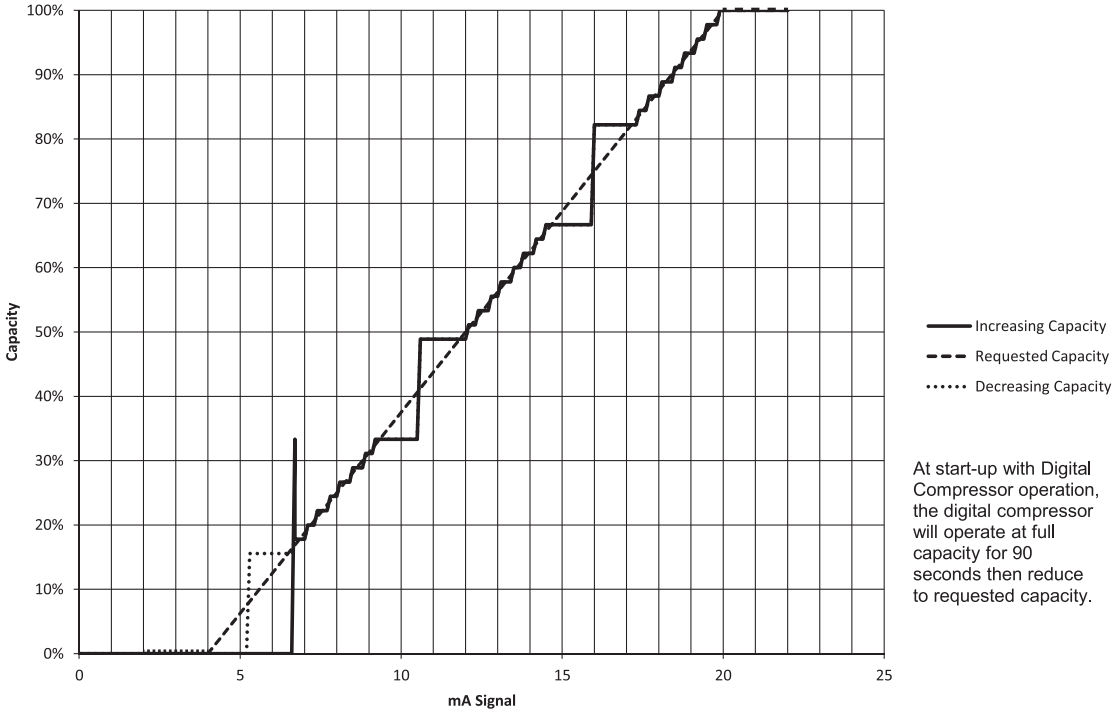


Fig. 139 — Capacity Loading, C.TYP=7
38APS040-050, Digital, Equal (Default) Circuit Loading, Circuit A Leads

***C.TYP* = 8** (DUAL TSTAT) — This configuration allows for the connection and control of a single 38APD unit to two separate air handlers. The configuration allows the MBB to monitor the thermostat inputs from each of two separate thermostats to make a determination of mode and capacity for each circuit of the 38APD unit. With this control scheme, Thermostat T1, Y1 and Y2 contacts operate circuit A. Thermostat T2, Y3 and Y4 contacts operate circuit B.

Recommended Applications — This control method is recommended for 38APD dual-circuit units with two separate air handlers connected, one to each circuit. Ideally, the 38APD unit should have no more than 2 compressors in the circuit. Units with more compressors in the circuit may not provide adequate control due to the large capacity steps.

This control scheme *cannot* be used with:

- Units with digital compressors. Digital operation is not supported with this control scheme.
- Minimum Load Control, which is not supported with this control scheme
- Single or 2-Step Demand Limit, which are not supported with this control scheme
- 38APS units

Hardware Requirements

- energy management module
- 2 two-stage thermostats, one for each air handler
- 4 SPST relays for thermostat input. If Minimum Load Control will be used, install DPDT Relays in place of the SPST Relays.

With this configuration, Single or 2-Step Demand Limit is not available as the inputs for this option are used by the second thermostat. If Demand Limit is required, 4 to 20 mA or Demand Limit through CCN communications is available.

Required Configurations — Table 35 lists the configurations required for proper operation.

Table 35 — C.TYP=8 (Dual Tstat) Required Configuration

CONFIGURATION MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OPT2	C.TYP	X	Machine Control Type	Default: 4 Range: 1 to 9 Set Item to 8 (Dual Stat)

Wiring — See Fig. 140.

Sequence of Operation — The MBB monitors the thermostat inputs to make a determination of circuit capacity stage. If Y1 or Y3 input is closed, no more than 50% of the circuit capacity will be energized. If Y2 or Y4 is closed, 100% of the circuit capacity will be energized for that circuit, if available. Y1 or Y3 closure is not required for 100% capacity. Thermostat inputs for circuit A can be monitored at the unit's scrolling marquee, ***Inputs→GEN.I→Y.1*** (Y1 Thermostat Input) and ***Inputs→GEN.I→Y.2*** (Y2 Thermostat Input). Thermostat inputs for circuit B can be monitored at the unit's scrolling marquee, ***Inputs→GEN.I→Y.3*** (Y3 Thermostat Input) and ***Inputs→GEN.I→Y.4*** (Y4 Thermostat Input).

For mechanical cooling, the unit's Control Method (***Configuration→OPT2→CTRL***) and inputs must allow the machine to run. See Control Methods on page 60 for additional information.

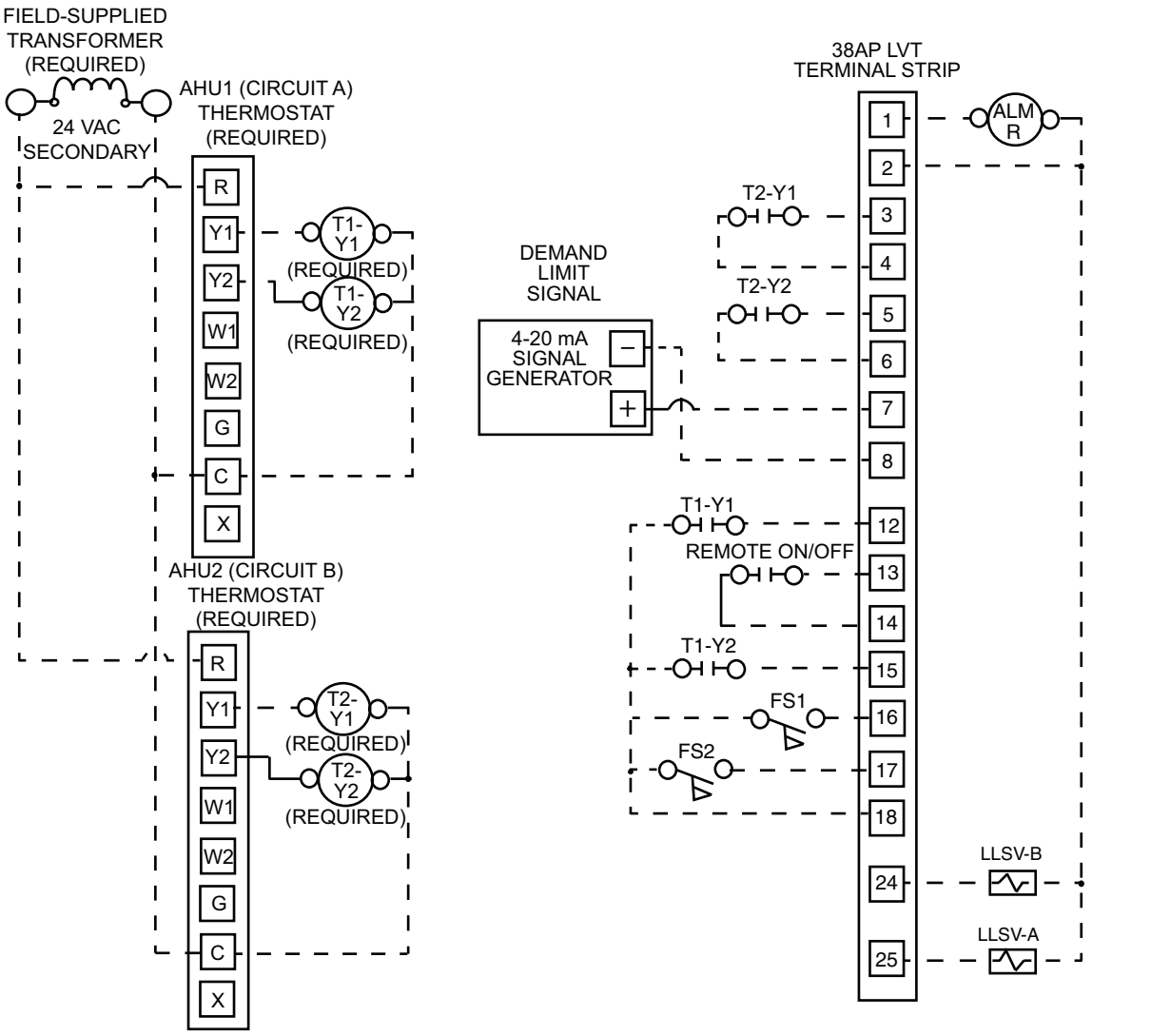
On power up or changing from Off to Enabled, the machine will remain off until Minutes Off Time (***Configuration→OPT2→DELY***) timer has expired. See Minutes Off Time on page 128 for additional information. Liquid Line Solenoid Valve operation is as described in Liquid Line Solenoid Valves on page 40. Time Guard is honored for all compressors. For specific information on Time Guard, see MDTG - Time Guard Active on page 135.

In this Control Type, Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=0** (Off Cool) as long as Control Mode ***Run Status→VIEW→STAT*=1** (Off Local), **2** (Off CCN), **3** (Off Time), or **4** (Off Emrgcy). When the Control Mode, ***STAT*=5** (On Local), **6** (On CCN), or **7** (On Time), ***SPT.M*=1** (Lo Cool) if Y1 ***Inputs→GEN.I→Y.1*=ON** or Y3 ***Inputs→ GEN.I→Y.3*=ON** is closed. ***SPT.M*=2** (High Cool) if Y2 ***Inputs→GEN.I→Y.2*=ON**, or Y4 ***Inputs→GEN.I→Y.4*=ON** is closed. ***SPT.M*=0** (Off Cool) if Y1, Y2, Y3 and Y4 are all open, ***Y.1*=OFF**, ***Y.2*=OFF**, ***Y.3*=OFF** and ***Y.4*=OFF**. With this Control Type, if the Indoor Fan Status Switch for circuit A or B opens, ***Inputs→GEN.I→ID.F.A*=OFF** or ***Inputs→GEN.I→ ID.F.B*=OFF**, ***STAT*** will change to **8** (IDFS Not On), the unit will remain with ***SPT.M*=0** (Off Cool) if Y1, Y2, Y3 and Y4 are all open, ***Y.1*=OFF**, ***Y.2*=OFF**, ***Y.3*=OFF** and ***Y.4*=OFF**. If Y1, Y2, Y3 or Y4 close, ***Y.1*=ON**, ***Y.2*=ON**, ***Y.3*=ON** or ***Y.4*=ON**, Control Mode will change from ***STAT*=8** (IDFS Not On), to **4** (Off Emrgcy) as an alarm is generated. Table 36 shows the space temperature control mode response for ***C.TYP*=8**.

38APD Units — On a circuit B call for cooling, Y1 closure, Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. On a circuit B call for cooling, Y3 closure, Indoor Fan Status Cir B (***Inputs→GEN.I→ID.F.B***) is checked. The circuit fan status switch must be closed before the capacity routine will start for the circuit. The lead compressor of the circuit will be determined and started. See Circuit Compressor Staging on page 112. The solenoid corresponding to the circuit is opened 30 seconds after the Y1 or Y3 closure. The lead compressor is started 20 seconds later. Compressors will be staged at 70-second intervals until the unit's capacity is as close as possible to 50% without exceeding it. When the Y2 or Y4 contact is closed, the remaining capacity will be started, staging compressors at 60-second intervals. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

As part of normal operation, if a single compressor in a multiple compressor circuit (38APD040-130) operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease and the Y2 or Y4 contact opens, the machine controls will reduce the unit's capacity by removing compressors. The first compressor will turn off between 30 and 60 seconds following the loss of the Y2 or Y4 signal. The remaining compressors will turn off in 90-second intervals until the unit is as close to 50% capacity without exceeding it. Finally, as the Y1 or Y3 contact opens, the remaining capacity is removed immediately.



LEGEND

AHU	—	Air-Handling Unit
ALM R	—	Alarm Relay
CXB	—	Compressor Expansion Board
FS1	—	Fan Status Switch, AHU1
FS2	—	Fan Status Switch, AHU2
LLSV-A	—	Liquid Line Solenoid, Circuit A, First Stage
LLSV-A2	—	Liquid Line Solenoid, Circuit A, Second Stage (38APD070-130 only)
LLSV-B	—	Liquid Line Solenoid, Circuit B, First Stage
LLSV-B2	—	Liquid Line Solenoid, Circuit B, Second Stage (38APD070-130 only)
LVT	—	Low Voltage Terminal
T1	—	AHU1 Thermostat
T2	—	AHU2 Thermostat
———		Factory Wiring
- - - - - - - -		Field Wiring

NOTES:
1. AHU1 is connected to 38APD — Circuit A.
   AHU2 is connected to 38APD — Circuit B.
2. Field wiring must be in accordance with local codes.
3. LVT-1 and 2 are for the alarm relay. The maximum load allowed for the alarm relay is 5 VA sealed, 10 VA at 24 VAC. Field power supply is not required.
4. LVT-24, 25, and 2 are for control of field-supplied liquid line solenoid valve (LLSV) 15 VA sealed, 30 VA inrush at 24 VAC. Field power supply is not required.
5. For 38APD070-130 units, an additional LLSV, 15 VA sealed, 30 VA inrush at 24 VAC can be connected to CXB. A field-supplied control transformer is required, not to exceed 75 VA.
6. All discrete inputs are 24 VAC.
7. Installation of fan status switches (FS1, FS2) is recommended. If not used, a jumper must be installed.
8. Energy management module (EMM) is required.
9. This control scheme does not support digital compressor operation.
10. The contacts for Remote On-Off, Fan Status Switch and Demand Limit must be rated for dry circuit applications capable of handling a 24 VAC load up to 50 mA.
11. Single or 2-Step Demand Limit is not available with this control type.

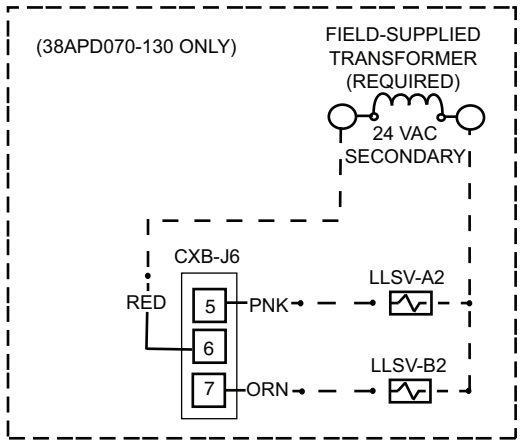


Fig. 140 — C.TYP=8 (Dual Tstat) Wiring

Table 36 — Space Temperature Control Mode Response for C.TYP=8

CONTROL MODE *STAT*	Y1 STATUS *Y.1* AND/OR Y3 STATUS *Y.3*	Y2 STATUS *Y.2* AND/OR Y4 STATUS *Y.4*	INDOOR FAN STATUS CIR A *ID.F.A* AND/OR INDOOR FAN STATUS CIR B *ID.F.B*	SPACE TEMPERATURE CONTROL MODE *SPT.M*
1 (Off Local)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
2 (Off CCN)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
3 (Off Time)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
4 (Off Emrgcy)	***Off*** or ***On***	***Off*** or ***On***	***Off*** or ***On***	***0*** (Off Cool)
5 (On Local)	***Off***	***Off***	***Off*** or ***On***	***0*** (Off Cool)
	On	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
6 (On CCN)	***Off***	***Off***	***Off*** or ***On***	***0*** (Off Cool)
	On	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
7 (On Time)	***Off***	***Off***	***Off*** or ***On***	***0*** (Off Cool)
	On	***Off***	***On***	***1*** (Lo Cool)
	Off or ***On***	***On***	***On***	***2*** (Hi Cool)
8 (IDFS Not On)	***Off*** or ***On***	***Off*** or ***On***	***Off***	***0*** (Off Cool)
9 (SPT Satisfied)	*Not Applicable*			

C.TYP* = 9** (VAV SETPOINT) — With this configuration, the 38AP unit operates as a VAV unit and controls unit capacity in an attempt to meet a field-supplied 4 to 20 mA supply air temperature request, by staging compressors to attempt to meet the current Control Point (Run Status→VIEW→CTPT***). A field-supplied 4 to 20 mA signal determines the Active Setpoint, (***Run Status→VIEW→SETP***). The Control Point is the Active Setpoint ***Run Status→VIEW→SETP*** adjusted for any temperature reset that is applied. See Temperature Reset on page 129 for information on Temperature Reset. This control type requires the energy management module option or accessory.

This configuration is compatible with both standard and digital compressors.

Recommended Applications — This control type is used when variable supply air set points are required and determined by a third-party Building Management System.

Hardware Requirements

- energy management module
- 4 to 20 mA generator
- return/mixed air sensor
- supply air sensor

This control scheme requires a supply air sensor and a return air sensor or mixed air sensor. In lieu of wiring sensors to the 38AP unit, both values can be communicated via CCN to the 38AP unit. For information on broadcasting values, see Thermistors on page 28. The ***Supply Configuration→OPT1→SAT.T*** (SAT Thermistor Type) and ***Configuration→OPT1→RAT.T*** (RAT Thermistor Type) must be configured for either **0** (5 kΩ) or **1** (10 kΩ) type sensors whether they are hard wired or their values are communicated to the controller.

Required Configurations — Table 37 lists the configurations required for proper operation.

Recommended Settings — With this Control Type, ***CSP.1*** should be set to the design supply air temperature used most often.

Wiring — See Fig. 141.

Sequence of Operation — The 4-20 mA Cooling Set Point (***Inputs→4-20→CL.MA)*** is translated into a desired active set point ranging from 40 to 80 F (4.4 to 26.7 C). The control translates the input linearly with 4 mA equal to 40 F (4.4 C) and 20 mA equal to 80 F (26.7 C) as the basis for the Active Set Point (***Run Status→VIEW→SETP***). With the loss of the field-supplied signal, the Active Setpoint will change to Cooling Set Point 1 (***Set Points→COOL→CSP.1***). See Fig. 142 and 143.

The Control Point (***Run Status→VIEW→CTPT***) is the Active Set Point (***SETP***) or Cooling Set Point 1 (***CSP.1***) adjusted for any temperature reset that is applied. See Temperature Reset on page 129 for additional information.

For mechanical cooling, the unit's Control Method (***Configuration→OPT2→CTRL***) and inputs must allow the machine to run. See Control Methods on page 60 for additional information.

On power up or changing from Off to Enabled, the machine will remain off until Minutes Off Time (***Configuration→OPT2→DELY***) timer has expired. See Minutes Off Time on page 128 for additional information. Liquid line solenoid valve operation is as described in Liquid Line Solenoid Valves on page 40. Time Guard is honored for all compressors. For specific information on Time Guard, see MDTG - Time Guard Active on page 135.

In this Control Type, Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=0** (Off Cool) as long as ***Run Status→VIEW→STAT*=1** (Off Local), **2** (Off CCN), **3** (Off Time) or **4** (Off Emrgcy). ***SPT.M*=3** (Cool On) when Control Mode, **STAT=5** (On Local), **6** (On CCN), or **7** (On Time). In this Control Type, if the Indoor Fan Status Switch opens (***Inputs→GEN.1→ID.F.A*=OFF**) Control Mode (***STAT***) will change to **8** (IDFS Not On); the unit will alarm and switch to **4** (Off Emrgcy). Table 38 shows the space temperature control mode response for ***C.TYP*=9**.

Table 37 — C.TYP=9 (VAV Setpoint) Required Configuration

CONFIGURATION MODE				
SUBMODE	**ITEM**	**DISPLAY**	**ITEM DESCRIPTION**	**COMMENT**
OPT1	RAT.T	X	RAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
	SAT.T	X	SAT Thermistor Type	Default: 0 Range: 0 to 2 Must be set for appropriate value: 0 = 5 kΩ 1 = 10 kΩ 2 = None
	EMM	YES/NO	EMM Module Installed	Default: YES, if factory installed; NO, if not. EMM must be installed and configured for YES.
OPT2	C.TYP	X	Machine Control Type	Default: 4 Range: 1 to 9 Set Item to 9 (VAV Setpoint)
SETPOINTS MODE				
COOL	CSP.1	XX.X	Cooling Setpoint 1	Default: 60.0 F (15.6 C) Range: 40.0 to 80.0 F (4.4 to 26.7 C)

Table 38 — Space Temperature Control Mode Response for C.TYP=9

CONTROL MODE *STAT*	INDOOR FAN STATUS CIR A *ID.F.A*	SPACE TEMPERATURE CONTROL MODE *SPT.M*
1 (Off Local)	***Off*** or ***On***	***0*** (Cool Off)
2 (Off CCN)	***Off*** or ***On***	***0*** (Cool Off)
3 (Off Time)	***Off*** or ***On***	***0*** (Cool Off)
4 (Off Emrgcy)	***Off*** or ***On***	***0*** (Cool Off)
5 (On Local)	***On***	***3*** (Cool On)
6 (On CCN)	***On***	***3*** (Cool On)
7 (On Time)	***On***	***3*** (Cool On)
8 (IDFS Not On)	***Off***	***3*** (Cool On)
9 (SPT Satisfied)	*Not Applicable*	

38APD Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead circuit is determined. See Lead/Lag Determination on page 112. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's supply air temperature meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. If additional capacity requires the lag circuit to start, the lag circuit's lead compressor will be determined and started. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

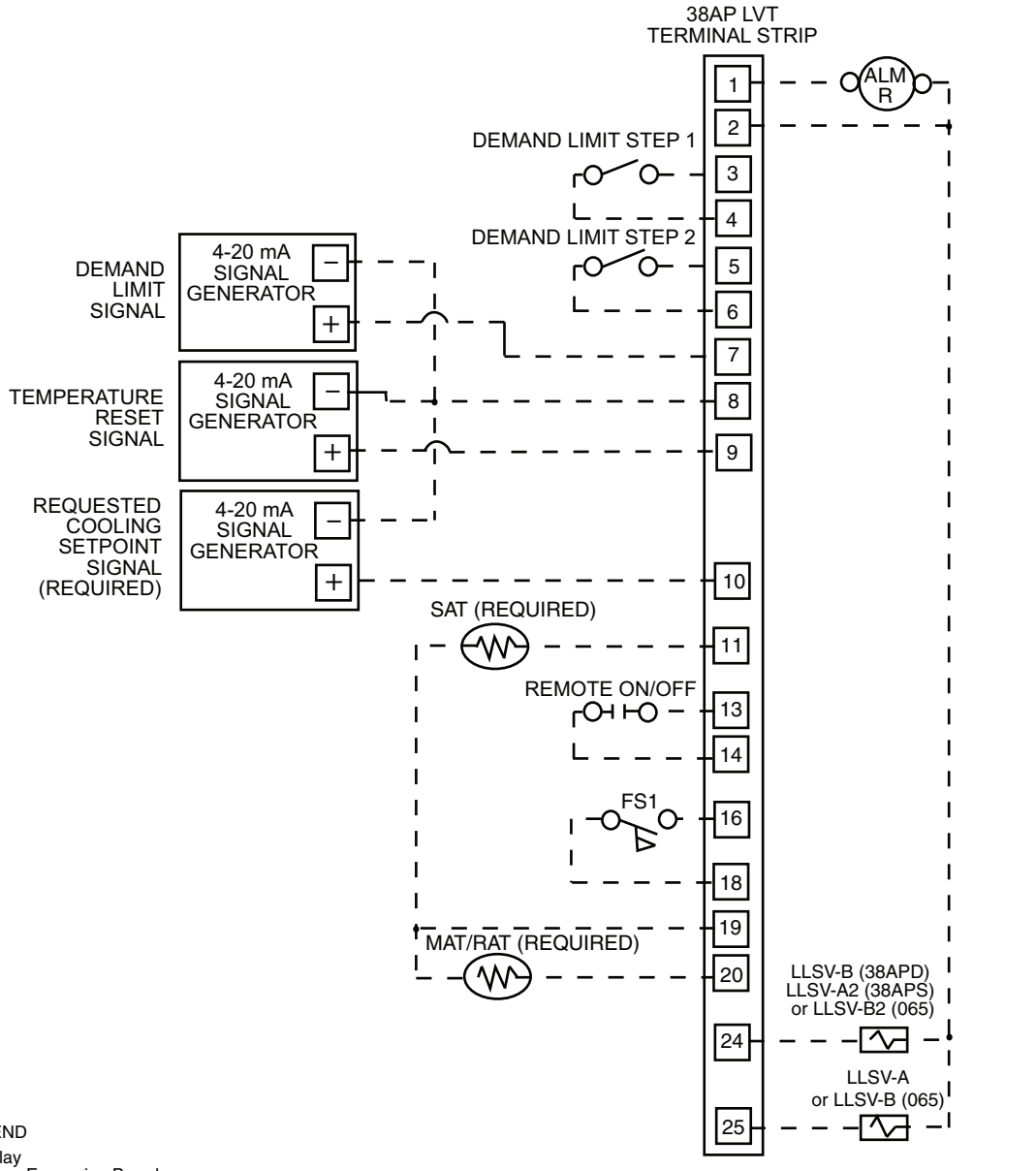
As part of normal operation, if a single compressor in a multiple compressor circuit (38APD040-130) operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.

38APS Units — On a call for cooling, the Indoor Fan Status Cir A (***Inputs→GEN.I→ID.F.A***) is checked. The switch must be closed before the capacity routine will start. The lead compressor will be determined and started. See Circuit Compressor Staging on page 112. If the lead compressor is a digital compressor and is enabled, the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Compressors will be staged until the unit's supply air temperature meets the Control Point (***CTPT***) as described in Supply Air Temperature Control on page 110. During operation, the controls will stage the condenser fans to maintain head pressure. See Head Pressure Control on page 117.

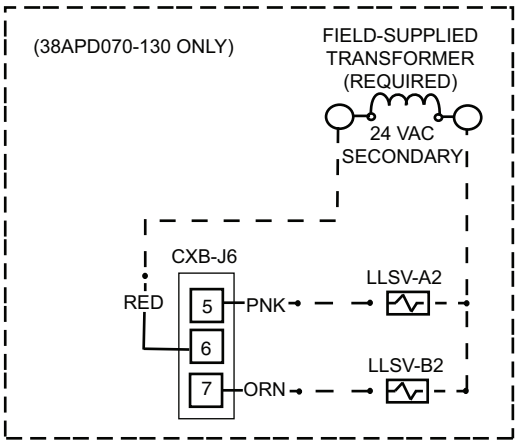
As part of normal operation, if a single compressor operates for the cumulative time of 60 minutes without an increase in circuit capacity, an oil recovery routine is initiated. When this routine is initiated, a second compressor in the circuit is started. Once started, the normal capacity control routine takes priority and will turn off the compressor if needed.

As the capacity requirement begins to decrease, the machine controls will reduce the unit's capacity to maintain the Control Point. If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity.



LEGEND

ALM R	—	Alarm Relay
CXB	—	Compressor Expansion Board
FS1	—	Fan Status Switch, AHU1
LLSV-A	—	Liquid Line Solenoid, Circuit A, First Stage
LLSV-A2	—	Liquid Line Solenoid, Circuit A, Second Stage (38APS040,050, 38APD070-130 only)
LLSV-B	—	Liquid Line Solenoid, Circuit B, First Stage (38APS065, 38APD only)
LLSV-B2	—	Liquid Line Solenoid, Circuit B, Second Stage (38APS065, 38APD070-130 only)
LVT	—	Low Voltage Terminal
MAT/RAT	—	Mixed Air Thermistor/Return Air Thermistor
SAT	—	Supply Air Thermistor
———		Factory Wiring
---------		Field Wiring



NOTES:
1. Field wiring must be in accordance with local codes.
2. LVT-1 and 2 are for the alarm relay. The maximum load allowed for the alarm relay is 5 VA sealed, 10 VA at 24 VAC. Field power supply is not required.
3. LVT-24, 25, and 2 are for control of field-supplied liquid line solenoid valve (LLSV) 15 VA sealed, 30 VA inrush at 24 VAC. Field power supply is not required.
4. For 38APD070-130 units, an additional LLSV, 15 VA sealed, 30 VA inrush at 24 VAC can be connected to CXB. A field-supplied control transformer is required, not to exceed 75 VA.
5. All discrete inputs are 24 VAC.
6. Installation of fan status switch (FS1) is recommended. If not used, a jumper must be installed.
7. Energy management module (EMM) is required.
8. The contacts for Remote On-Off, Fan Status Switch and Demand Limit must be rated for dry circuit applications capable of handling a 24 VAC load up to 50 mA.

Fig. 141 — C.TYP=9 (VAV Setpoint) Wiring

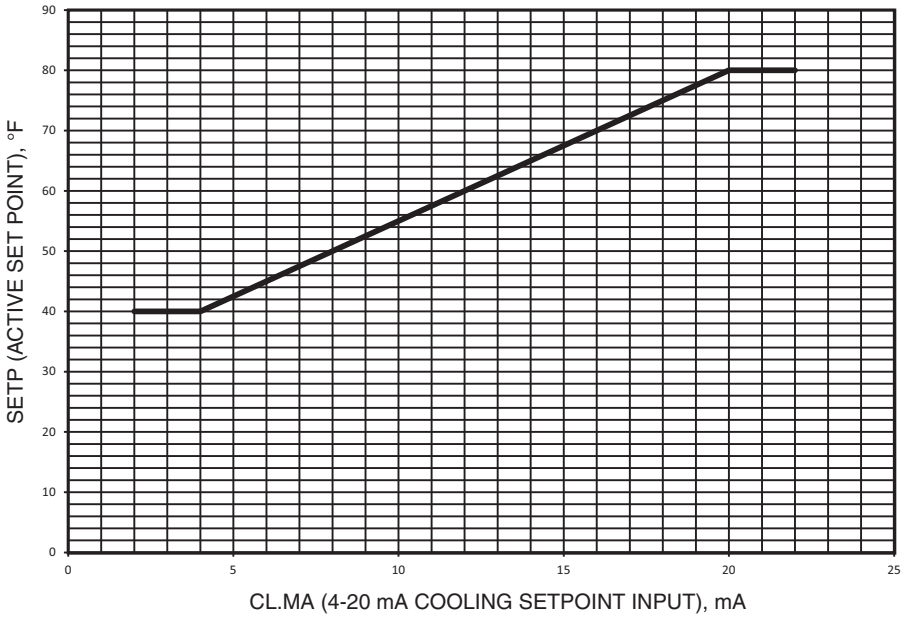


Fig. 142 — Active Setpoint (English)

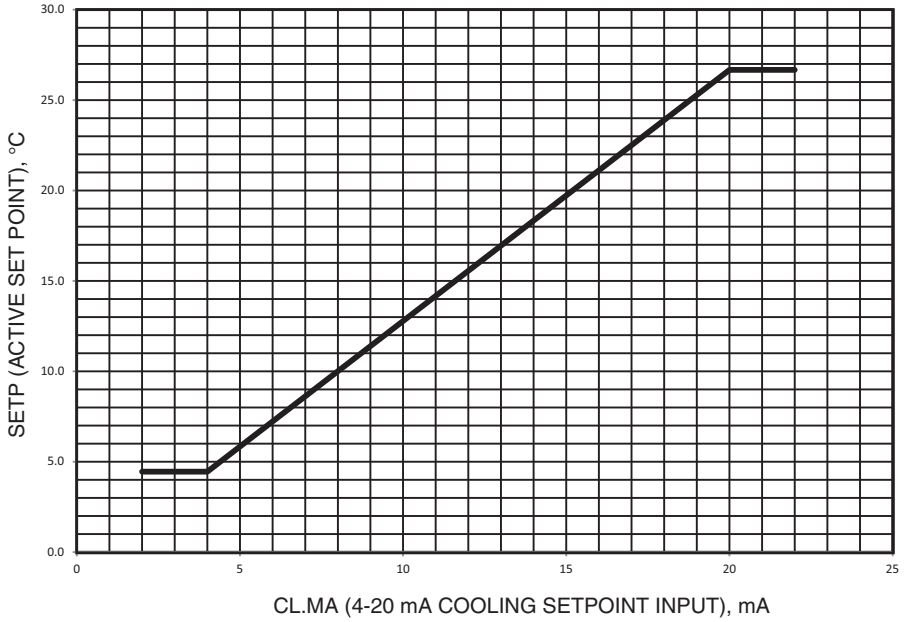


Fig. 143 — Active Setpoint (SI)

CAPACITY CONTROL ALGORITHMS — Three types of capacity control are available for the 38AP units.

Supply Air Temperature Control — This control algorithm is applicable to Control Types ***Configuration→OPT2→C.TYP*=1** (VAV), **3** (Tstat Multi), **5** (SPT Multi), or **9** (VAV Setpoint).

Capacity control is determined by the difference between the supply air temperature and the Control Point (***Run Status→VIEW→CTPT***) and its rate of change. The capacity control routine runs every 30 seconds. The algorithm attempts to maintain the Control Point at the desired set point. Additionally, the control calculates a rise per stage knowing which compressor is on, its capacity and the temperature difference across the evaporator coil (return or mixed air temperature minus supply air temperature) to determine the best time to turn on or off the next compressor, institute Minimum Load Control, or change the digital response, if equipped. Supply and return air temperatures can be monitored at the unit's interface device ***Return Air Temperature Temperatures→UNIT→RAT*** and ***Supply Air Temperature Temperatures→UNIT→SAT***. With this information, a capacity ratio is calculated to determine whether to make any changes to the current stage of capacity. This ratio, Capacity Load/Unload Factor (***Run Status→VIEW→LOD.F***) value ranges from –100% to +100% times Deadband Multiplier (***Configuration→SLCT→Z.GN***). See Deadband Multiplier on page 115 for more information. If the next stage of capacity is a compressor, the control starts (stops) a compressor when the ratio reaches +100% (–100%) times Deadband Multiplier (***Z.GN***). Once a change in capacity occurs, a 90-second time delay is initiated and the capacity stage is held during this time delay.

When the unit is at stage zero (Requested Stage ***Run Status→VIEW→STGE*=0**) as part of the capacity control routine, the control adds a 1.2 factor on adding the first stage to reduce cycling.

If the unit is equipped with a digital compressor, it is normally the first compressor started. If the lead compressor is a digital compressor, and is enabled and available (not in alarm or held off by Time Guard), the compressor will start fully loaded for 90 seconds prior to starting to cycle between loaded and unloaded. Once the digital compressor is on, positive changes in ***LOD.F*** will cause the compressor to load. Negative changes to ***LOD.F*** will cause the compressor to unload. This process can occur every 30 seconds. Changes to the digital loading are not subject to the 90-second delay.

If the unit is equipped with Minimum Load Control, it will not be active until the unit is on its last stage of capacity. It too is treated as a stage of compression. As a result, Minimum Load Control will be activated when capacity is decreasing, Requested Stage ***STGE*=1**, and Capacity Load/Unload Factor (***Run Status→VIEW→LOD.F***) is –100% times Deadband Multiplier (***Z.GN***).

Similar to increasing ***STGE*** from 0 to 1, the control adds a 1.2 factor to the capacity control routine when reducing capacity from 1 to 0 to reduce cycling.

Thermostat Capacity Stage Control — This control algorithm is applicable to Control Types ***Configuration→OPT2→C.TYP*=4** (Tstat 2 Stg), or **8** (Dual Tstat). This capacity routine relies on inputs from thermostats to control capacity staging. See the Sequence of Operation section for the specific Capacity Control (***C.TYP*=4**, page 69 or ***C.TYP*=8**, page 105).

4 to 20 mA Capacity Stage Control — This control algorithm is applicable to Control Type ***Configuration→OPT2→C.TYP*=7** (Pct Cap). This capacity routine relies on a 4 to 20 mA input from an external source to control capacity staging. See the Sequence of Operation seection for ***C.TYP*=7** (page 75).

Field Configurable Controls

ALARM ROUTING — A CCN feature within the 38AP units allows for alarm broadcasting.

Alarm Routing Control — Alarms recorded on the 38AP unit can be routed through the CCN. To configure this option, the *Comfort*Link control must be configured to determine which CCN elements will receive and process alarms. Input for the decision consists of eight digits, each of which can be set to either 0 or 1. Setting a digit to 1 specifies that alarms will be sent to the system element that corresponds to that digit. Setting all digits to 0 disables alarm processing. The factory default is 00000000. See Figure 144. The default setting is based on the assumption that the unit will not be connected to a network. If the network does not contain a ComfortVIEW™, ComfortWORKS®, TeLink, DataLINK™, or BAClink module, enabling this feature will only add unnecessary activity to the CCN communication bus.

The CCN Point ALRM_CNT is the variable and can be modified with ComfortVIEW software or Network Service Tool only. It cannot be modified with the scrolling marquee or Navigator™ display.

Typical configuration of the Alarm Routing variable is 11010000. This Alarm Routing status will transmit alarms to ComfortVIEW software, TeLink, BAClink, and DataLINK.

Alarm routing is not supported with the LON Translator.

Alarm Equipment Priority — The ComfortVIEW software uses the equipment priority value to determine the order in which to sort alarms that have the same level. A priority of 0 is the highest and would appear first when sorted. A priority of 7 would appear last when sorted. For example, if two units send out identical alarms, the unit with the higher priority would be listed first. The default is 4. The CCN point EQP_TYPE is the variable and can be changed when using ComfortVIEW software or Network Service Tool only. This variable cannot be changed with the scrolling marquee or Navigator display.

Communication Failure Retry Time — This variable specifies the amount of time that will be allowed to elapse between alarm retries. Retries occur when an alarm is not acknowledged by a network alarm acknowledger, which may be either ComfortVIEW software or TeLink. If acknowledgement is not received, the alarm will be re-transmitted after the number of minutes specified in this decision. The factory default for this item is 10 minutes with a range of 1 to 254 minutes. The CCN Point RETRY_TM is the variable and can be changed with ComfortVIEW software or Network Service Tool only. This variable cannot be changed with the scrolling marquee or Navigator display.

Re-Alarm Time — This variable specifies the amount of time that will be allowed to elapse between re-alarms. A re-alarm occurs when the conditions that caused the initial alarm continue to persist for the number of minutes specified in this decision. Re-alarming will continue to occur at the specified interval until the condition causing the alarm is corrected. To disable this feature, set the variable to 255. The factory default is 30 minutes with a range of 1 to 254. The CCN Point RE-ALARM is the variable and can be changed with ComfortVIEW software or Network Service Tool only. This variable cannot be changed with the scrolling marquee or Navigator display.

Alarm System Name — This variable specifies the system element name that will appear in the alarms generated by the unit control. The name can be up to 8 alphanumeric characters long and should be unique to the unit. The factory default is SPLIT. The CCN point ALRM_NAM is the variable and can be changed with ComfortVIEW software or Network Service Tool only. This variable cannot be changed with the scrolling marquee or Navigator display.

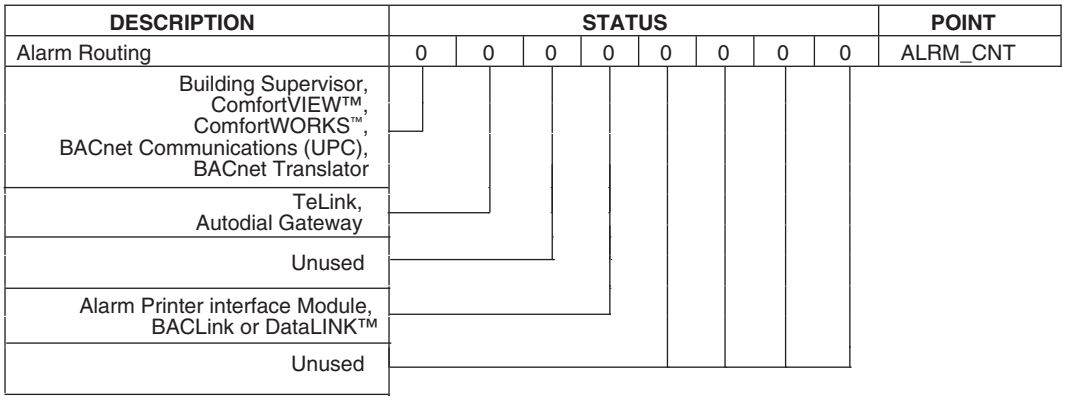


Fig. 144 — Alarm Routing Control

COMPRESSOR STAGING — Several factors determine which circuit and compressor to start:

Lead/Lag Determination (38APD Units) — Lead/Lag determination is a configurable choice and is factory set to be automatic, ***Configuration→OPT2→LLCS*=1** for all units, and applies specifically to the 38APD units.

When the 38APD unit is equipped with a digital scroll compressor and enabled (***Configuration→UNIT→A1.TY*=YES**), or minimum load is installed and enabled (***Configuration→OPT1→MLV.S*=YES**), then circuit A is always the lead circuit regardless of the LLCS value. For 38APD units without digital scroll compressor (***A1.TY*=NO**), or minimum load is not installed or enabled (***MLV.S*=NO**), the value can be changed to Circuit A leads (***LLCS*=2**) or Circuit B leads (***LLCS*=3**) as desired. Set at automatic ***LLCS*=1**, 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.

Circuit Wear Factor = Circuit Starts + (Circuit Run Hours/4)

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.

Lead/Lag determination will obey the Time Guard function. If a compressor is unavailable due to Time Guard, it will be skipped in the selection process. For additional information on Time Guard, see MDTG - Time Guard Active on page 135.

Loading Sequence Select — This feature is configurable as equal circuit loading or staged circuit loading with the default set at equal (***Configuration→OPT2→LOAD*=1**). The control determines the order in which the steps of capacity for each circuit are changed. Set to equal, the unit will alternate starting compressors in each circuit as the requirement increases. Set to staged (***Configuration→OPT2→LOAD*=2**), one circuit will load completely before the second circuit is started. This control choice does NOT have any impact on machines with only one circuit or units with 2 compressors, one in each circuit.

Circuit Compressor Staging — The control has an automatic lead-lag feature built in which determines the wear factor for each compressor. Wear factor is calculated for each compressor as 6 times the number of starts plus the number of run hours.

Compressor Wear Factor = 6 x (Compressor Starts + Compressor Run Hours)

If all compressors are off and less than 30 minutes have 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 unit control will add them after the Time Guard timer has expired, if applicable. Time Guard may change the loading sequence. If a circuit is to be stopped, the compressor with the lowest wear factor will be shut off first after its Time Guard timer has expired, if applicable. For additional information on Time Guard, MDTG - Time Guard Active on page 135.

Tables 39 and 40 are examples that depict the capacity staging for equal circuit loading and staged circuit loading, without digital compressor. These are two of many possible staging sequences and are only meant to provide examples of staging sequences.

Table 39 — Capacity Staging, Equal Circuit Loading (Example)

UNIT	CAPACITY STEP	LEAD CIRCUIT A		LEAD CIRCUIT B	
		% DISPLACEMENT	COMPRESSOR	% DISPLACEMENT	COMPRESSOR
38APD025-030	1	50	A1	50	B1
	2	100	A1, B1	100	A1, B1
38APD040	1	26	A1	24	B1
	2	50	A1, B1	50	A1, B1
	3	76	A1, A2, B1	74	A1, B1, B2
	4	100	A1, A2, B1, B2	100	A1, A2, B1, B2
38APD050	1	24	A1	26	B1
	2	50	A1, B1	50	A1, B1
	3	74	A1, A2, B1	76	A1, B1, B2
	4	100	A1, A2, B1, B2	100	A1, A2, B1, B2
38APD060	1	23	A1	27	B1
	2	50	A1, B1	50	A1, B1
	3	73	A1, A2, B1	77	A1, B1, B2
	4	100	A1, A2, B1, B2	100	A1, A2, B1, B2
38APD070	1	24	A1	18	B1
	2	41	A1, B1	41	A1, B1
	3	65	A1, A2, B1	59	A1, B1, B2
	4	83	A1, A2, B1, B2	83	A1, A2, B1, B2
	5	100	A1, A2, B1, B2, B3	100	A1, A2, B1, B2, B3
38APD080	1	20	A1	20	B1
	2	40	A1, B1	40	A1, B1
	3	60	A1, A2, B1	60	A1, B1, B2
	4	80	A1, A2, B1, B2	80	A1, A2, B1, B2
	5	100	A1, A2, B1, B2, B3	100	A1, A2, B1, B2, B3
38APD090	1	16	A1	18	B1
	2	33	A1, B1	33	A1, B1
	3	49	A1, A2, B1	51	A1, B1, B2
	4	67	A1, A2, B1, B2	67	A1, A2, B1, B2
	5	82	A1, A2, A3, B1, B2	85	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APD100	1	17	A1	17	B1
	2	33	A1, B1	33	A1, B1
	3	50	A1, A2, B1	50	A1, B1, B2
	4	67	A1, A2, B1, B2	67	A1, A2, B1, B2
	5	83	A1, A2, A3, B1, B2	83	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APD115	1	14	A1	19	B1
	2	33	A1, B1	33	A1, B1
	3	48	A1, A2, B1	52	A1, B1, B2
	4	67	A1, A2, B1, B2	67	A1, A2, B1, B2
	5	81	A1, A2, A3, B1, B2	86	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APD130	1	13	A1	21	B1
	2	33	A1, B1	33	A1, B1
	3	46	A1, A2, B1	54	A1, B1, B2
	4	67	A1, A2, B1, B2	67	A1, A2, B1, B2
	5	79	A1, A2, A3, B1, B2	88	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APS025-030	1	50	A1	—	—
	2	100	A1, A2		
38APS040-050	1	33	A1	—	—
	2	67	A1, A2		
	3	100	A1, A2, A3		
38APS065	1	—	—	33	B1
	2			67	B1, B2
	3			100	B1, B2, B3

Table 40 — Capacity Staging, Staged Circuit Loading (Example)

UNIT	CAPACITY STEP	LEAD CIRCUIT A		LEAD CIRCUIT B	
		% DISPLACEMENT	COMPRESSOR	% DISPLACEMENT	COMPRESSOR
38APD025-030	1	50	A1	50	B1
	2	100	A1, B1	100	A1, B1
38APD040	1	26	A1	24	B1
	2	53	A1, A2	47	B1, B2
	3	76	A1, A2, B1	74	A1, B1, B2
	4	100	A1, A2, B1, B2	100	A1, A2, B1, B2
38APD050	1	24	A1	26	B1
	2	48	A1, A2	52	B1, B2
	3	74	A1, A2, B1	76	A1, B1, B2
	4	100	A1, A2, B1, B2	100	A1, A2, B1, B2
38APD060	1	23	A1	27	B1
	2	46	A1, A2	54	B1, B2
	3	73	A1, A2, B1	77	A1, B1, B2
	4	100	A1, A2, B1, B2	100	A1, A2, B1, B2
38APD070	1	24	A1	18	B1
	2	48	A1, A2	35	A1, B1
	3	65	A1, A2, B1	52	A1, B1, B2
	4	83	A1, A2, B1, B2	76	A1, A2, B1, B2
	5	100	A1, A2, B1, B2, B3	100	A1, A2, B1, B2, B3
38APD080	1	20	A1	20	B1
	2	40	A1, B1	40	A1, B1
	3	60	A1, A2, B1	60	A1, B1, B2
	4	80	A1, A2, B1, B2	80	A1, A2, B1, B2
	5	100	A1, A2, B1, B2, B3	100	A1, A2, B1, B2, B3
38APD090	1	16	A1	18	B1
	2	31	A1, A2	36	B1, B2
	3	46	A1, A2, A3	54	B1, B2, B3
	4	64	A1, A2, A3, B1	69	A1, B1, B2, B3
	5	82	A1, A2, A3, B1, B2	85	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APD100	1	17	A1	17	B1
	2	33	A1, A2	33	B1, B2
	3	50	A1, A2, A3	50	B1, B2, B3
	4	67	A1, A2, A3, B1	67	A1, B1, B2, B3
	5	83	A1, A2, A3, B1, B2	83	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APD115	1	14	A1	19	B1
	2	29	A1, A2	38	B1, B2
	3	43	A1, A2, A3	57	B1, B2, B3
	4	62	A1, A2, A3, B1	71	A1, B1, B2, B3
	5	81	A1, A2, A3, B1, B2	86	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APD130	1	13	A1	21	B1
	2	25	A1, A2	42	B1, B2
	3	38	A1, A2, A3	63	B1, B2, B3
	4	58	A1, A2, A3, B1	75	A1, B1, B2, B3
	5	79	A1, A2, A3, B1, B2	88	A1, A2, B1, B2, B3
	6	100	A1, A2, A3, B1, B2, B3	100	A1, A2, A3, B1, B2, B3
38APS025-030	1	50	A1	—	—
	2	100	A1, A2		
38APS040-050	1	33	A1	—	—
	2	67	A1, A2		
	3	100	A1, A2, A3		
38APS065	1	—	—	33	B1
	2			67	B1, B2
	3			100	B1, B2, B3

DEADBAND MULTIPLIER — The user configurable Deadband Multiplier (***Configuration→SLCT→Z.GN***) has a default value of 1.0. The range is 1.0 to 4.0. When set to a value other than 1.0, this factor is applied to the Capacity Load/Unload Factor (***Run Status→VIEW→LOD.F***). The configuration affects the cycling rate of the cooling stages by raising or lowering the threshold that capacity Load/Unload Factor must build to in order to add or subtract a stage of cooling. The larger this value is set, the longer the control will delay between adding or removing stages of capacity.

Normally this configuration should not require any tuning or adjustment. If there is an application where the unit may be significantly oversized and there are indications of high compressor cycles, then the Deadband Multiplier (***Z.GN***) can be used to adjust the overall logic gain. As the value of (***Z.GN***) is increased, the cycling of cooling stages will be slowed.

DEMAND LIMIT — Demand limit is a feature that allows the unit capacity to be limited during periods of peak energy usage. Depending on the load profile for the space and the demand limit placed on the machine, the unit may not be able to satisfy the cooling requirements while demand limit is active.

For units with a digital compressor, digital operation is ignored when determining capacity limit of the machine. Since Demand Limit controls the number of compressors operating, the requested demand limit must allow for the corresponding capacity of the full digital compressor capacity plus any remaining compressors. For example, a 38APS040 unit with a digital compressor will require a demand limit of at least 33% for the first compressor to be energized. No compressor operation will be allowed prior to this demand limit level. Digital operation below 33% will require a demand limit of at least 33% to allow a compressor to start. Digital operation between 33 and 67% will require a demand limit of at least 67% to allow 2 compressors to be operating. Finally, for digital operation above 67%, demand limit must be at 100% to allow for all compressors to be operating. For other unit capacity steps, see Tables 39 and 40.

If Demand Limit is active, the control will indicate an Operating Mode of Demand Limited, ***Operating Modes→ MODE→MD15*=YES**.

Four types of demand limiting 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. The fourth type utilizes communications to write directly to the demand limit point.

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.

2-Stage Switch Controlled Demand Limit

NOTE: Single or 2-Stage Switch Controlled Demand Limit is not available when using Dual Thermostat Control Type, ***C.TYP*=8**.

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 41. Capacity steps are controlled by 2 relay switch inputs field-wired to low voltage terminal (LVT) strip terminal 3-6. Refer to the specific control type wiring diagrams or unit wiring diagram for these connections. Demand Limit Switch status can be monitored at the unit's scrolling marquee, Demand Limit Switch 1 and Demand Limit Switch 2 (***Inputs→ GEN.I→DLS1*** and ***DLS2***) respectively.

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.

As an example, 2-stage demand limit is planned with Demand Limit Switch 1 to allow the unit to operate to 80% capacity. Demand Limit Switch 2 is to allow the unit to operate to 50% capacity. See Table 41 for programming requirements. When Demand Limit Switch 1 closes, the unit's capacity will not exceed 80%. If Demand Limit Switch 2 closes, the unit's capacity will not exceed 50%. The Operating Mode, Demand Limited (***MD15***) will remain active as long as either Demand Limit Switch 1 or Demand Limit Switch 2 is closed.

Table 41 — Configuring 2-Stage Demand Limit

CONFIGURATION→OPT2			
ITEM	**EXPANSION**	**COMMENTS**	**EXAMPLE VALUE**
C.TYP	Machine Control Type	Range: 1 to 9 1 (VAV) 3 (Tstat Multi) 4 (Tstat 2stg) 5 (SPT Multi) 7 (PCT Cap) 8 (Dual Tstat) 9 (VAV Setpoint) Default: 4 Value must not be set to 8.	1, 3, 4, 5, 7, or 9
CONFIGURATION→RSET			
DMDC	Demand Limit Select	0=None (Default) 1=Switch 2=4 to 20 mA Input 3=CCN Loadshed	1
DLS1	Demand Limit Switch 1	Range: 0 to 100% Default: 80%	80%
DLS2	Demand Limit Switch 2	Range: 0 to 100% Default: 50%	50%

4-20 mA Controlled Demand Limit — 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 (-). The external signal can be monitored at the scrolling marquee, 4-20 mA Demand Signal (***Inputs→4-20→DMND***). Refer to the specific control type wiring diagrams or unit wiring diagram for these connections. The control will reduce allowable capacity to this user-programmed level for the 20 mA signal. See Table 42 and Fig. 145.

⚠CAUTION

To avoid unit damage, care should be taken when interfacing with other manufacturer's control systems due to 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.

The 4-20 mA Input Demand Limit example (Fig. 145) will allow the unit to operate at full capacity if required with ***DMND*** **=4 mA** or 100% Demand Limit. At ***DMND*****=20 mA** the unit is not allowed to operate, with a Demand Limit of 0%. Between ***DMND*****=4 mA** and ***DMND*****=20 mA** a proportional demand limit amount will be applied to the machine.

Table 42 — Configuring 4 to 20 mA Demand Limit

CONFIGURATION→RSET			
ITEM	**DISPLAY**	**COMMENTS**	**EXAMPLE**
DMDC	Demand Limit Select	0=None (Default) 1=Switch 2=4 to 20 mA Input 3=CCN Loadshed	2
DM20	Demand Limit at 20 mA	Range: 0 to 100% Default: 100%	0%

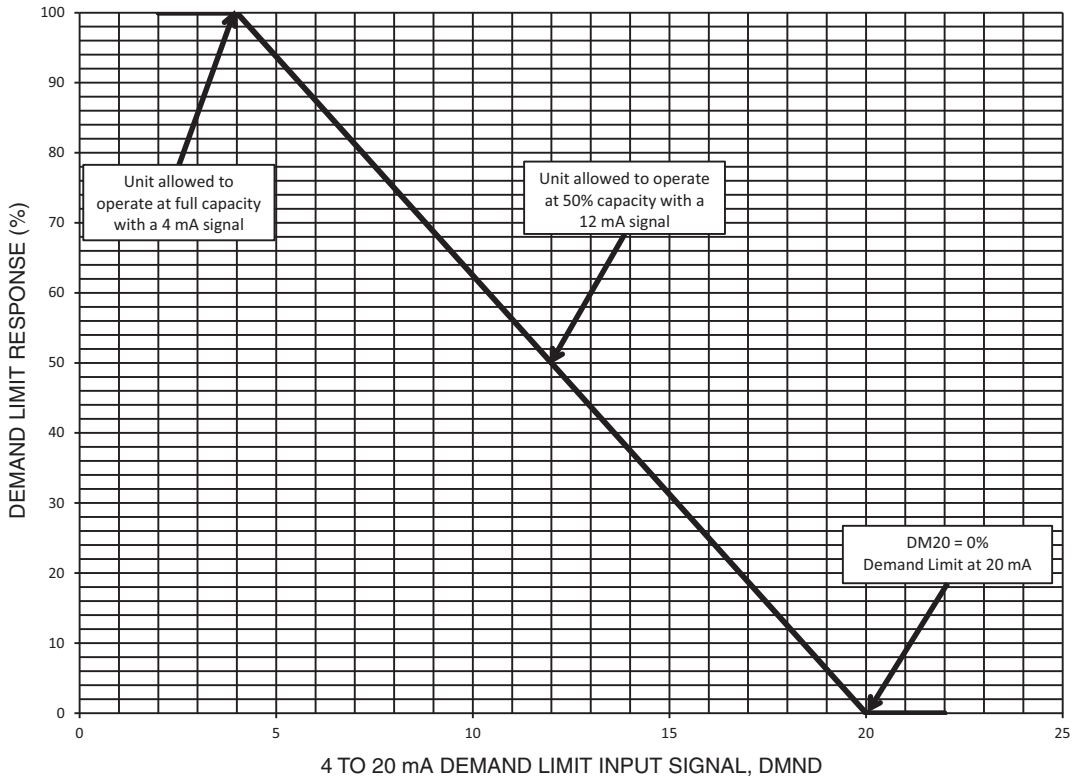


Fig. 145 — 4 to 20 mA Demand Limit, Demand Limit Select *DMDC*=2

CCN Loadshed Demand Limit — 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***).

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. Refer to the Loadshed Overview and Configuration Manual for additional information.

CCN Controlled Demand Limit — With the control method set to CCN Control (***Configuration→OPT2→CTRL*=3** [CCN]), an external CCN device controls the On/Off state of the machine. While in this control mode, the demand limit can be written to the CCN Point, DEM_LIM. No other configuration is required. Any value less than 100% written to this point will limit the capacity to this value.

Units controlled via communications by a separate third-party building automation system through a translator or UPC Open Controller must be set to CCN Control (***CTRL*=3**). If the unit is to be monitored only via communications, ***CTRL*=3** (CCN) is not required.

DIGITAL COMPRESSOR — The 38AP units have a factory-installed option for a digital scroll compressor which provides additional capacity control for the unit. If equipped, 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 states: the "loaded state" when the digital unloader solenoid valve (DUS) is normally closed, and the "unloaded state" when the DUS 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.

When a digital compressor is started, it will run at full load for 90 seconds prior to beginning the digital operation. This is for oil return.

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 based on unit size, which indicates the maximum unloading for the digital compressor. The factory default for ***MAX.T*** is **10** (38APD,APS025-030) or **8** (38APD,APS040-130). These numbers can be lowered, but cannot be increased more than the factory default. The upper limit for the maximum unload time is preset based on the unit and is set for oil return. See Table 43 for required configurations.

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 (OAT) sensor to control the fans. If OAT is greater than 70 F (21.1 C) before a circuit is starting, then all condenser fan stages will be energized. A fan stage is changed based on SCT (saturated condensing temperature).

Fan staging is controlled by four parameters: Head Setpoint On (***Setpoints→HEAD→H.SP***), Head Setpoint Off (***Setpoints→HEAD→H.SP.F***), Fan Stage Delta (***Setpoints→ HEAD→F.DLT***), and Fan Delta Active Time (***Setpoints→ HEAD→ F.TME***). From these parameters, two control points are calculated, Fan On Set Point (***Setpoints→HEAD→F.ON***) and Fan Off Set Point (***Setpoints→HEAD→F.OFF***).

See Table 44 for head pressure control settings. Tables 45-52 show the number of fan stages, contactors energized and the fans that are on during the fan stage.

Table 43 — Digital Compressor Required Configurations

CONFIGURATION→UNIT			
ITEM	**DISPLAY**	**EXPANSION**	**COMMENTS**
A1.TY	NO/YES	A1 Compressor Digital?	YES = Factory Equipped (Default) NO = Not Equipped
MAX.T	XX Sec	Maximum A1 Unload Time	Range: 0 to 10 (38AP025-030) 0 to 8 (38AP040-130) Default: 10 (38AP025-030) 8 38AP040-130)

Fan On Set Point (***F.ON***) is Head Setpoint On (***H.SP***) except after a fan stage increase, when Head Setpoint On (***H.SP***) is increased by Fan Stage Delta (***F.DLT***) for the Fan Delta Active Time (***F.TME***). Using the factory default settings results in the following values: ***F.ON***=115.0 F (46.1 C) or following a fan stage increase, ***F.ON***=130 F [115.0 + 15.0 F] (54.4 C [46.1 + 8.3 C]) for 60 seconds following the fan stage increase.

Fan Off Set Point (***F.OFF***) is Head Setpoint Off (***H.SP.F***). Using the factory default settings results in the following value: ***F.OFF***=72.0 F (22.2 C).

38APD025-060 — The 38APD025-060 units have common fan control; both circuits share the same condenser fans. When the highest SCT of both circuits is greater than ***F.ON***, then an additional stage of fan will be added to the current fan stage. ***F.ON*** will be updated for the required time. A fan stage will decrease if the SCT for both circuit is less than ***F.OFF*** for 2 minutes.

38APS025-065 — For 38APS025-065 units, when the circuit SCT is greater than ***F.ON***, then an additional stage of fan will be added to the current fan stage. ***F.ON*** will be updated for the required time. A fan stage will decrease if the circuit's SCT is less than ***F.OFF*** for 2 minutes

38APD070 — The 38APD070 unit uses an additional fan stage when the ambient temperature is less than 32 F (0 °C) and only one circuit is on, Fan Stage 1. This fan stage turns on the fans in the opposite circuit to draw a lower air volume across the active circuit coils. (This fan stage is not used if Motormaster® control is used.) When the circuit SCT is greater than ***F.ON***, then an additional stage of fan will be added to the current fan stage. ***F.ON*** will be updated for the required time. A fan stage will decrease if the circuit's SCT is less than ***F.OFF*** for 2 minutes.

38APD080-130 — The 38APD080-130 units have some fans that are common between both circuits and some that are controlled by each circuit individually. Initial fan stages are circuit-specific fans and are controlled by the circuit's SCT. When the circuit SCT is greater than ***F.ON***, then an additional stage of fan will be added to the current fan stage. ***F.ON*** will be updated for the required time.

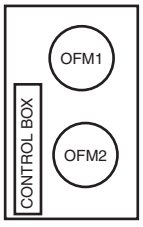
The common fans are controlled by the circuit with the highest SCT. If the next fan stage is a common fan stage and one circuit's SCT is greater than ***F.ON***, the next fan stage will be energized. ***F.ON*** will be updated for the required time.

A fan stage will decrease if the circuit's SCT is less than ***F.OFF*** for 2 minutes.

Table 44 — Head Pressure Control Settings

SETPOINTS→HEAD			
ITEM	**DISPLAY**	**EXPANSION**	**COMMENTS**
H.SP	XXX.X °F (°C)	Head Setpoint On	Range: 85.0 to 120.0 F (29.4 to 48.9 C) Default: 115.0 F (46.1 C)
H.SP.F	XX.X °F (°C)	Head Setpoint Off	Range: 45.0 to 90.0 F (7.2 to 32.2 C) Default: 72.0 F (22.2 C)
F.ON	XXX.X °F (°C)	Fan On Set Point	Calculated value, cannot be changed
F.OFF	XXX.X °F (°C)	Fan Off Set Point	Calculated value, cannot be changed
F.DLT	XX.X ΔF (ΔC)	Fan Stage Delta	Range: 0.0 to 50.0 ΔF (0.0 to 27.8 ΔC) Default: 15.0 ΔF (8.3 ΔC)
F.TME	XXX secs	Fan Stage Active Time	Range: 0 to 300 seconds Default: 60 seconds

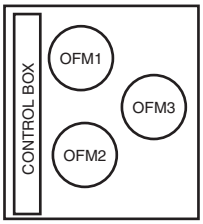
Table 45 — 38APD,APS025-030 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD025,027,030, 38APS025, 027,030 With or Without Motormaster Controller	A (38APS) A or B (38APD)	1	FAN1	FC1	OFM1†
		2	FAN1 FAN2	FC1 FC2	OFM1† OFM2

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Motormaster controlled motor, if equipped.

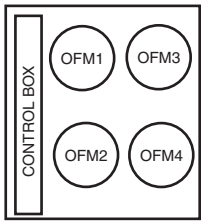
Table 46 — 38APD,APS040-050 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD040,050 38APS040,050 Without Motormaster® Controller	A (38APS) A or B (38APD)	1	FAN1	FC1	OFM3
		2	FAN2	FC2	OFM1, OFM2
		3	FAN1 FAN2	FC1 FC2	OFM3 OFM1, OFM2
38APD040,050 38APS040,050 With Motormaster Controller	A (38APS) A or B (38APD)	1	FAN1	FC1	OFM3†
		2	FAN1 FAN2	FC1 FC2	OFM3† OFM1, OFM2

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Motormaster controlled motor.

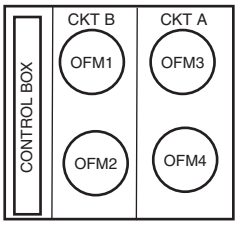
Table 47 — 38APD060, 38APS065 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD060 Without Motormaster Controller	A or B	1	FAN1	FC1	OFM3
		2	FAN1 FAN2	FC1 FC2	OFM3 OFM1, OFM2
		3	FAN1 FAN3	FC1 FC3	OFM3, OFM4
		4	FAN1 FAN2 FAN3	FC1 FC2 FC3	OFM3 OFM1, OFM2 OFM4
38APD060 With Motormaster Controller	A or B	1	FAN1	FC1	OFM3†
		2	FAN1 FAN3	FC1 FC3	OFM3†, OFM4
		3	FAN1 FAN2	FC1 FC2	OFM3† OFM1, OFM2
		4	FAN1 FAN2 FAN3	FC1 FC2 FC3	OFM3† OFM1, OFM2 OFM4
38APS065 With or Without Motormaster Controller	B	1	FAN1	FC1	OFM3†
		2	FAN1 FAN3	FC1 FC3	OFM3†, OFM4
		3	FAN2	FC2	OFM1, OFM2
		4	FAN1 FAN2	FC1 FC2	OFM3† OFM1, OFM2
		5	FAN1 FAN2 FAN3	FC1 FC2 FC3	OFM3† OFM1, OFM2 OFM4

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Motormaster controlled motor, if equipped.

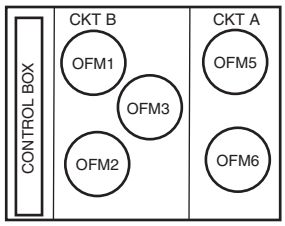
Table 48 — 38APD070 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD070 With or Without Motormaster® Controller	A	1†	FAN2 FAN4	FC2 FC4	OFM1** OFM2
		2	FAN1	FC1	OFM3**
		3	FAN1 FAN3	FC1 FC3	OFM3** OFM4
	B	1†	FAN1 FAN3	FC1 FC3	OFM3** OFM4
		2	FAN2	FC2	OFM1**
		3	FAN2 FAN4	FC2 FC4	OFM1** OFM2
	A and B	1†	—	—	—
		2	FAN1 FAN2	FC1 FC2	OFM3** OFM1**
		3	FAN1 FAN2 FAN3 FAN4	FC1 FC2 FC3 FC4	OFM3** OFM1** OFM4 OFM2

*Items in either ***Service Test→OUTS*** or ***Outputs→ GEN.O***.
†Fan Stage 1 is used only when ambient temperature is less than 32 F (0 °C) and circuit A or B is running alone. Fan Stage 1 is not used when Motormaster is used.
**Motormaster controlled motor, if equipped.

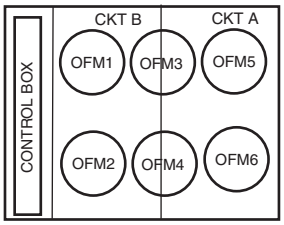
Table 49 — 38APD080 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD080 With or Without Motormaster Controller	A	1	FAN1	FC1	OFM5†
		2	FAN1 FAN3	FC1 FC3**	OFM5† OFM2, OFM6
	B	1	FAN4	FC4	OFM3†
		2	FAN3 FAN4	FC3** FC4	OFM2, OFM6 OFM3†
		3	FAN2 FAN3 FAN4	FC2 FC3** FC4	OFM1 OFM2, OFM6 OFM3†
	A and B	1	FAN1 FAN4	FC1 FC4	OFM5† OFM3†
		2	FAN1 FAN3 FAN4	FC1 FC3** FC4	OFM5† OFM2, OFM6 OFM3†
		3	FAN1 FAN2 FAN3 FAN4	FC1 FC2 FC3** FC4	OFM5† OFM1 OFM2, OFM6 OFM3†

*Items in either ***Service Test→OUTS*** or ***Outputs →GEN.O***.
†Motormaster controlled motor, if equipped.
**Fans that affect both circuits.

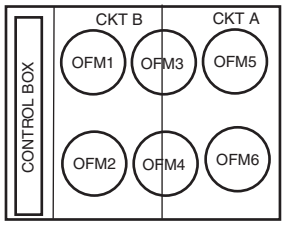
Table 50 — 38APD090, 100 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD090,100 Without Motormaster® Controller	A	1	FAN4	FC4†	OFM3
		2	FAN1	FC1	OFM5
		3	FAN1 FAN4	FC1 FC4†	OFM5 OFM3
		4	FAN3 FAN4	FC3† FC4†	OFM2, OFM4, OFM6 OFM3
		5	FAN1 FAN3	FC1 FC3†	OFM5 OFM2, OFM4, OFM6
		6	FAN1 FAN3 FAN4	FC1 FC3† FC4†	OFM5 OFM2, OFM4, OFM6 OFM3
	B	1	FAN4	FC4†	OFM3
		2	FAN2	FC2	OFM1
		3	FAN2 FAN4	FC2 FC4†	OFM1 OFM3
		4	FAN3 FAN4	FC3† FC4†	OFM2, OFM4, OFM6 OFM3
		5	FAN2 FAN3	FC2 FC3†	OFM1 OFM2, OFM4, OFM6
		6	FAN2 FAN3 FAN4	FC2 FC3† FC4†	OFM1 OFM2, OFM4, OFM6 OFM3
	A and B	1	FAN4	FC4†	OFM3
		2	FAN1 FAN2	FC2 FC4†	OFM1 OFM3
		3	FAN3	FC3†	OFM2, OFM4, OFM6
		4	FAN3 FAN4	FC3† FC4†	OFM2, OFM4, OFM6 OFM3
		5	FAN1 FAN3 FAN4	FC1 FC3† FC4†	OFM5 OFM2, OFM4, OFM6 OFM3
		6	FAN1 FAN2 FAN3 FAN4	FC1 FC2 FC3† FC4†	OFM5 OFM1 OFM2, OFM4, OFM6 OFM3

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Fans that affect both circuits.
**Motormaster controlled motor.

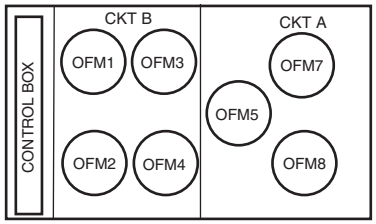
Table 50 — 38APD090, 100 Fan Staging (cont)



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD090,100 With Motormaster® Controller	A	1	FAN1	FC1	OFM5**
		2	FAN1 FAN4	FC1 FC4†	OFM5** OFM3
		3	FAN1 FAN3	FC1 FC3†	OFM5** OFM2, OFM4, OFM6
		4	FAN1 FAN3 FAN4	FC1 FC3† FC4†	OFM5** OFM2, OFM4, OFM6 OFM3
	B	1	FAN2	FC2	OFM1**
		2	FAN2 FAN4	FC2 FC4†	OFM1** OFM3
		3	FAN2 FAN3	FC2 FC3†	OFM1** OFM2, OFM4, OFM6
		4	FAN2 FAN3 FAN4	FC2 FC3† FC4†	OFM1** OFM2, OFM4, OFM6 OFM3
	A and B	1	FAN1 FAN2	FC1 FC2	OFM5** OFM1**
		2	FAN1 FAN2 FAN4	FC1 FC2 FC4†	OFM5** OFM1** OFM3
		3	FAN1 FAN2 FAN3	FC1 FC2 FC3†	OFM5** OFM1** OFM2, OFM4. OFM6
		4	FAN1 FAN2 FAN3 FAN4	FC1 FC2 FC3† FC4†	OFM5** OFM1** OFM2, OFM4, OFM6 OFM3

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Fans that affect both circuits.
**Motormaster controlled motor.

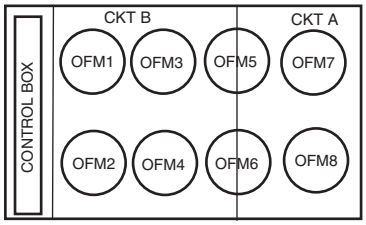
Table 51 — 38APD115 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD115 Without Motormaster® Controller	A	1	FAN1	FC1	OFM5
		2	FAN5	FC5	OFM7
		3	FAN1 FAN5	FC1 FC5	OFM5 OFM7
		4	FAN1 FAN4 FAN5	FC1 FC4† FC5	OFM5 OFM3, OFM8 OFM7
	B	1	FAN2	FC2	OFM1
		2	FAN3	FC3	OFM2, OFM4
		3	FAN2 FAN3	FC2 FC3	OFM1 OFM2, OFM4
		4	FAN2 FAN3 FAN4	FC2 FC3 FC4†	OFM1 OFM2, OFM4 OFM3, OFM8
	A and B	1	FAN1 FAN2	FC1 FC2	OFM5 OFM1
		2	FAN3 FAN5	FC3 FC5	OFM2, OFM4 OFM7
		3	FAN1 FAN2 FAN3 FAN5	FC1 FC2 FC3 FC5	OFM5 OFM1 OFM2, OFM4 OFM7
		4	FAN1 FAN2 FAN3 FAN4 FAN5	FC1 FC2 FC3 FC4† FC5	OFM5 OFM1 OFM2, OFM4 OFM3, OFM8 OFM7
38APD115 With Motormaster Controller	A	1	FAN5	FC5	OFM7**
		2	FAN1 FAN5	FC1 FC5	OFM5 OFM7**
		3	FAN1	FC1	OFM5
		4	FAN4 FAN5	FC4† FC5	OFM3, OFM8 OFM7**
	B	1	FAN2	FC2	OFM1**
		2	FAN2 FAN4	FC2 FC4†	OFM1** OFM3, OFM8
		3	FAN2 FAN3	FC2 FC3	OFM** OFM2, OFM4
		4	FAN2 FAN3 FAN4	FC2 FC3 FC4†	OFM1** OFM2, OFM4 OFM3, OFM8
	A and B	1	FAN2 FAN5	FC2 FC5	OFM1** OFM7**
		2	FAN2 FAN4 FAN5	FC2 FC4† FC5	OFM5 OFM1** OFM3, OFM8 OFM7**
		3	FAN1 FAN2 FAN4 FAN5	FC1 FC2 FC4† FC5	OFM1** OFM3, OFM8 OFM7**
		4	FAN1 FAN2 FAN3 FAN4 FAN5	FC1 FC2 FC3 FC4† FC5	OFM5 OFM1** OFM2, OFM4 OFM3, OFM8 OFM7**

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Fans that affect both circuits.
**Motormaster controlled motor.

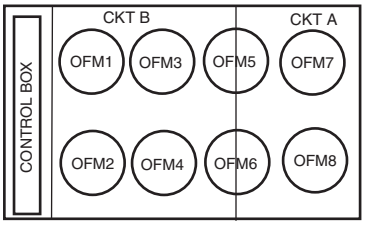
Table 52 — 38APD130 Fan Staging



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD130 Without Motormaster® Controller	A	1	FAN1	FC1†	OFM5
		2	FAN5	FC5	OFM7
		3	FAN1 FAN5	FC1† FC5	OFM5 OFM7
		4	FAN1 FAN4 FAN5	FC1† FC4† FC5	OFM5 OFM3, OFM8 OFM7
		5	FAN1 FAN3 FAN4 FAN5	FC1† FC3† FC4† FC5	OFM5 OFM2, OFM4, OFM6 OFM3, OFM8 OFM7
	B	1	FAN1	FC1†	OFM5
		2	FAN1 FAN2 FAN4	FC1† FC2 FC4†	OFM5 OFM1 OFM3, OFM8
		3	FAN1 FAN2 FAN3	FC1† FC2 FC3†	OFM5 OFM1 OFM2, OFM4, OFM6
		4	FAN1 FAN2 FAN3 FAN4	FC1† FC2 FC3† FC4†	OFM5 OFM1 OFM2, OFM4, OFM6 OFM3, OFM8
	A and B	1	FAN1	FC1†	OFM5
		2	FAN1 FAN4	FC1† FC4†	OFM5 OFM3, OFM8
		3	FAN1 FAN2 FAN4 FAN5	FC1† FC2 FC4† FC5	OFM5 OFM1 OFM3, OFM8 OFM7
		4	FAN1 FAN3 FAN4 FAN5	FC1† FC3† FC4† FC5	OFM5 OFM2, OFM4, OFM6 OFM3, OFM8 OFM7
		5	FAN1 FAN2 FAN3 FAN4 FAN5	FC1† FC2 FC3† FC4† FC5	OFM5 OFM1 OFM2, OFM4, OFM6 OFM3, OFM8 OFM7

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Fans that affect both circuits.
**Motormaster controlled motor.

Table 52 — 38APD130 Fan Staging (cont)



UNIT	OPERATING CIRCUIT	FAN STAGE	OUTPUT POINT NAME*	CONTACTOR	FANS ENERGIZED
38APD130 With Motormaster® Controller	A	1	FAN5	FC5	OFM7**
		2	FAN1 FAN5	FC1† FC5	OFM5 OFM7**
		3	FAN1 FAN4 FAN5	FC1† FC4† FC5	OFM5 OFM3, OFM8 OFM7**
		4	FAN1 FAN3 FAN4 FAN5	FC1† FC3† FC4† FC5	OFM5 OFM2, OFM4, OFM6 OFM3, OFM8 OFM7**
	B	1	FAN2	FC2	OFM1**
		2	FAN1 FAN2	FC1† FC2	OFM5 OFM1**
		3	FAN1 FAN2 FAN4	FC1† FC2 FC4†	OFM5 OFM1** OFM3, OFM8
		4	FAN1 FAN2 FAN3 FAN4	FC1† FC2 FC3† FC4†	OFM5 OFM1** OFM2, OFM4, OFM6 OFM3, OFM8
	A and B	1	FAN2 FAN5	FC2 FC5	OFM1** OFM7**
		2	FAN1 FAN2 FAN5	FC1† FC2 FC5	OFM5 OFM1** OFM7**
		3	FAN1 FAN2 FAN4 FAN5	FC1† FC2 FC4† FC5	OFM5 OFM1** OFM3, OFM8 OFM7**
		4	FAN1 FAN2 FAN3 FAN4 FAN5	FC1† FC2 FC3† FC4† FC5	OFM5 OFM1** OFM2, OFM4, OFM6 OFM3, OFM8 OFM7**

*Items in either ***Service Test→OUTS*** or ***Outputs→GEN.O***.
†Fans that affect both circuits.
**Motormaster controlled motor.

Motormaster V Option/Accessory — For low-ambient operation, the first stage of fan is equipped with the Motormaster V head pressure controller option or accessory. Units 38APD025-060 and 38APS025-065 have one Motormaster V controller for each unit. The 38APD070-130 units have two Motormaster V controllers, one in each circuit.

If equipped, the Motormaster controller must be enabled in the controls. See Table 53.

Table 53 — Motormaster Required Configurations

CONFIGURATION→M.MST		
ITEM	**EXPANSION**	**COMMENTS**
MMR.S	Motormaster Select	YES = Factory Equipped (Default) NO = Not Equipped Value: YES to enable
MIN.S	Minimum Fan Speed	Range: 0 to 100% Default: 8%

Although the control has a Minimum Fan Speed configuration, the Motormaster V device has a programmed point for minimum fan speed. Its default is 8 Hz. This is above the minimum speed for the unit control. This parameter does not need to be adjusted.

Once Motormaster V controller is enabled, the calculated value Fan On Set Point (***F.ON***) is lowered by 10° F (5.6° C). Using the factory defaults, ***F.ON***=105.0 F [115.0 – 10.0° F] (40.6 C [46.1 – 5.6° C]) or following a fan stage increase, ***F.ON***= 120 F [115.0 + 15.0 – 10.0° F] (48.8 C [46.1 + 8.3 – 5.6° C]) for 60 seconds following the fan stage increase.

The Motormaster V controller is provided an ON command with the first stage of fan, and is started at 100%. It adjusts fan speed through a 0 to 10 vdc output from the AUX Board. On 38APD025-060 units, the highest circuit SCT controls the speed signal to the Motormaster V controller to try to maintain it at 105 F (40.6 C). On 38APD070-130 and 38APS025-065 units, each circuit controls its Motormaster V controller to try to maintain SCT at 105 F (40.6 C) for the circuit.

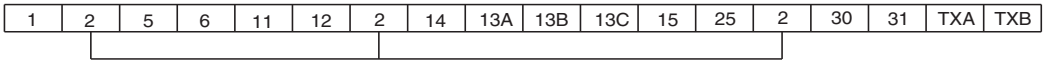
The signal to the Motormaster V controller can be monitored through the scrolling marquee or Navigator™ display. Each circuit has a corresponding signal in percentage of full speed. These values can be found under Var Head Press Out Cir A (***Outputs→ GEN.O→V.HPA***) and Var Head Press Out Cir B (***Outputs→ GEN.O→V.HPB***). For units that use a single Motormaster controller (38AP025-060), the output will be displayed under ***V.HPA***. For 38APS065, the output will be displayed under ***V.HPB***.

The Motormaster V display indicates speed in Hz.

Motormaster V® Drive Configuration — The Motormaster V controller is configured for 1 of 12 operation modes based on the inputs to the control terminal block. The 38AP units use operating modes 5 through 8. The operating mode determines the default parameter values. With these operating modes, the Motormaster V follows a 4 to 20 mA speed reference signal present on terminals 25 (+) and 2 (–). The AUX Board generates a 2 to 10 vdc signal that is converted to a 4 to 20 mA signal by means of a 240 Ω, $^1/_4$ w resistor in series with the positive (+) signal wire. One additional jumper, a Run Jumper controlled by a relay, is required to configure the drive for operation and input voltage. The jumper termination is determined by the system voltage and frequency. See Table 54 and Fig. 146 for Run Jumper terminations. See Fig. 147 for connection diagram. See Table 55 for Operating Mode drive parameters and default values. Once the drive is powered, it will change to the mode selected according to the inputs. See Fig. 148.

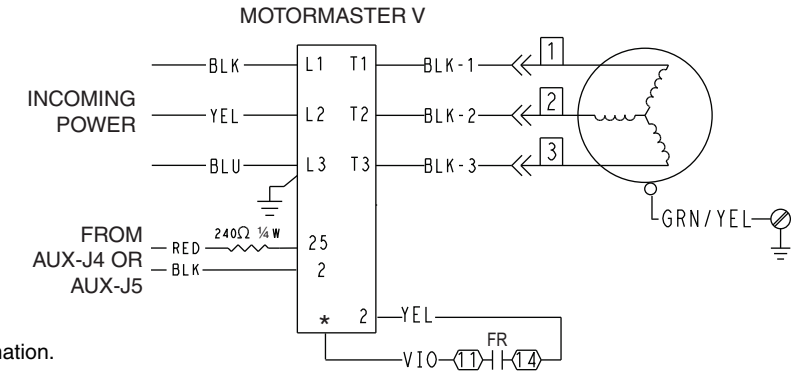
Table 54 — Run Jumper Connection Points

RUN JUMPER CONNECTION	VOLTAGE-Hz	OPERATING MODE
1 TO 2	208/230-60 460-60 575-60	5
13A TO 2	208-60 380-60	6
13C TO 2	380/415-50 400-50	8



Note: All "2" terminals are internally connected to each other.

Fig. 146 — Motormaster V Terminal Block Designations



*See Table 54 for proper termination.

Fig. 147 — Motormaster V Connection Diagram

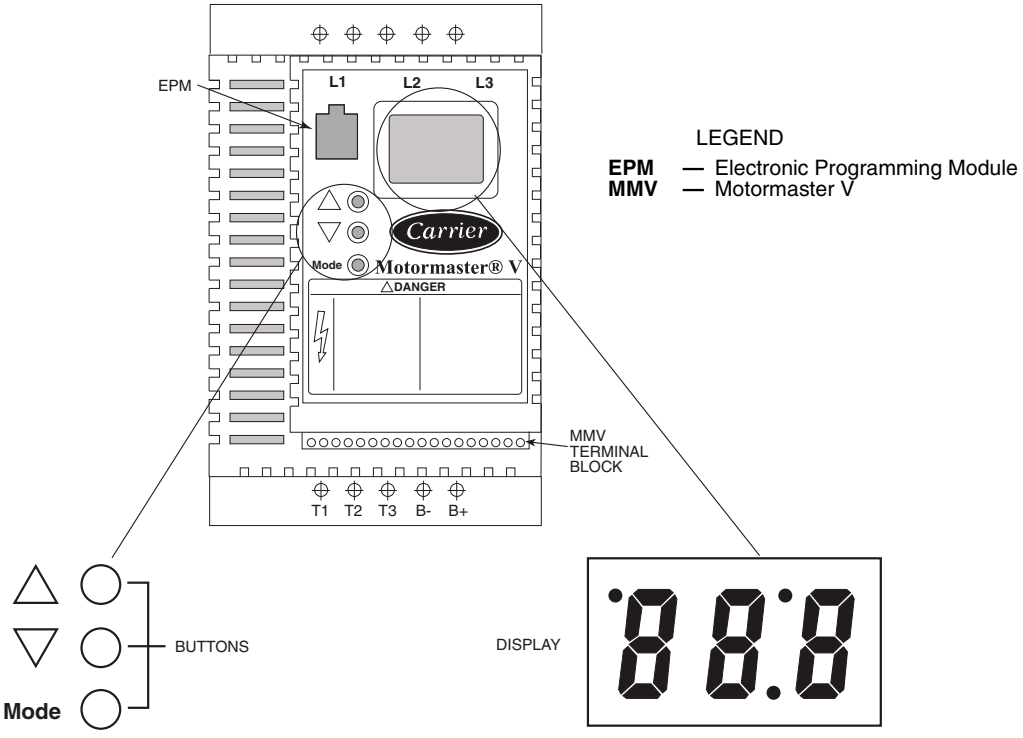


Fig. 148 — Motormaster V Buttons and Mode Display

Table 55 — Motormaster® V Program Parameters for Operating Modes

PARAMETERS	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	Startup mode: flying restart	06	06	06	06
P04	Stop mode: coast to stop	01	01	01	01
P05	Standard Speed source: 01= keypad, 04=4-20mA (NO PI), 05= R22/410A, 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	110	125	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: speed if loss of control signal	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 — R22/410A set point. TB12-2 open	18.0	18.0	18.0	18.0
P35	Preset spd 5 default — R134a set point. 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 mode is disabled and 4-20mA input is at 4 mA	8	8	8	8
P46	Speed at max feedback: 60 or 50 Hz. Used when PID disabled and 4-20mA input is at 20 mA	60	60	50	50
P47	Clear history? 01 = maintain. (set to 02 to clear)	01	01	01	01
P48	Program selection: Program 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 acell/decel (set point change filter) = 5	5	5	5	5
P67	Min alarm	0	0	0	0
P68	Max alarm	0	0	0	0
P69	0 - 10 vdc feedback	NA	NA	NA	NA

LEGEND

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

Changing Motormaster® V Parameters

⚠ 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 change parameter values of the Motormaster V controller:

1. 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. 148.
2. Use the up and down arrow buttons to scroll to the password value (the factory default password is 111) and press the Mode button to accept the value.
3. Once the correct password value is entered, the display will read P01, which indicates that the PROGRAM mode has been accessed. 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.
4. Use the up and down arrow buttons to scroll to the desired parameter number.
5. 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 the up and down arrow buttons to change setting. Press Mode to store the new setting and exit the PROGRAM mode.
6. To change another parameter, press the Mode button 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 button 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.

The drive uses an electronic programming module (EPM) chip to store the program parameters. This is an EPROM memory chip and is accessible from the front of the Motormaster V. It should not be removed with power applied to the VFD. See Fig. 148.

Motormaster V Drive Password Configuration — Changing the password is not recommended. Once the password is changed, there is no means to retrieve the new password if it is lost. A new EPM chip must be installed.

To change password, follow the parameter changing instructions in the section Changing Motormaster V Parameters above. Change parameter P44 to the desired password. Setting P44 to 000 disables the password function. Valid range for the password is 000 to 999.

LOW AMBIENT LOCKOUT — The control software has a feature that allows the user to select an outdoor air temperature (OAT) at which mechanical cooling will be disabled. To use this feature, set OAT Lockout Temperature (***Set Points→COOL→OAT.L***) to a value between –19 and 80 F (–28.3 and 26.7 C). This value should be set to the desired temperature at which no mechanical cooling is required. Any time the feature is active due to the outdoor air temperature being below the field programmed value, the machine will indicate OAT Below Lockout Temp (***Operating Modes→MODE→L.OUT*=YES**). Mechanical cooling will be enabled once the Outdoor Ambient is 3° F (1.6° C) above the ***OAT.L*** set point.

The factory default is 20 F (–28.9 C) and indicates that this feature is disabled. If an Outdoor Air Temperature Sensor failure is declared, this feature must be disabled by setting the ***OAT.L*** to 20 F (–28.9 C), to allow the unit to operate.

MAINTENANCE REMINDER — The 38AP *Comfort*Link controls have the ability to provide a reminder for service personnel that regularly scheduled condenser coil maintenance is required. Maintenance interval is a field-configurable item. The service interval should be adjusted for the job site conditions. See Table 56.

Table 56 — Configuring Maintenance Reminder

RUN STATUS→PM→COIL		
ITEM	**EXPANSION**	**COMMENTS**
SI.CL	Coil Cleaning Srvc Int	Range: 0 to 65,500 hrs Default: 8760 hrs Setting SI.CL to 0 disables the feature.

MINIMUM LOAD CONTROL — Minimum load control is generally not recommended for split systems. If installed, the feature must be enabled in the controls. Minimum load control or hot gas bypass cannot be used in conjunction with the digital scroll option.

Minimum load control can only be added to standard compressor units in the field. This feature will not operate with an optional digital compressor and when the digital function is enabled (***Configuration→Unit→A1.TY*=YES**). To enable the minimum load valve, confirm that the digital compressor option is disabled and set Minimum Load Valve Select to YES, (***Configuration→OPT1→MLV.S*=YES**). See Table 57.

NOTE: Minimum Load Control and Digital Compressor operation cannot be used together.

Table 57 — Configuring Minimum Load Control

CONFIGURATION→UNIT		
ITEM	**EXPANSION**	**COMMENTS**
A1.TY	Compressor A1 Digital?	Range: NO/YES Default: Depends on product configuration NO = Not Equipped Value must be set to NO
CONFIGURATION→OPT1		
MLV.S	Minimum Load Vlv Select	Range: NO/YES Default: NO Set to YES to activate

If equipped and enabled, the Minimum Load Control valve is active as the last stage of capacity when the unit is unloading.

MINUTES OFF TIME — The Minutes Off Time feature (***Configuration→OPT2→DELY***) is a user-configurable time period used by the control to determine how long unit operation is delayed after the unit has been enabled. This delay is initiated following the Enable-Off-Remote Switch being placed in "Enable" position or "Remote" with remote contacts closed, or if power is applied/restored to the unit with the Enable-Off-Remote Switch in a position that would allow the unit operate. 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.

If Minutes Off Time is active, the control will indicate Operating Mode, Minutes Off Time Active (***Operating Modes→MODE→MD10*** will indicate YES).

RAMP LOADING — The Ramp Loading Select feature (***Configuration→SLCT→RL.S***) limits the rate of change of supply air temperature. This feature is only available for Machine Control Types (***Configuration→OPT2***) ***C.TYP*=1** (VAV), ***C.TYP*=3** (Tstat Multi), ***C.TYP*=5** (SPT Multi), and

***C.TYP*=9** (VAV Setpoint). This feature is not available for Machine Control Types ***C.TYP*=4** (2 Stg Tstat), ***C.TYP*=7** (Pct Cap) and ***C.TYP*=8** (Dual Tstat).

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 (***Configuration→SLCT→CRMP***) at the current capacity stage, the control does not allow any change to the current stage of capacity.

If Ramp Loading is active, the control will indicate Operating Mode, Ramp Load Limited (***Operating Modes→ MODE→MD05*** will indicate YES). See Table 58.

Table 58 — Configuring Ramp Loading Control

CONFIGURATION→OPT2		
ITEM	**EXPANSION**	**COMMENTS**
C.TYP	Machine Control Type	Range: 1 to 9 1 (VAV) 3 (Tstat Multi) 4 (Tstat 2stg) 5 (SPT Multi) 7 (PCT Cap) 8 (Dual Tstat) 9 (VAV Setpoint) Default: 4 Value must be set to 1, 3, 5 or 9
CONFIGURATION→SLCT		
RL.S	Ramp Loading Select	Range: DSBL/ENBL Default: ENBL Set to ENBL to activate
CRMP	Cooling Ramp Loading	Range: 0.2 to 2.0 Default: 1.0

TEMPERATURE RESET — The control system is capable of changing the controlling set point based on several different methods: space temperature (SPT), outside air temperature (OAT), and from an externally powered 4 to 20 mA signal. The set point can be adjusted up or down depending on how it is configured.

If Temperature Reset is active, the control will indicate Operating Mode, Temperature Reset (***Operating Modes→ MODE→MD14*** will indicate YES).

NOTE: Temperature Reset is available for a Control Type (***Configuration→OPT2→C.TYP***) that uses a Supply Air Temperature set point, such as ***C.TYP*=1** (VAV), ***C.TYP*=3** (TSTAT MULTI) or ***C.TYP*=5** (SPT MULTI). While Temperature Reset will operate with ***C.TYP*=9** (VAV Setpoint), since the set point temperature is being supplied to the control, Temperature Reset should be accomplished by the building management system incorporating any required reset in the set point signal.

Space Temperature Reset — Space temperature must be available to the unit controls, either by communication via a network connection or by a wired sensor. Any one of the accessory space temperature sensors (T55, T56, or T59) can be installed for space temperature reset.

To use space temperature reset, four variables must be configured. In ***Configuration→RSET***, set these items:

- Cooling Reset Type (***CRST***): Configure for the type of reset desired, Space Temperature
- Remote – No Reset Temp (***RM.NO***): Set to the temperature that no reset should occur
- Remote – Full Reset Temp (***RM.F***): Set to the temperature that maximum reset is to occur
- Remote – Degrees Reset (***RM.DG***): Set to the maximum amount of reset desired

The space temperature reset example shown in Table 59 and Fig. 149 and 150 provides 0° F (0° C) reset to the Active Set Point (***Run Status→VIEW→SETP***) if Space Temperature (***Temperatures→UNIT→SPT***) =72 F (22.2 C), and 6 F (3.3 C) reset if ***SPT***=68 F (20.0 C). Using these values, if ***SETP***=55 F (12.8 C) and SPT=68 F (20.0 C) or less, the Control Point (***Run Status→VIEW→CTPT***) will reflect 6 F (3.3 C) reset or 61 F (16.1 C). If ***SPT***=72 F (22.2 C) or more, the Control Point (***Run Status→VIEW→CTPT***) will reflect 0° F (0.0° C) reset or 55 F (12.8 C). Between ***SPT***=68 F (20.0 C) and ***SPT***=72 F (22.2 C) a proportional reset amount will be applied to ***CTPT***.

Table 59 — Configuring Space Temperature Reset

CONFIGURATION→OPT2			
ITEM	**EXPANSION**	**COMMENTS**	**EXAMPLE VALUE**
C.TYP	Machine Control Type	Range: 1 to 9 1 (VAV) 3 (Tstat Multi) 4 (Tstat 2stg) 5 (SPT Multi) 7 (PCT Cap) 8 (Dual Tstat) 9 (VAV Setpoint) Default: 4 Value must be set to 1, 3, 5 or 9	1, 3, 5 or 9
CONFIGURATION→RSET			
CRST	Cooling Reset Type	0=No Reset (Default) 1=4-20 Input 2=Out Air Temp 3=Return* 4=Space Temp	4
RM.NO	Remote – No Reset Temp	Range: 0.0 to 125.0 F (–17.8 to 51.7 C) Default: 125.0 °F (51.7 C)	72.0 F (22.2 C)
RM.F	Remote – Full Reset Temp	Range: 0.0 to 125.0 F (–17.8 to 51.7 C) Default: 0.0 F (–17.8 C)	68.0 F (20.0 C)
RM.DG	Remote – Degrees Reset	Range: –30.0 to 30.0 ΔF (–16.7 to 16.7 ΔC) Default: 0.0 ΔF (0.0 ΔC)	6.0 ΔF (3.3 ΔC)

*Not supported.

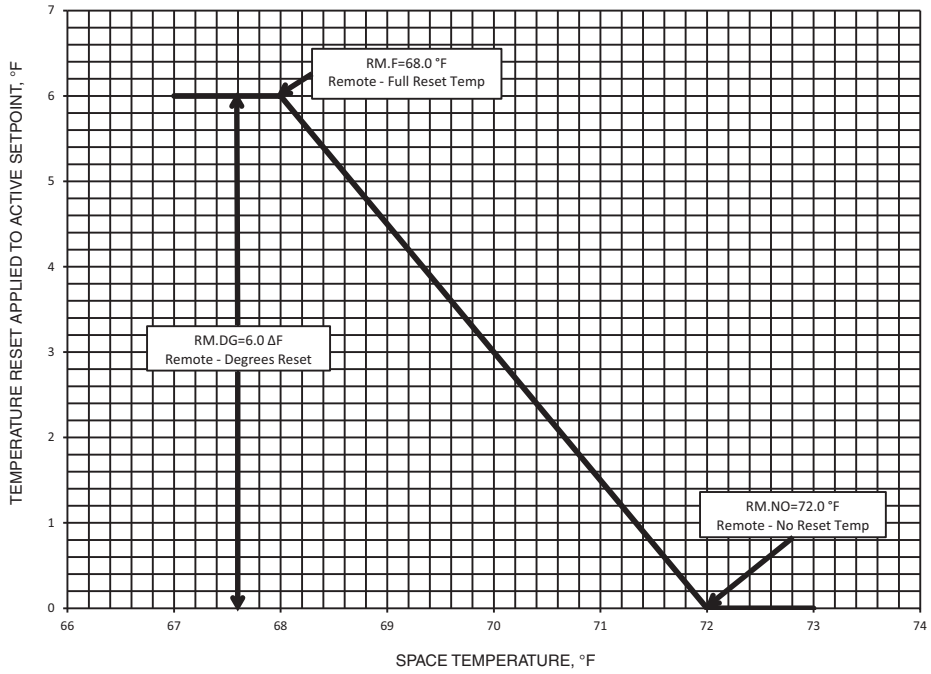


Fig. 149 — Space Temperature Reset, °F (*CRST*=4)

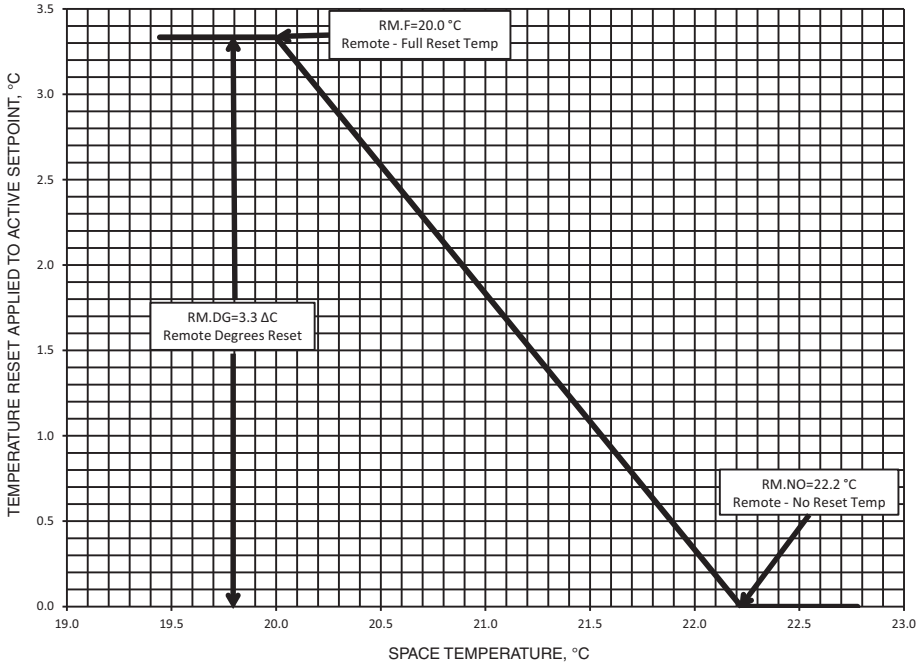


Fig. 150 — Space Temperature Reset, °C (*CRST*=4)

Outside Air Temperature Reset — The 38AP units are shipped with an outside air sensor, so no additional sensors are required.

To use Outside Air Temperature Reset, four variables must be configured. In ***Configuration→RSET***, set these items:

- Cooling Reset Type (***CRST***): Configure for the type of reset desired, Outside Air Temperature
- Remote – No Reset Temp (***RM.NO***): Set to the temperature that no reset should occur
- Remote – Full Reset Temp (***RM.F***): Set to the temperature that maximum reset is to occur
- Remote – Degrees Reset (***RM.DG***): Set to the maximum amount of reset desired

The Outside Air Temperature Reset example shown in Table 60 and Fig. 151 and 152 provides 0° F (0° C) reset to the Active Set Point (***Run Status→VIEW→SETP***) if Outside Air Temperature (***Temperatures→UNIT→OAT***)=85 F (29.4 C) and 6 F (3.3 C) reset if ***OAT***=55 F (12.8 C). Using these values, if ***SETP***=55 F (12.8 C) and ***OAT***=55 F (12.8 C) or less, the Control Point (***Run Status→VIEW→CTPT***) will reflect 6° F (3.3° C) reset or 61 F (16.1 C). If ***OAT***=85 F (29.4 C) or more, the control point ***Run Status→VIEW→CTPT*** will reflect 0° F (0.0° C) reset or 55 F (12.8 C). Between ***OAT***=55 F (12.8 C) and ***OAT***=85 F (29.4 C) a proportional reset amount will be applied to ***CTPT***.

Table 60 — Configuring Outside Air Temperature Reset

CONFIGURATION→OPT2			
ITEM	**EXPANSION**	**COMMENTS**	**EXAMPLE VALUE**
C.TYP	Machine Control Type	Range: 1 to 9 1 (VAV) 3 (Tstat Multi) 4 (Tstat 2stg) 5 (SPT Multi) 7 (PCT Cap) 8 (Dual Tstat) 9 (VAV Setpoint) Default: 4 Value must be set to 1, 3, 5 or 9	1, 3, 5 or 9
CONFIGURATION→RSET			
CRST	Cooling Reset Type	0=No Reset (Default) 1=4-20 Input 2=Out Air Temp 3=Return* 4=Space Temp	2
RM.NO	Remote – No Reset Temp	Range: 0.0 to 125.0 F (–17.8 to 51.7 C) Default: 125.0 F (51.7 C)	85.0 F (29.4 C)
RM.F	Remote – Full Reset Temp	Range: 0.0 to 125.0 F (–17.8 to 51.7 C) Default: 0.0 F (–17.8 C)	55.0 F (12.8 C)
RM.DG	Remote – Degrees Reset	Range: –30.0 to 30.0 ΔF (–16.7 to 16.7 ΔC) Default: 0.0 ΔF (0.0 ΔC)	6.0 ΔF (3.3 ΔC)

*Not supported.

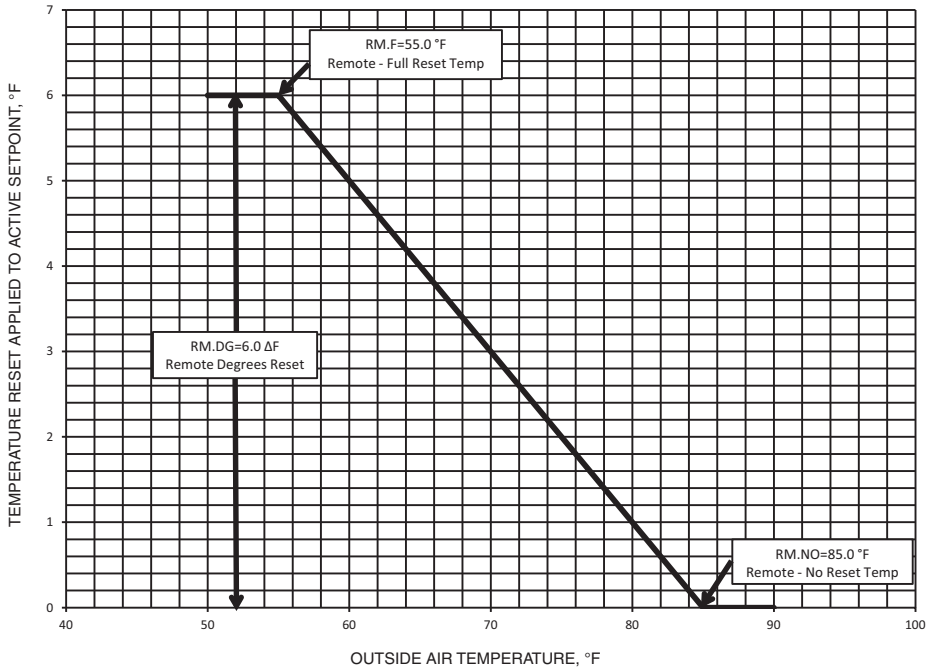


Fig. 151 — Outside Air Temperature Reset, °F (*CRST*=2)

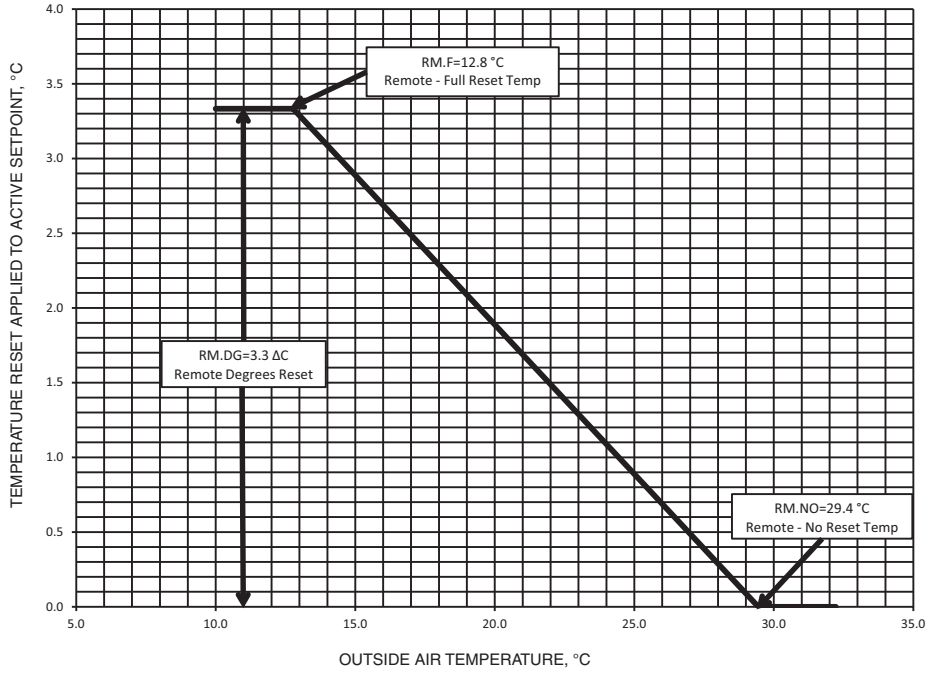


Fig. 152 — Outside Air Temperature Reset, °C (*CRST*=2)

4-20 mA Temperature Reset — The energy management module (EMM) must be used for temperature reset using a 4 to 20 mA signal. The signal can be monitored to the control at the scrolling marquee point 4-20 mA Reset Signal (***Inputs→4-20→RSET***).

To use 4-20 mA temperature reset, two variables must be configured. In ***Configuration→RSET***, set these items:

- Cooling Reset Type (***CRST***): Configure for the type of reset desired, 4-20 mA Input
- ***MA.DG***: Set to 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.

⚠ CAUTION

To avoid unit damage, care should be taken when interfacing with other manufacturer's control systems due to 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.

The 4-20 mA input temperature reset example shown in Table 61 and Fig. 153 and 154 provides 0° F (0° C) reset to the Active Set Point (***Run Status→VIEW→SETP***) if ***RSET*** **=4 mA** and 6° F (3.3° C) reset if ***RSET*****=20 mA**. Using these values, if ***SETP***=55 F (12.8 C) and ***RSET*** **=4 mA**, the Control Point (***Run Status→VIEW→CTPT***) will reflect 0° F (0.0° C) reset or 55 F (12.8 C). If ***RSET*****=20 mA**, the Control Point (***Run Status→ VIEW→CTPT***) will reflect 6° F (3.3° C) reset or 61 F (16.1 C). Between ***RSET*** **=4 mA** and ***RSET*****=20 mA** a proportional reset amount will be applied to ***CTPT***.

Table 61 — Configuring 4 to 20 mA Temperature Reset

CONFIGURATION→OPT2			
ITEM	**EXPANSION**	**COMMENTS**	**EXAMPLE VALUE**
C.TYP	Machine Control Type	Range: 1 to 9 1 (VAV) 3 (Tstat Multi) 4 (Tstat 2stg) 5 (SPT Multi) 7 (PCT Cap) 8 (Dual Tstat) 9 (VAV Setpoint) Default: 4 Value must be set to 1, 3, 5 or 9	1, 3, 5 or 9
MODE→SUB-MODE: CONFIGURATION→RSET			
CRST	Cooling Reset Type	0=No Reset (Default) 1=4-20 Input 2=Out Air Temp 3=Return* 4=Space Temp	1
MA.DG	4-20 – Degrees Reset	Range: –30.0 to 30.0 ΔF (–16.7 to 16.7 ΔC) Default: 0.0 ΔF (0.0 ΔC)	6.0 ΔF (3.3 ΔC)

*Not supported.

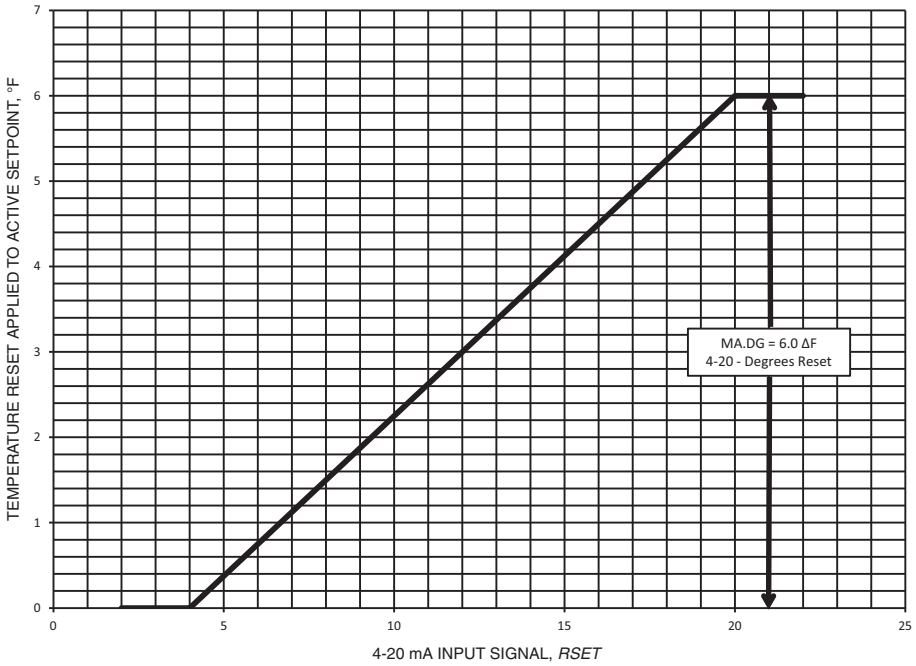


Fig. 153 — 4-20 mA Temperature Reset, °F (*CRST*=1)

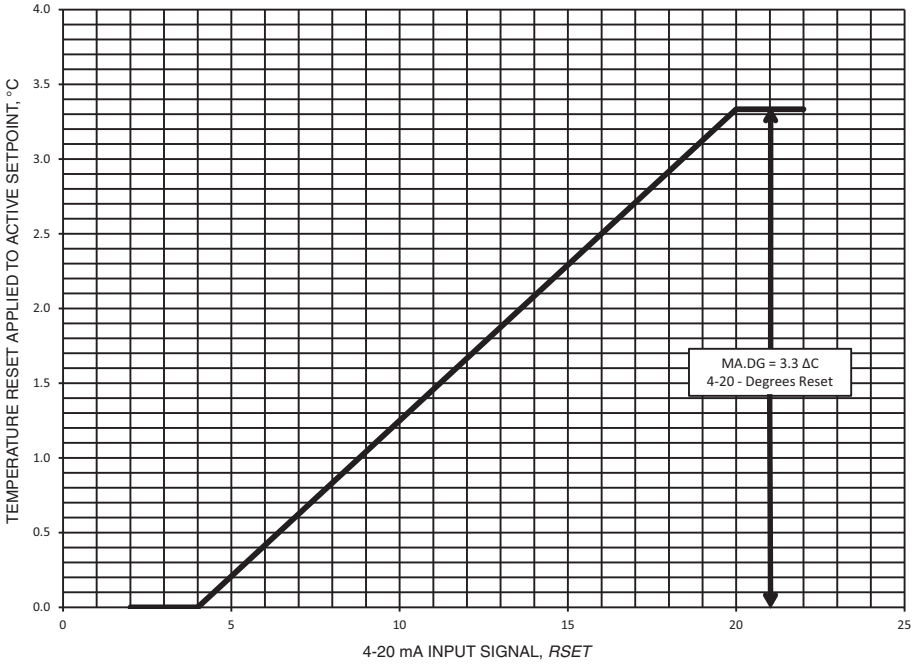


Fig. 154 — 4-20 mA Temperature Reset, °C (*CRST*=1)

Operating Modes — Operating Modes are capacity overrides that override the normal operation of the unit control. See Table 62.

D.OIL (Digital Oil Recover Mode) — When this mode is active (***Operating Modes→MODE→D.OIL*=YES**) the unit is ON and the digital compressor has been operating at less than the standard Maximum A1 Unload Time (***Configuration→UNIT→MAX.T***) for more than 30 minutes of cumulative time without an increase in circuit capacity. During this oil recovery mode, the compressor will load fully for 30 seconds. The unit capacity may exceed system requirements. For more information, contact your Carrier representative.

L.OUT (OAT Below Lockout Temp) — When this mode is active (***Operating Modes→MODE→L.OUT*=YES**) the unit is ON and the ambient temperature is below the field programmed OAT Lockout Temperature. See Low Ambient Lockout on page 128 for additional details.

MD05 (Ramp Load Limited) — When this mode is active (***Operating Modes→MODE→MD05*=YES**) the unit capacity is limited. See Ramp Loading on page 128 for details.

MD06 (Timed Override in Effect) — When this mode is active (***Operating Modes→MODE→MD06*=YES**) the unit is operating under normal capacity control during a scheduled unoccupied time. See Timed Override on page 63 for additional information.

MD09 (Slow Change Override) — When this mode is active (***Operating Modes→MODE→MD09*=YES**) the supply air temperature is close to and is moving toward the Control Point (***Run Status→VIEW→CTPT***). While this mode is active, the control is prohibited from making capacity stage changes.

MD10 (Minimum Off Time Active) — When this mode is active (***Operating Modes→MODE→MD10*=YES**) the unit is prohibited from starting by Minutes Off Time (***Configuration→OPT2→DELY***). See Minutes Off Time on page 128 for additional information.

MD14 (Temperature Reset) — When this mode is active (***Operating Modes→MODE→MD14*=YES**) Temperature Reset is in effect. In this mode, unit is using Temperature Reset to adjust Active Set Point (***Run Status→VIEW→SETP***) and is currently controlling to the modified set point, (***Run Status→VIEW→CTPT***). The set point can be modified based on outdoor air temperature, space temperature, or a 4 to 20 mA signal. See Temperature Reset on page 129 for additional information.

MD15 (Demand Limited) — When this mode is active (***Operating Modes→MODE→MD15*=YES**) Demand Limit is in effect. This indicates that the capacity of the unit is being limited by the demand limit control option. Because of this limitation, the unit may not be able to produce the desired supply air temperature. Demand limit can be controlled by switch inputs or a 4 to 20 mA signal. See Demand Limit on page 115 for additional information.

MD17 (Low Temperature Cooling) — When this mode is active (***Operating Modes→MODE→MD17*=YES**) unit is ON and the rate of change of the supply air temperature is negative and decreasing faster than –0.5° F (0.5° C) per minute. Error between Supply Air Temperature (***Run Status→VIEW→SAT***) and Control Point (***Run Status→VIEW→CTPT***) exceeds fixed amount. Control will automatically unload the unit if necessary.

MD18 (High Temperature Cooling) — When this mode is active (***Operating Modes→MODE→MD18*=YES**) unit is ON and the rate of change of the supply air temperature is positive and increasing. Error between Supply Air Temperature (***Run Status→VIEW→SAT***) and Control Point (***Run Status→VIEW→CTPT***) exceeds fixed amount. Control will automatically load the unit if necessary to better match the increasing load.

MD21 (High SCT Circuit A), ***MD22*** (High SCT Circuit B) — When these modes are active (***Operating Modes→MODE→MD21*=YES** and/or ***MD22*=YES**) unit is ON and the saturated condensing temperature (SCT) of the circuit 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. If this condition is encountered, check items listed for alerts T122 – Circuit A High Pressure Trip and T123 – Circuit B High Pressure Trip on page 170.

MD23 (Minimum Comp On Time) — When this mode is active (***Operating Modes→MODE→MD23*=YES**) the unit is ON, a compressor has just started, and the Minimum Compressor On Time timer of 60 seconds is active. Although the cooling load may be satisfied, control continues to operate compressor to ensure proper oil return. This may be an indication of oversized application or low airflow.

MD25 (Low Sound Mode) — This mode is not supported.

MDTG (Time Guard Active) — When this mode is active (***Operating Modes→MODE→MDTG*=YES**) at least one compressor is affected by a Time Guard timer. Any time a compressor is started, it must remain on for 120 seconds. If a compressor is shut off, it must remain off for 180 seconds. Unit capacity or compressor staging sequence may be affected if this mode is active. This is part of the compressor protection algorithm to prevent rapid cycling of a compressor.

Table 62 — Operating Modes

MODE	ITEM EXPANSION	DESCRIPTION	SYSTEM EFFECT
D.OIL	Digital Oil Recover Mode	Digital compressor has been running below standard Maximum A1 Unload Time (***Configuration→UNIT→MAX.T***) for more than 30 minutes. Digital compressor will load to 100% for 30 seconds.	Digital compressor will load completely. supply air temperature may be lower than Control Point (***Run Status→VIEW→ CTPT***).
L.OUT	OAT Below Lockout Temp	Ambient temperature is below field configurable setting, causing mechanical cooling to be disabled.	Unit is not allowed to start.
MD05	Ramp Load Limited	Prevents rapid staging of compressors at start-up	May not be able to supply air at the Control Point (***Run Status→VIEW→CTPT***)
MD06	Timed Override in Effect	Unit is operating outside of normal occupied time period	Normal capacity control is enabled.
MD09	Slow Change Override	Supply air temperature is close to and moving toward the Control Point ***(Run Status→VIEW→CTPT***)	Capacity stage changes are prohibited. Unit may not supply air at the Control Point ***(Run Status→VIEW→CTPT***)
MD10	Minutes Off Time Active	Unit is prohibited from starting until the timer has expired	Unit is not allowed to start.
MD14	Temperature Reset	Unit is operating with a modified set point	Unit is operating with a modified set point under normal capacity control.
MD15	Demand Limited	Unit capacity is being limited by a Demand Limit command	Unit may not be able to deliver the desired supply air temperature.
MD17	Low Temperature Cooling	Supply Air Temperature is decreasing faster than 0.5 F (0.3 C) and the difference between the Supply Air Temperature and Control Point (***Run Status→VIEW→CTPT***) exceeds a calculated value.	Unit may unload.
MD18	High Temperature Cooling	Supply Air Temperature and and its rate of change are increasing, and the difference between the Supply Air Temperature and Control Point (***Run Status→VIEW→CTPT***) exceeds a calculated value.	Unit will automatically load.
MD21	High SCT Circuit A	Circuit SCT exceeds a calculated limit	No additional stages of capacity will be added. Unit may unload to lower SCT.
MD22	High SCT Circuit B		
MD23	Minimum Comp On Time	Compressor has not completed its minimum run time	Compressor will remain running. Supply Air Temperature may be lower than Control Point (***Run Status→VIEW→CTPT***).
MD25	Low Sound Mode	Not supported	Not Supported
MDTG	Time Guard Active	Prevents rapid cycling of a compressor	May allow the unit to overshoot the set point or not allow a compressor to start if required.

SERVICE

Service Test — The controls system allows for the operation of various components in a Service Test mode. While operating in Service Test mode, outputs can be tested and various components run to confirm proper operation. While operating compressors in Service Test mode, the capacity control algorithm and all safeties are active. Confirm airflow in the evaporator before starting the unit in Service Test.

NOTE: Main power must be on for Service Test to function.

The Service Test function should be used to verify proper operation of condenser fan(s), compressors, minimum load valve solenoid (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 to begin Service Test. Press ESCAPE and the up or down key to enter the OUTS, CMPA or CMPB submode.

Test the condenser fans, liquid line solenoids 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. Use the arrow keys to select the desired percentage when testing Motormaster® V controller or number of seconds for the digital unloader solenoid, if equipped. All compressor outputs can be turned on, but the control will limit the rate by staging one compressor per minute. Minimum load valve relays/solenoids, if installed, can be tested with the compressors on or off. The relays under the CMPA or CMPB mode will stay on for 10 minutes if there is no keypad activity. 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 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 MODE item (***Run Status→VIEW***) will display NO 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 Control for normal operation.

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

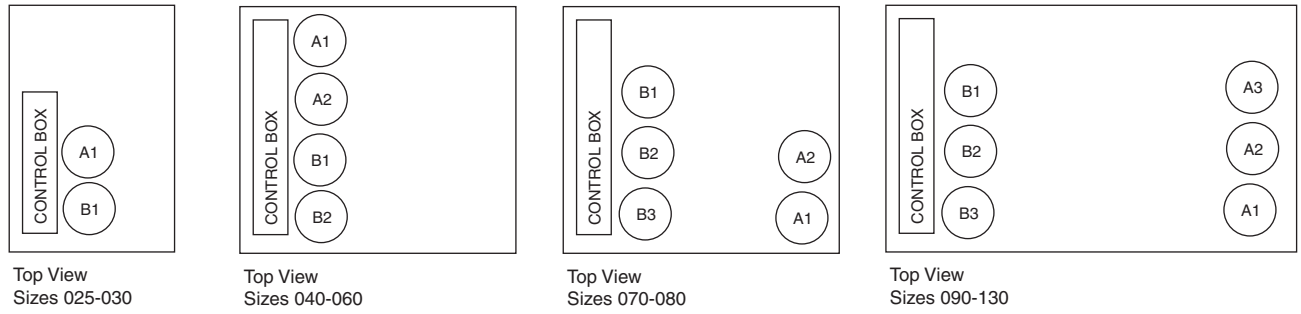
Exercise extreme caution when reading compressor currents when high-voltage power is on. Correct any of the problems described below before installing and running a replacement compressor. Wear safety glasses and gloves when handling refrigerants. Failure to follow this warning can cause fire, resulting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

⚠ CAUTION

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

Figure 155 shows the location of each compressor within the unit. Figures 156 and 157 show the compressor operating envelope.

Compressor Layout Dual Circuit, 38APD



Compressor Layout Single Circuit, 38APS

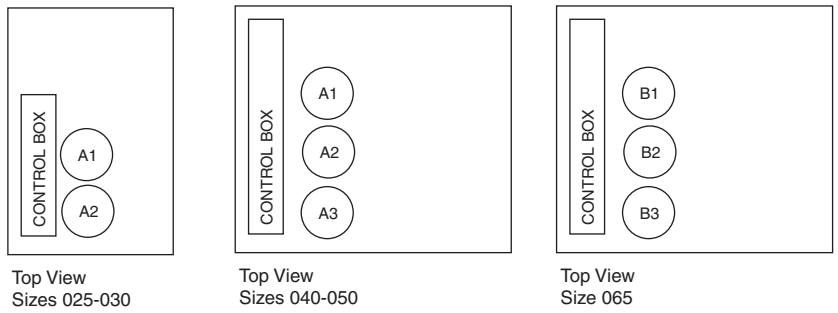


Fig. 155 — Compressor Locations

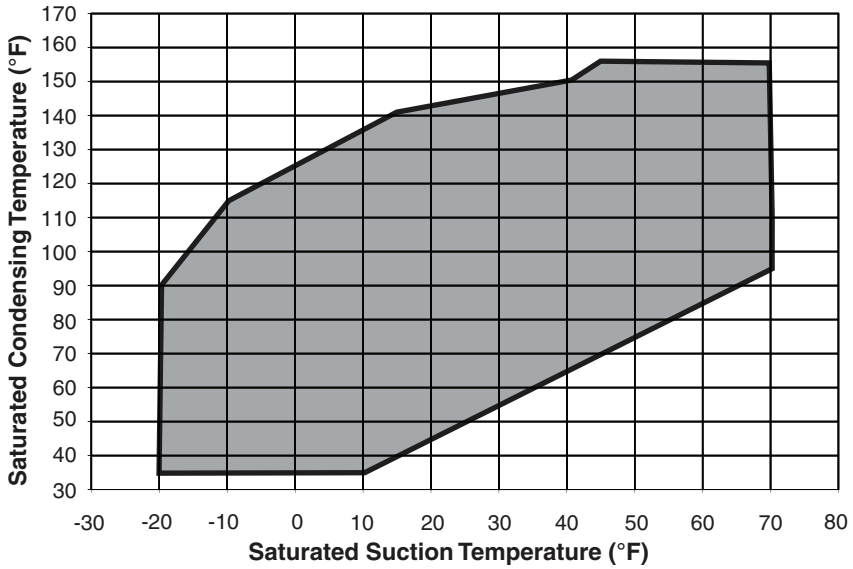


Fig. 156 — Compressor Operating Envelope, °F

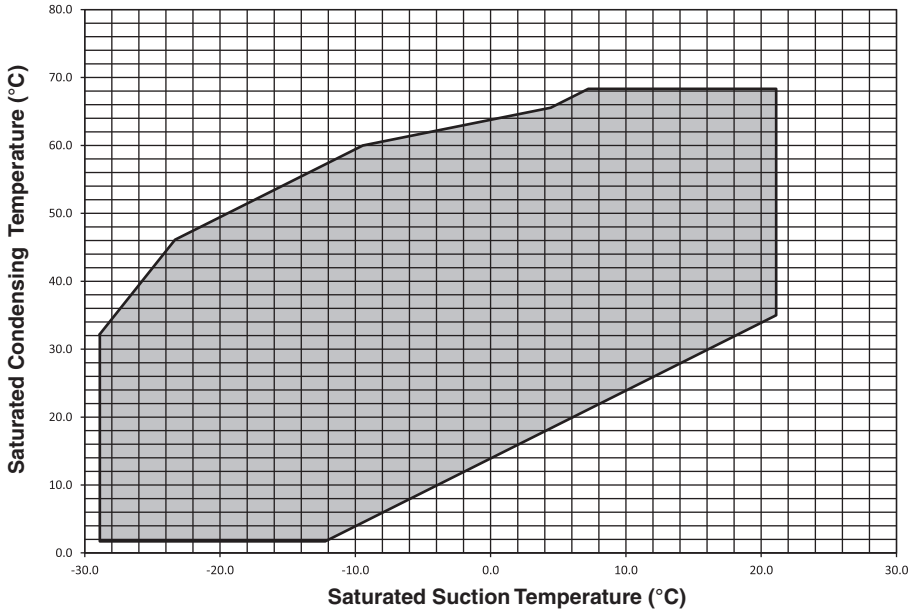


Fig. 157 — Compressor Operating Envelope, °C

ENABLING AND DISABLING COMPRESSORS — Compressors in the 38AP units can be enabled or disabled in the controls. To enable or disable a compressor, toggle the value in the ***Configuration→SERV*** menu for each individual compressor.

COMPRESSOR MOTOR PROTECTION — Two types of motor protection are used on the scroll compressors.

Compressor Circuit Breakers — Compressors have a manual reset, calibrated trip, magnetic circuit breaker for overcurrent protection. Do not bypass connections or increase the size of the circuit breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

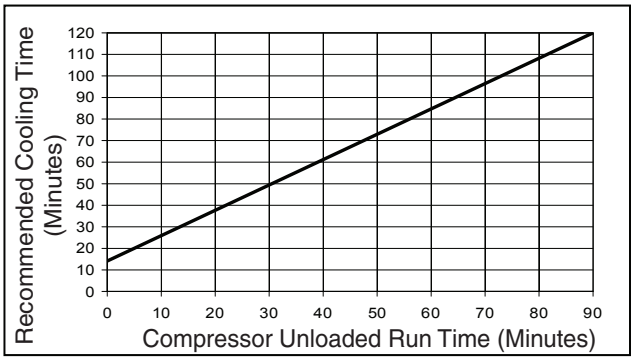
Advanced Scroll Temperature Protection (ASTP) — All non-digital Copeland compressors are equipped with advanced scroll temperature protection (ASTP). A label located above the terminal box identifies models that contain this technology. See Fig. 158.

Fig. 158 — 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 (150 C). 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. After the compressor runs for some time without pumping gas, the motor overload protector will open. The longer the compressor runs unloaded, the longer it must cool before the bi-metal disk resets. See Fig. 159 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.



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

Fig. 159 — Recommended Minimum Cool Down Time After Compressor is Stopped

MOTOR OVERLOAD PROTECTION

Copeland* Compressors Models with Electrical Code TF — Models with a "TF" in the electrical code (i.e., ZP182KCE**TF**E) have an internal line break motor overload located in the center of the Y of the motor windings. This overload disconnects all three legs of the motor from power in case of an over-current or over-temperature condition. The overload reacts to a combination of motor current and motor winding temperature. The internal overload protects against single phasing. Time must be allowed for the motor to cool down before the overload will reset. If current monitoring to the compressor is available, the system controller can take advantage of the compressor internal overload operation. The controller can lock out the compressor if current draw is not coincident with contactor energizing, implying that the compressor has shut off on its internal overload. This will prevent unnecessary compressor cycling on a fault condition until corrective action can be taken.

Copeland Compressors Models with Electrical Code TW or TE

⚠CAUTION

The electronic motor protection module is a safety device that must not be bypassed or compressor damage may result.

Models with a "TW" or "TE" in the electrical code (i.e., ZP182KCE**TW**D or ZP182KCE**TE**D) have a motor overload system that consists of an external electronic control module connected to a chain of four thermistors embedded in the motor windings. The module will trip and remain off for a minimum of 30 minutes if the motor temperature exceeds a preset point to allow the scrolls to cool down after the motor temperature limit has been reached. It may take as long as two hours for the motor to cool down before the overload will reset.

NOTE: Turning off power to the module will reset it immediately.

⚠CAUTION

Restoring the compressor sooner may cause a destructive temperature build up in the scrolls.

For this reason, module power must never be switched with the control circuit voltage.

Current sensing boards monitor to the compressor current. The *Comfort*Link control system takes advantage of the compressor overload operation by locking out the compressor if current draw is not detected. This will prevent unnecessary compressor cycling on a fault condition until corrective action can be taken.

Kriwan Motor Protection Module Troubleshooting — Copeland models with a "TW" in the electrical code (i.e., ZP182KCE**TW**D), have a motor overload system that consists of an external Kriwan electronic control module. These have been replaced by the CoreSense* communication module for motor protection. This section is included for reference, and contains instructions for replacing the Kriwan module with the CoreSense module in the field.

Follow the steps listed below to troubleshoot the Kriwan module in the field. See wiring diagram on terminal box cover, or Fig. 160.

⚠WARNING

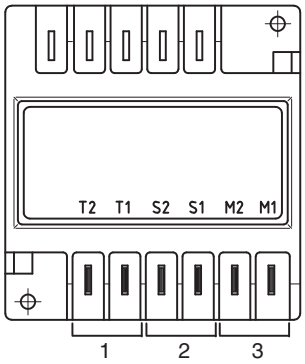
Do not supply power to unit with compressor cover removed. Failure to follow this warning can cause a fire, resulting in personal injury or death.

⚠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 personal injury or death.

⚠CAUTION

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



LEGEND

1 — Kriwan Motor Protection Module Power
2 — Kriwan Control Circuit Connections
3 — Motor Thermal Sensor

Fig. 160 — Kriwan Motor Protection Wiring

*Trademarks of Emerson Climate Technologies.

1. De-energize control circuit and module power. Remove the control circuit wires from the module (terminals M1 and M2). Connect a jumper across these control circuit wires. This will bypass the control contact of the module.

⚠ CAUTION

The motor protection system within the compressor is now bypassed. Use this configuration to temporarily test module only.

2. Re-energize the control circuit and module power. If the compressor will not operate with the jumper installed, then the problem is external to the solid-state protection system. If the compressor operates with the module bypassed but will not operate when the module is reconnected, then the control circuit relay in the module is open. Remove the temporary jumper installed in Step 1.
3. The thermistor protection chain now needs to be tested to determine if the module's control circuit relay is open due to excessive internal temperatures or a faulty component. Check the thermistor protection chain located in the compressor as follows:
   a. De-energize control circuit and module power.
   b. Remove the sensor leads from the module (S1 and S2).
   c. Measure the resistance of the thermistor protection chain through these sensor leads with an ohm meter.

⚠ CAUTION

Use an ohmmeter with a maximum of 9 volts to check the sensor chain. The sensor chain is sensitive and easily damaged; no attempt should be made to check continuity through it with anything other than an ohmmeter. The application of any external voltage to the sensor chain may cause damage requiring the replacement of the compressor.

   d. The diagnosis of this resistance reading is as follows:
   - 200 to 2250 ohms: Normal operating range
   - 2750 ohms or greater: Compressor overheated. Allow time to cool.
   - Zero resistance: Shorted sensor circuit. Replace the compressor.
   - Infinite resistance: Open sensor circuit. Replace the compressor.
4. If the resistance reading is abnormal, remove the sensor connector plug from the compressor and measure the resistance at the sensor fusite pins. This will determine if the abnormal reading was due to a faulty connector.
5. On initial start-up, and after any module trip, the resistance of the sensor chain must be below the module reset point before the module circuit will close. Reset values are 2250 to 3000 ohms.
6. If the sensor chain has a resistance that is below 2250 ohms, and the compressor will run with the control circuit bypassed, but will not run when connected properly, the solid-state module is defective and should be replaced. The replacement module must have the same supply voltage rating as the original module.

CoreSense Replacement of Kriwan Motor Protection Module — The Kriwan module has been replaced by the CoreSense communication module for motor protection. Minor wiring changes are required as described below.

⚠ 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 supply power to unit with compressor cover removed. Failure to follow this warning can cause a fire, resulting in personal injury or death.

Removing the Kriwan motor protection module:

1. Disconnect and lock out the high voltage and control voltage supply to the unit.
2. Using a straight blade screwdriver, carefully depress the tabs holding the terminal cover to the terminal box to remove the terminal cover. Before proceeding, use a volt meter to verify that the power has been disconnected from the unit.
3. Using wire markers, label the M1, M2, T1, and T2 wires that are connected to the Kriwan module. Using needle nose pliers, remove the M1, M2, T1, T2, S1 and S2 wires from the Kriwan motor protector module.
4. Gently bend the holding tabs holding the Kriwan module in the terminal box and remove the Kriwan module from the terminal box. See Fig. 161.
5. Take note of the S1-S2 plug orientation on the compressor thermistor fusite. Remove the S1-S2 wire harness and plug from the compressor.

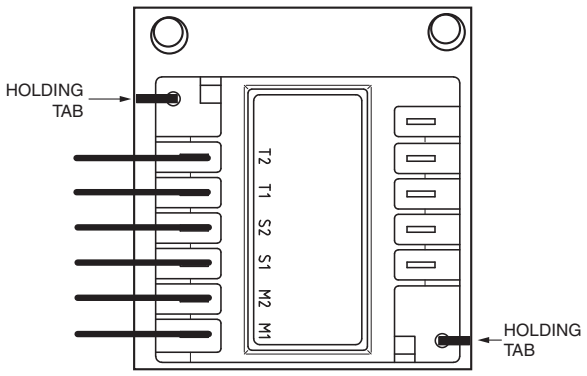


Fig. 161 — Kriwan Motor Protection Module Removal

Installing the CoreSense communications module:

1. A new S1-S2 thermistor wiring harness is shipped with the CoreSense kit and must be used. The wiring harness connector block should be fully inserted on the three pins in the orientation shown in Fig. 162 for proper operation.

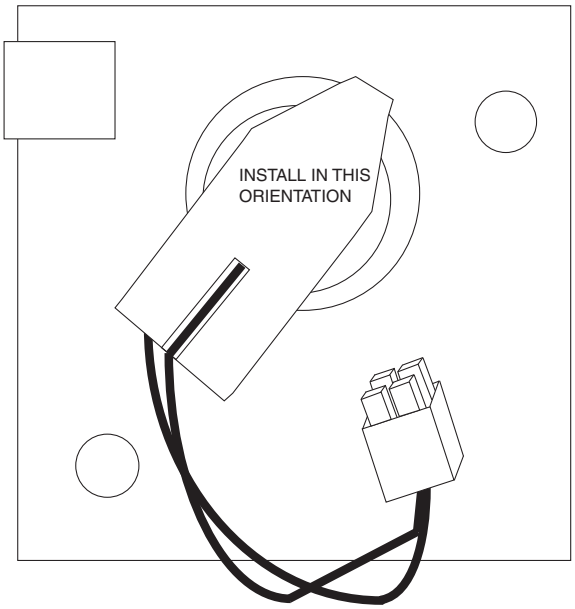


Fig. 162 — Compressor Motor Sensor Harness Installation

2. Review the DIP switch settings on the CoreSense module. DIP switch no. 1 should be ON (up position) and all other DIP switches should be OFF (down position). See Fig. 163.

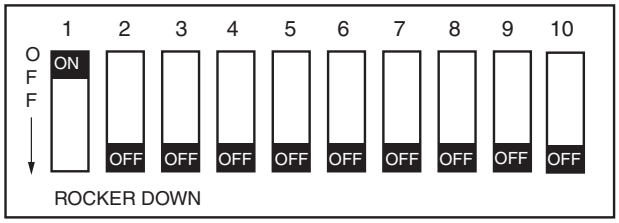


Fig. 163 — CoreSense Communication DIP Switch Settings for Kriwan Retrofit

3. Install the CoreSense module in the compressor terminal box as shown in Fig. 164, with the tabs holding the module in place. Route the thermistor wire harness as shown and plug the harness into the 2x2 socket on the CoreSense module.
4. Connect the previously labeled M1, M2, T1, and T2 wires to the appropriate terminals on the CoreSense module.
5. Connect the L1, L2, and L3 phase sensing wires to the L1, L2, and L3 compressor terminal block connections. See the compressor terminal cover diagram for identication of the L1, L2, and L3 terminal block connections.
6. Double-check the installation and make sure all connections are secure. Install the compressor terminal cover.

   The CoreSense retrofit is complete and the system can be put back into service.

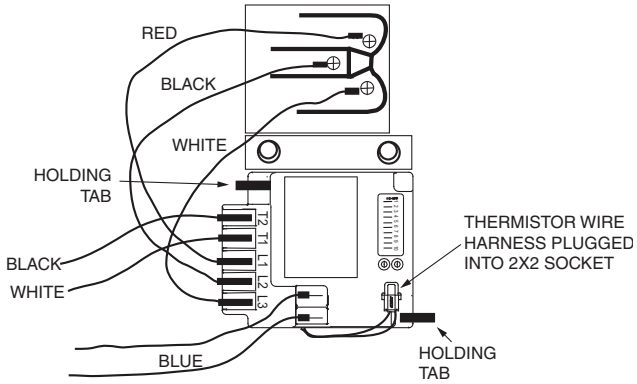


Fig. 164 — CoreSense Communication Module Mounting

CoreSense Communications Module Troubleshooting — Copeland models with a "TE" in the electrical code (i.e., ZP182KCE**TE**D) have a motor overload system that consists of an external CoreSense communication electronic control module.

Motor thermistors are connected to the CoreSense communication module via a 2x2 plug (Fig. 165).

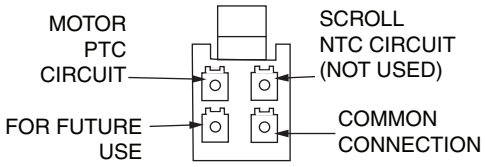


Fig. 165 — CoreSense Communications Motor Thermistor Plug

The CoreSense communications module has field configurable DIP switches for addressing and configuring the module. The DIP switches should be addressed as shown in Table 63.

The CoreSense communication module has a green and a red light-emitting diode (LED). A solid green LED indicates the module is powered and operation is normal. A solid red LED indicates an internal problem with the module. If a solid red LED is encountered, power down the module (interrupt the T1-T2 power) for 30 seconds to reboot the module. If a solid red LED is persistent, change the CoreSense module.

The CoreSense module communicates warning codes via a green flashing LED. Warning codes do not result in a trip or lockout condition. Alert codes are communicated via a red flashing LED. Alert codes will result in a trip condition and possibly a lockout condition. See wiring diagram on terminal box cover, or Fig. 166. The flash code corresponds to the number of LED flashes, followed by a pause, and then the flash code is repeated. A lockout condition produces a red flash, followed by a pause, a solid red, a second pause, and then repeated. Table 64 lists the flash code information for Warning and Alert codes along with code reset and troubleshooting information.

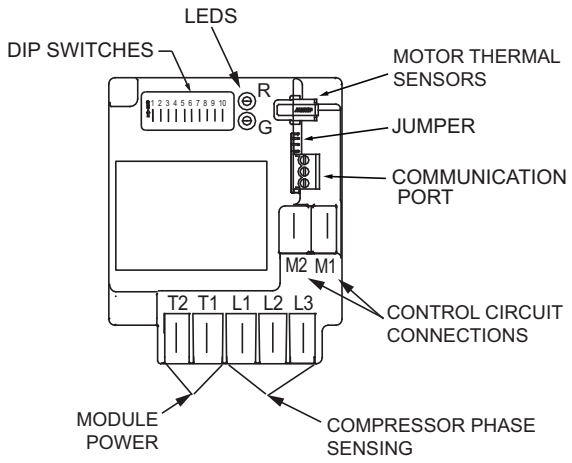


Fig. 166 — CoreSense Communication Motor Protection Wiring

Warning Codes (Green LED Flash Code):

- Code 1 – Loss of Communication: The module will flash the green Warning LED one time indicating the module has not communicated with the master controller for longer than 5 minutes. Once communication is reinitiated, the Warning will be cleared. The 38AP units do not support the communication capability of this module.
- Code 2 – Reserved For Future Use
- Code 3 – Short Cycling: The module will flash the green Warning LED three times indicating the compressor has short cycled more than 48 times in 24 hours. A short cycle is defined as compressor runtime of less than 1 minute. The Warning will be activated when the "Short Cycling" DIP Switch (no. 10) is OFF (in the down position). When fewer than 48 short cycles are accumulated in 24 hours the Warning code will be cleared.
- Code 4 – Open/Shorted Scroll Thermistor: The module will flash the green Warning LED four times, indicating that the scroll NTC thermistor has a resistance value that indicates an open/shorted thermistor. The Warning will be cleared when the resistance value is in the normal range. The 38AP units do not utilize a scroll thermistor.
- Code 5 – Not used.

Alert/Lockout Codes (Red LED Flash Code):

- Code 1 – Motor High Temperature: The module will flash the red Alert LED one time indicating the motor PTC circuit has exceeded 4500 Ω.. A Code 1 Alert will open the M2-M1 contacts. The Alert will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the motor PTC circuit is below 2750 Ω.. Five consecutive Code 1 Alerts will lock out the compressor. Once the module has locked out the compressor, a power cycle will be required for the lockout to be cleared.
- Code 2 – Open/Shorted Motor Thermistor: The module will flash the red Alert LED 2 times indicating the motor PTC thermistor circuit has a resistance value greater than 2200 Ω or less than 100 Ω. that indicates an open/shorted thermistor chain. A Code 2 Alert will open the M2-M1 contacts. The Alert will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the motor PTC circuit is back in the normal range. The module will lock out the compressor if the trip condition exists for longer than 6 hours. Once the module has locked out the compressor, a power cycle will be required to clear the lockout.
- Code 3 – Short Cycling: The module will flash the red Alert LED 3 times indicating the compressor is locked out due to short cycling. A Code 3 Alert will open the M2-M1 contacts. Code 3 will be enabled when the Short Cycling DIP switch (no. 10) is ON (in the up position) and the compressor has exceeded the number of short cycles configured by the user in a 24-hour period. Once the module has locked out the compressor, a power cycle will be required to clear the lockout.
- Code 4 – Scroll High Temperature: The module will flash the red Alert LED 4 times indicating the scroll NTC circuit is less than 2400 Ω.. A Code 4 Alert will open the M2-M1 contacts. The Alert will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the scroll NTC circuit is higher than 5100 Ω.. The module will lock out the compressor if the number of Code 4 Alerts exceeds the user configurable number of Code 4 events within a 24-hour period. Once the module has locked out the compressor, a power cycle will be required to clear the lockout.
- Code 5 – Not used.
- Code 6 – Missing Phase: The module will flash the red Alert LED 6 times indicating a missing phase in one of the three leads to the compressor. A Code 6 Alert will open the M2-M1 contacts. The Alert will reset after 5 minutes and the M2-M1 contacts will close if the missing phase condition is not present. The module will lock out the compressor after 10 consecutive Code 6 Alerts. Once the module has locked out the compressor, a power cycle will be required to clear the lockout.
- Code 7 – Reverse Phase: The module will flash the red Alert LED 7 times indicating a reverse phase in two of the three leads to the compressor. A Code 7 Alert will open the M2-M1 contacts. The module will lock out the compressor after one Code 7 Alert. A power cycle will be required to clear the lockout.
- Code 8 – Not used.
- Code 9 – Module Low Voltage: The module will flash the red Alert LED 9 times indicating low module voltage, less than 18 vac on the T2-T1 terminals for more than 5 seconds. A Code 9 Alert will open the M2-M1 contacts. The Alert will reset after 5 minutes and the M2-M1 contacts will close if the T2-T1 voltage is above the reset value in 18 to 30 vac.

Resetting Alert codes can be accomplished manually by cycling power to the module (disconnect T2 or T1 for 5 seconds). If the fault that initiated the Alert code is absent after the reset is performed, the Alert code will be cleared and CoreSense module will allow normal operation. If the fault is still present after the reset is performed, the fault code will continue to be displayed via the green or red flashing LED.

Troubleshooting procedures described for the Kriwan module section (page 139) are applicable to the CoreSense communication module.

Table 63 — CoreSense Communication Module DIP Switch Settings

COPELAND ELECTRICAL CODE	DIP SWITCH									
	1	2	3	4	5	6	7	8	9	10
"TE"	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
"TW"*	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

*Settings for Kriwan retrofit. See "CoreSense Replacement of Kriwan Motor Protection Module" on page 140.

Table 64 — CoreSense Communication Module LED Flash Codes

LED STATUS	FAULT CONDITION	FAULT CODE DESCRIPTION	FAULT CODE RESET	TROUBLESHOOTING INFORMATION
SOLID GREEN	None, normal operation	Module is powered and under normal operation	Not applicable	None
SOLID RED	Module malfunction	Module has an internal fault	Not applicable	1. Reset module by removing power from T1-T2. 2. Replace module.
		WARNING LED FLASH		
GREEN FLASH CODE 1	Loss of communication	Module and Master Controller have lost communications with each other for more than 5 minutes	Automatic when communications are re-established	Not Supported. Check DIP Switch settings.
GREEN FLASH CODE 2	Not used	Not applicable	Not applicable	Not applicable
GREEN FLASH CODE 3	Short cycling	Run time of less than 1 minute. Number of short cycles exceeds 48 in a 24-hour period.	Fewer than 48 short cycles in 24 hours	38AP controls do not allow this operation normally. Confirm proper wiring and DIP switch settings.
GREEN FLASH CODE 4	Open/Shorted Scroll Thermistor	Not applicable	Not applicable	Not applicable
GREEN FLASH CODE 5	Not used	Not applicable	Not applicable	Not applicable
		ALERT/LOCKOUT LED FLASH		
RED FLASH CODE 1	High motor temperature	Thermistor resistance greater than 4500 Ω. Lockout occurs after 5 alerts.	Thermistor resistance less than 2750 Ω and 30 minutes have elapsed	1. Check power supply. 2. Check system charge and superheat. 3. Check compressor contactor.
RED FLASH CODE 2	Open/shorted motor thermistor	Thermistor resistance greater than 4500 Ω, or less than 100 Ω. Lockout occurs after 6 hours.	Terhmistor resistance is between 100 and 2750 Ω and 30 minutes have elapsed	1. Check for poor connections at module and thermistor fusite. 2. Check continuity of thermistor wiring harness. 3. Check for an open thermistor circuit.
RED FLASH CODE 3	Short cycling	Run time of less than 1 minute. Lockout if the number of alerts exceeds the number configured by the user in 24 hours.	Interrupt power to T2-T1	38AP controls do not allow this operation normally. Confirm proper wiring.
RED FLASH CODE 4	Scroll high temperature	Not applicable	Not applicable	Not applicable
RED FLASH CODE 5	Not used	Not applicable	Not applicable	Not applicable
RED FLASH CODE 6	Missing phase	Missing phase detected. Lockout after 10 consecutive alerts.	After 5 minutes and missing phase condition is not present	1. Check incoming power. 2. Check fuses or circuit breakers. 3. Check compressor contactor.
RED FLASH CODE 7	Reverse phase	Reverse phase detected. Lockout after 1 alert.	Interrupt power to T2-T1	1. Check incoming power phase sequence 2. Check compressor contactor 3. Check module phase wiring A-B-C.
RED FLASH CODE 8	Not used	Not applicable	Not applicable	Not applicable
RED FLASH CODE 9	Module low voltage	Less than 18 vac supplied to module	After 5 minutes and voltage is between 18 and 30 vac	This alert does not result in a lockout fault. 1. Verify correct 24 vac module is installed. 2. Check for a wiring error.

Compressor Discharge Check Valve — A disk-type check valve in the discharge of the compressor prevents high pressure discharge gas from flowing rapidly back through the compressor at shutdown. This same check valve prevents a high to low side bypass in multiple compressor circuits.

COMPRESSOR FUNCTIONAL CHECK

⚠ 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 personal injury or death.

⚠ CAUTION

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

A functional compressor test with the suction service valve closed to check how low the compressor will pull suction pressure is not a good indication of how well a compressor is performing. Such a test may damage a scroll compressor. The following diagnostic procedure should be used to evaluate whether a Copeland scroll compressor is working properly.

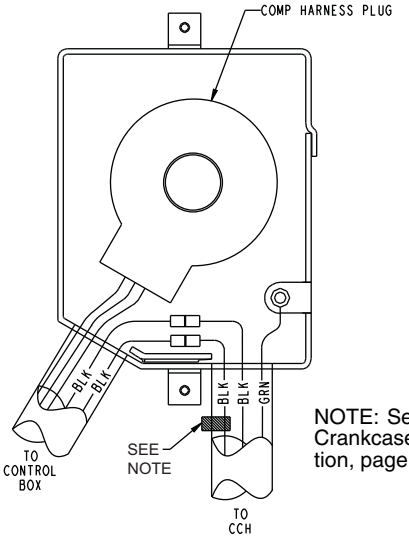
1. Proper voltage to the unit should be verified.
2. The normal checks of motor winding continuity and short to ground should be made to determine if the inherent overload motor protector has opened or if an internal motor short or ground fault has developed. If the protector has opened, the compressor must be allowed to cool sufficiently to allow it to reset.
3. Proper indoor and outdoor blower/fan operation should be verified.
4. With service gages connected to suction and discharge pressure fittings, turn on the compressor. If suction pressure falls below normal levels, the system is either low on charge or there is a flow blockage in the system.
5. If suction pressure does not drop and discharge pressure does not rise to normal levels, reverse any two of the compressor power leads and reapply power to make sure compressor was not wired to run in reverse direction. If pressures still do not move to normal values, the compressor may be faulty. Reconnect the compressor leads as originally configured.
6. To test if the compressor is pumping properly, the compressor current draw must be compared to published compressor performance curves using the operating pressures and voltage of the system. If the measured average current deviates more than ±15% from published values, a faulty compressor may be indicated. A current imbalance exceeding 15% of the average on the three phases should be investigated further.

COMPRESSOR REPLACEMENT — All models contain scroll compressors and have from one to six compressors. 38APD025-030 units utilize a single compressor per circuit. These compressors are mounted directly to the unit base. All other sizes have multiple compressors per circuit. Multiple compressor circuits are mounted in sets on mounting rails.

⚠ 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.

1. Open and tag all disconnects following proper lock-out tag-out procedures. Use proper personal protective equipment.
2. Remove the junction box cover and disconnect the compressor power and ground connections. See Fig. 167 or 168.
3. Disconnect and remove the crankcase heater from the compressor. Save the ground screw for re-installation later.
4. If the compressor is equipped with a motor protection module (Kriwan or CoreSense), disconnect the wiring to the device.
5. Remove the cable from the compressor junction box.
6. If the compressor is a digital compressor, remove the digital unloader solenoid (Fig. 169). Save the mounting screw for re-installation later. Remove the harness from the junction box.
7. Isolate the circuit and remove the refrigerant using standard refrigeration techniques.
8. If the circuit high pressure switch (HPS), discharge temperature thermistor (DTT), return gas thermistor (RGT), discharge pressure transducer (DPT), or suction pressure transducer (SPT) are in an area where brazing could damage the sensor, remove the device from the line and secure it out of the way.
9. For tandem and trio compressor circuits, remove the oil from the compressors as described in the section Removing Oil on page 149. This is required to cut (tandem compressor circuits) or remove (trio compressor circuits) the oil equalizer line. For tandem compressor circuits, cut the oil equalizer with a tubing cutter in a convenient place to be able to reconnect with a coupling.
10. Remove the bolts securing the compressor. Be sure to save all of the mounting hardware for compressor installation.



NOTE: See wire color codes in Crankcase Heater Wiring section, page 146.

Fig. 167 — Compressor Junction Box Without Motor Protection Module

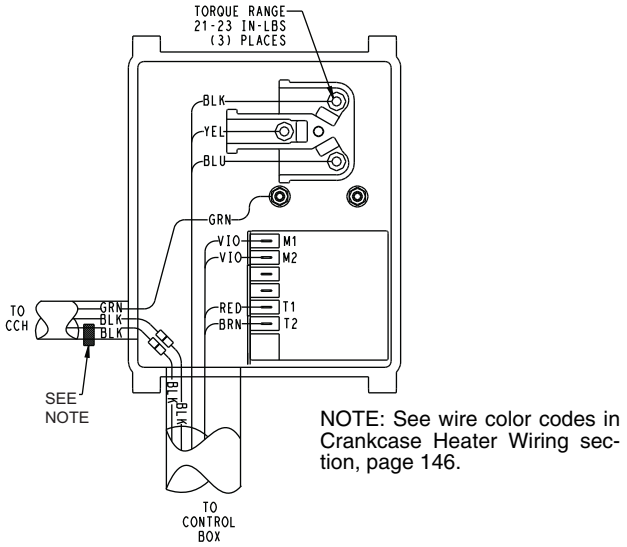


Fig. 168 — Compressor Junction Box With Motor Protection Module

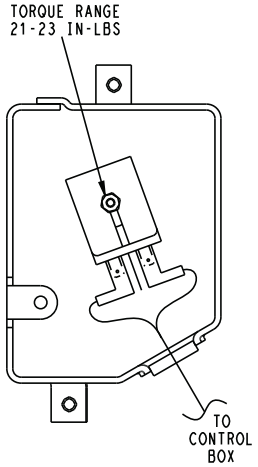


Fig. 169 — Digital Unloader Solenoid Valve

11. Using a tubing cutter, cut the suction and discharge lines in an area of the manifold that can be reconnected with a coupling.
12. Carefully remove the compressor from the unit. All compressors must be lifted by the lifting rings. Use care and extreme caution when lifting and moving compressors.

⚠ WARNING

All compressors must be lifted by the lifting rings. Use care and extreme caution when lifting and moving compressors to avoid personal injury and equipment damage.

13. The replacement compressor will come with an oil charge. If the compressor will be mounted in a tandem or trio compressor circuit, the oil must be drained below the connection point. Be sure to measure the amount of oil removed and replace it with new oil once the assembly is complete. In tandem compressor applications, while connecting the oil equalizer line, it is recommended that the compressor be tipped back approximately 12 degrees from the horizontal to move the oil away from the fitting so any remaining oil moves away from the oil equalizer connection point.
14. Before moving the compressor into its final location, install the mounting grommets on the compressor.
15. Carefully move the compressor into place on the unit. All compressors must be lifted by the lifting rings. Use care and extreme caution when lifting and moving compressors.
16. Secure the compressor using the mounting hardware removed in Step 10. Tighten mounting hardware to torque values listed in Table 65.
17. Using new fittings and tubing, reconnect the suction and discharge lines. In tandem compressor circuits, the oil equalizer line for the new compressor should be as close to the original as possible. Make the connections using proper service techniques. In trio compressor circuits, reconnect the oil equalizer line. Be sure to use a new O ring to make the connection. Proper torque values are listed in Table 65.
18. Replace the liquid line filter drier.
19. If the compressor failure was as a result of a motor burn, install a suction line filter drier. This device must be removed after 72 hours.
20. Leak check all braze connections and repair if necessary.
21. Evacuate the circuit using proper service techniques.
22. Knock the same holes out of the new compressor junction box, if required, and install the cable connectors from the old compressor.
23. Install the crankcase heater on the compressor as described in the section Crankcase Heater Mounting on page 146 and wire the crankcase heater as described in the same section. Crankcase heater position is critical to proper operation.
24. For compressors with the motor protection module, wire the power wiring and control wiring as shown in Fig. 168. Be sure the correct motor protection module is installed. Copeland replacement compressors can be shipped with one of two motor protection modules, Kriwan or CoreSense communication module. Replacement compressors shipped with Kriwan motor protection modules are shipped with two solid-state motor protection modules. A 120/240-volt module is installed and a 24-volt module is shipped with the compressor. Replacement compressors with CoreSense modules are shipped with a voltage specific solid-state motor protection module. The 38AP units require the 24-volt module be field installed. Failure to install the 24-volt module will result in a compressor failure alarm. For compressors without a motor protection module, install the motor plug by hand only. See Fig. 167.

⚠ CAUTION

The molded electrical plug should be installed by hand to properly seat the plug on the electrical terminals. To avoid damage, the plug should not be struck with a hammer or any other device.

Table 65 — Compressor Fastener Recommended Torque Values

FASTENER	RECOMMENDED TORQUE
COMPRESSOR SLED MOUNTING BOLTS	7 to 10 ft-lb (9.5 to 13.5 N-m)
COMPRESSOR MOUNTING BOLTS	7 to 10 ft-lb (9.5 to 13.5 N-m)
COMPRESSOR POWER CONNECTIONS	24 to 28 in.-lb (2.7 to 3.2 N-m)
COMPRESSOR GROUND TERMINAL CONNECTION	14 to 18 in.-lb (1.6 to 2.0 N-m)
TRIO COMPRESSOR ASSEMBLY OIL EQUALIZER CONNECTION	74 to 81 ft-lb (100 to 110 N-m)

25. If the compressor is a digital compressor, connect the digital unloader solenoid as shown in Fig. 169.

⚠ CAUTION

Do not start the compressor while the system is in a deep vacuum. Compressor failure may occur.

26. Recharge the compressors with new oil as described in the section Adding Oil on page 147.
27. Charge the circuit as described in the Start-Up section on page 41.
28. Check the operation of the compressor.

CRANKCASE HEATER MOUNTING — All 38AP units have crankcase heaters as standard equipment. It is important that the crankcase heater be tight to the compressor shell and in proper location. See Table 66 and Fig. 170-174 for proper location. Crankcase heaters should be tightened to 20 to 25 in.-lb (2.26 to 2.82 N-m).

Table 66 — Crankcase Heater Location

UNIT	SERIAL NUMBER	CRANKCASE HEATER LOCATION	
		CIRCUIT A COMPRESSOR(S)	CIRCUIT B COMPRESSOR(S)
38APD025	—	Fig. 170	Fig. 170
38APD027	—	Fig. 171	Fig. 171
38APD030	—	Fig. 171	Fig. 171
38APD040	—	Fig. 170	Fig. 170
38APD050	—	Fig. 170	Fig. 171
38APD060	—	Fig. 171	Fig. 171
38APD070	—	Fig. 171	Fig. 170
38APD080	—	Fig. 171	Fig. 171
38APD090	—	Fig. 171	Fig. 171
38APD100	—	Fig. 171	Fig. 171
38APD115	PSN 1714Q	Fig. 171	Fig. 172
	SSN 1714Q	Fig. 171	Fig. 173
38APD115	PSN 1714Q	Fig. 171	Fig. 174
	SSN 1714Q	Fig. 171	Fig. 173
38APS025	—	Fig. 170	—
38APS027	—	Fig. 171	—
38APS030	—	Fig. 171	—
38APS040	—	Fig. 171	—
38APS050	—	Fig. 171	—
38APS065	PSN 1714Q	—	Fig. 172
	SSN 1714Q	—	Fig. 173

LEGEND

PSN — Prior Serial Number
SSN — Starting Serial Number

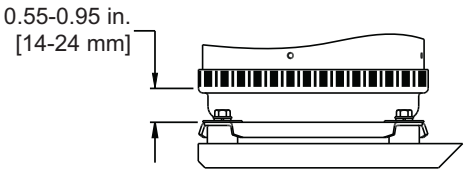


Fig. 170 — Copeland ZP/ZPD103, 120,137 Crankcase Heater Location

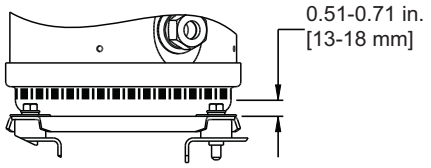


Fig. 171 — Copeland ZP/ZPD154,182 Crankcase Heater Location

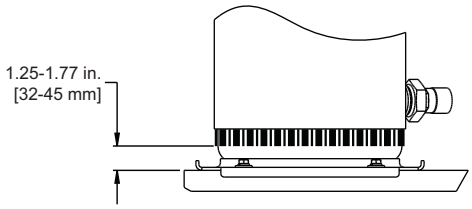


Fig. 172 — Copeland ZP235 Crankcase Heater Location

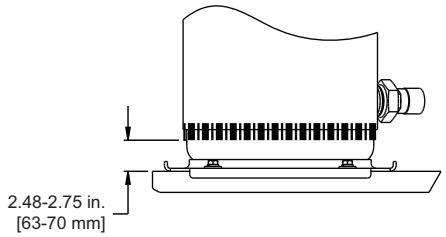


Fig. 173 — Copeland ZP236,296 Crankcase Heater Location

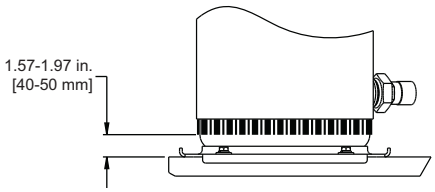


Fig. 174 — Copeland ZP295 Crankcase Heater Location

CRANKCASE HEATER WIRING — Crankcase heaters are specific to unit voltage. Each crankcase heater has a color-coded tag to indicate voltage. Table 67 identifies tag color code for each voltage. See Fig. 167 and 168 for compressor junction box connection information

Table 67 — Crankcase Heater Color-Coded Tags

UNIT POWER SUPPLY	TAG COLOR
208/230-3-60 380-3-60 380/415-3-50	Yellow
460-3-60	Red
575-3-60	Blue

OIL CHARGE

⚠ CAUTION

The compressor in a Puron® refrigerant (R-410A) system uses a polyolester (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 polyolester (POE) oil. Use only Carrier approved compressor oil. Table 68 lists indicates the factory oil charge per compressor and the cold oil recharge amount.

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. Oil levels above the recommended level can lead to poor system performance.

Adding Oil — Add oil to the oil equalizer Schrader valve on tandem compressor sets and the compressor Schrader valve on trio and single compressor circuits. (See Fig. 175 and 176.) When oil can be seen at the bottom of the sight glass, add oil in 5 oz (0.15 L) increments, each of which is approximately $^1/_8$ in. (3.2 mm) 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:

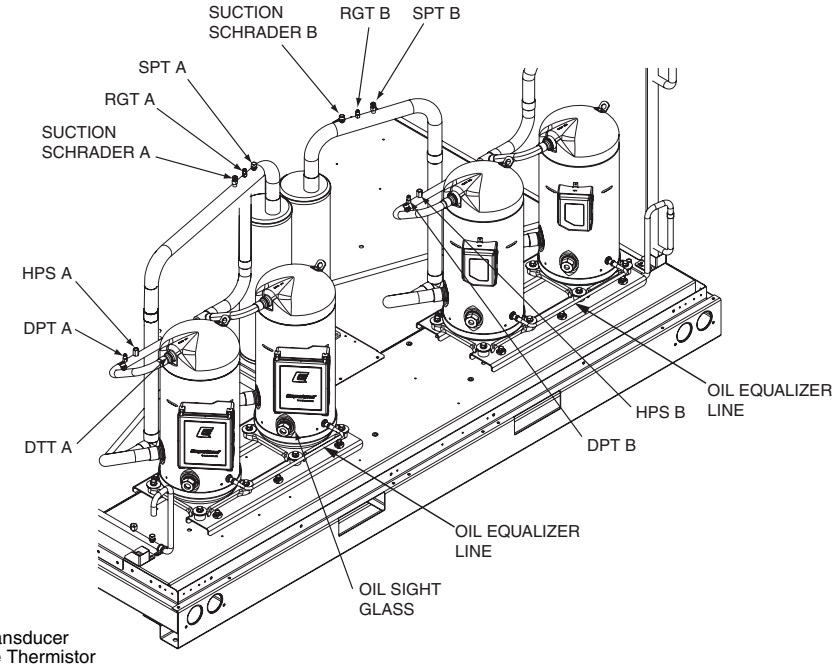
Totaline® . . . . . .3MAF POE P903-1601
Mobil. . . . . EAL Arctic 32-3MA
Uniqema RL32-3MAF

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

Table 68 — Factory/Recharge Oil Charge Quantity per Compressor

UNIT	CIRCUIT A				CIRCUIT B			
	COMPRESSOR*	QTY	OIL CHARGE PER COMPRESSOR, oz. (L)		COMPRESSOR*	QTY	OIL CHARGE PER COMPRESSOR, oz. (L)	
			FACTORY	RECHARGE			FACTORY	RECHARGE
38APD025	ZP/ZPD137	1	110 (3.2)	110 (3.2)	ZP137	1	110 (3.2)	110 (3.2)
38APD027	ZP/ZPD154	1	110 (3.2)	106 (3.1)	ZP154	1	110 (3.2)	106 (3.1)
38APD030	ZP/ZPD182	1	110 (3.2)	106 (3.1)	ZP182	1	110 (3.2)	106 (3.1)
38APD040	ZP/ZPD120	2	110 (3.2)	110 (3.2)	ZP103	2	110 (3.2)	110 (3.2)
38APD050	ZP/ZPD137	2	110 (3.2)	110 (3.2)	ZP154	2	110 (3.2)	106 (3.1)
38APD060	ZP/ZPD154	2	110 (3.2)	106 (3.1)	ZP182	2	110 (3.2)	106 (3.1)
38APD070	ZP/ZPD182	2	110 (3.2)	106 (3.1)	ZP182	3	110 (3.2)	106 (3.1)
38APD080	ZP/ZPD182	2	110 (3.2)	106 (3.1)	ZP182	3	110 (3.2)	106 (3.1)
38APD090	ZP/ZPD154	3	110 (3.2)	106 (3.1)	ZP182	3	110 (3.2)	106 (3.1)
38APD100	ZP/ZPD182	3	110 (3.2)	106 (3.1)	ZP182	3	110 (3.2)	106 (3.1)
38APD115	ZP/ZPD182	3	110 (3.2)	106 (3.1)	ZP235	3	158 (4.7)	148 (4.4)
	ZP/ZPD182	3	110 (3.2)	106 (3.1)	ZP236	3	152 (4.5)	142 (4.2)
38APD130	ZP/ZPD182	3	110 (3.2)	106 (3.1)	ZP295	3	230 (6.8)	217 (6.4)
	ZP/ZPD182	3	110 (3.2)	106 (3.1)	ZP296	3	152 (4.5)	142 (4.2)
38APS025	ZP/ZPD137	2	110 (3.2)	110 (3.2)	—	—	—	—
38APS027	ZP/ZPD154	2	110 (3.2)	106 (3.1)	—	—	—	—
38APS030	ZP/ZPD182	2	110 (3.2)	106 (3.1)	—	—	—	—
38APS040	ZP/ZPD154	3	110 (3.2)	106 (3.1)	—	—	—	—
38APS050	ZP/ZPD182	3	110 (3.2)	106 (3.1)	—	—	—	—
38APS065	—	—	—	—	ZP235	3	158 (4.7)	148 (4.4)
	—	—	—	—	ZP236	3	152 (4.5)	142 (4.2)

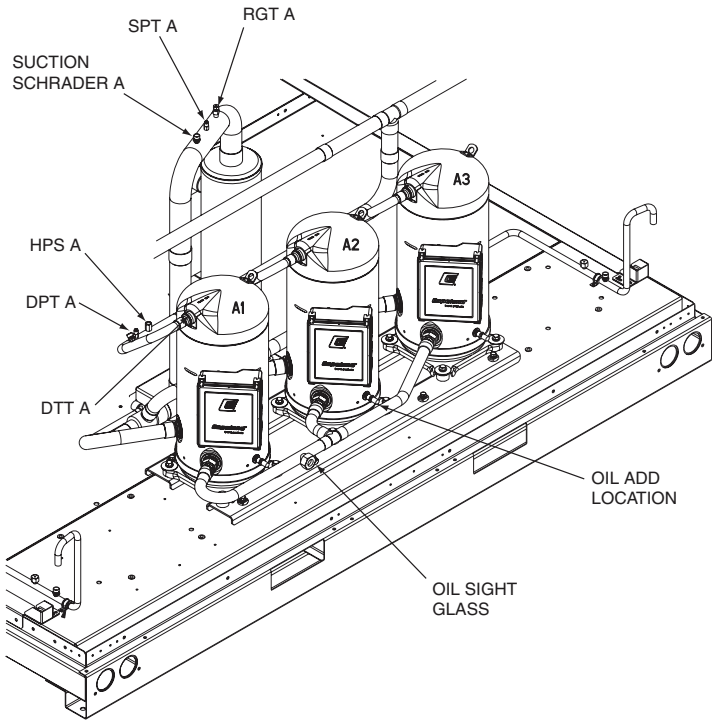
*Standard compressor model numbers start with ZP. Digital compressor model numbers start with ZPD.



LEGEND

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

Fig. 175 — 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. 176 — Typical Trio Compressor Assembly

Removing Oil — If the oil level is determined to be too high, oil can be removed from the Schrader fitting on the compressors for the single and trio compressor circuits. Remove oil from the Schrader fitting on the oil equalizer tube for the tandem compressor circuits.

If the complete oil charge must be removed, an oil dip tube assembly is required. The oil dip tube assembly is inserted into the compressor oil sight glass assembly. Oil dip tube assemblies are available through Carrier Replacement Components. See Table 69.

Table 69 — Oil Dip Tube Assemblies

CARRIER PART NUMBER	COPELAND COMPRESSOR USAGE
30RA680018	ZP/ZPD103,120,137,154,182
30RA680041	ZP235
30RA680040	ZP236, 296
30RA680039	ZP295

Leaving the oil dip tube assembly in place is not recommended. See the section Replacing the Sight Glass below for installation instructions.

COMPRESSOR AND OIL EQUALIZER LINE SIGHT GLASSES — Compressors in single and tandem circuit arrangements have oil sight glasses located on the compressors (Fig. 175 and 176).

Replacing the Sight Glass — The sight glass seal is accomplished with an O ring. Do not reuse O ring.

To install or replace the compressor sight glass, torque the sight glass to 50 to 58 ft-lb (68 to 78 N-m).

If the sight glass is on the oil equalizer line, torque the sight glass to 25 to 30 ft-lb (34 to 40 N-m). Be sure to use a back-up wrench to install the sight glass on the oil equalizer line.

Control Module Service

LOSS OF COMMUNICATION — Loss of communication issues can be found on the Carrier Comfort Network® (CCN) or Local Equipment Network (LEN). See the specific section below.

Carrier Comfort Network (CCN) — Loss of communication with CCN will result in the unit entering stand-alone mode. In this case check CCN wiring to the machine. The 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.

Local Equipment Network (LEN) — Loss of communications with the LEN is typically an internal wiring issue or a shorted input or output to a control module. Check the wiring, LEN wiring and input and output wiring.

CONTROL MODULE REPLACEMENT — The *Comfort*Link replacement modules are shown in Table 70. 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.

Table 70 — Replacement Modules

MODULE	REPLACEMENT PART NUMBER (WITH SOFTWARE)
Main Base Board (MBB)	38AP501672
Scrolling Marquee Display	HK50AA031
Energy Management Module (EMM)	30GT515218
Navigator Display	HK50AA033
Compressor Expansion Board (CXB)	30GT515219
Auxiliary Board (AUX)	32GB500442E

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.

⚠WARNING

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. To remove the defective module, remove its mounting screws with a Phillips screwdriver, and remove 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.

Condenser Fan Motors — If a condenser fan motor must be replaced, be sure to orient the motor properly in the motor mount. For 38APD025-060 and 38APS025-050, orient the motor plug toward the control box. Be sure the motor is securely seated in the bearing cup at the bottom of the motor support. Be sure to form a drip loop in the power wiring prior to connecting the power plug. See Condenser Fans on page 150 for proper fan placement.

CONDENSER FAN MOTOR PROTECTION — Each condenser fan motor is internally protected against overtemperature. They are also protected against a severe overcurrent condition by manual reset, calibrated trip, magnetic circuit breakers or fuses on a common circuit. Do not bypass connections or increase breaker size or fuse to correct trouble. Determine the cause and correct it before resetting the breaker.

Condenser Fans — Two types of condenser fans are offered in the 38AP units: metal (value sound) fans, and Aeroacoustic™ (low sound) fans. Each is addressed below. Each fan is supported by a formed wire mount bolted to a fan deck and covered with a wire guard.

METAL (VALUE SOUND) 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, when reinstalling the motor be sure to mount the motor band in the proper location. Re-grease fan shaft and reinstall fan guard. For recommended grease information, see the section Condenser Fan Blades on page 161. The fan hub must be facing up. 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. 177. Tighten set screws to 15 ± 2 ft-lb (20 ± 2.7 N-m). Figure 177 shows the proper position of mounted fan.

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

AEROACOUSTIC™ (LOW SOUND) FANS — Two designs have been used for this option and can be distinguished by the mounting bolt color. Two separate processes are used depending on the design revision. A shroud and a wire guard provide protection from the rotating fan.

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

Gray Bolt — The fan motor shaft is protected from weather by grease and the fan cover. If fan motor must be removed for service or replacement, when reinstalling the motor be sure to mount the motor band in the proper location. Re-grease fan shaft and reinstall fan cover. 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. See Fig. 178. Tighten bolt to 15 ± 2 ft-lb (20 ± 2.7 N-m). Figure 178 shows the proper position of mounted fan.

Black Bolt — To remove the fan, a fan puller will likely be needed. The fan motor shaft is protected from weather by the fan cover. If fan motor must be removed for service or replacement, when reinstalling the motor be sure to mount the motor band in the proper location. Do not use grease on the shaft or key. 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. Apply Loctite 680 Retaining Compound to the hub and motor keyway only just prior to installing the key. See Fig. 179 and 180. Tighten bolt to 24 ± 2 ft-lb (32.5 ± 2.7 N-m). Figure 181 shows the proper position of mounted fan.

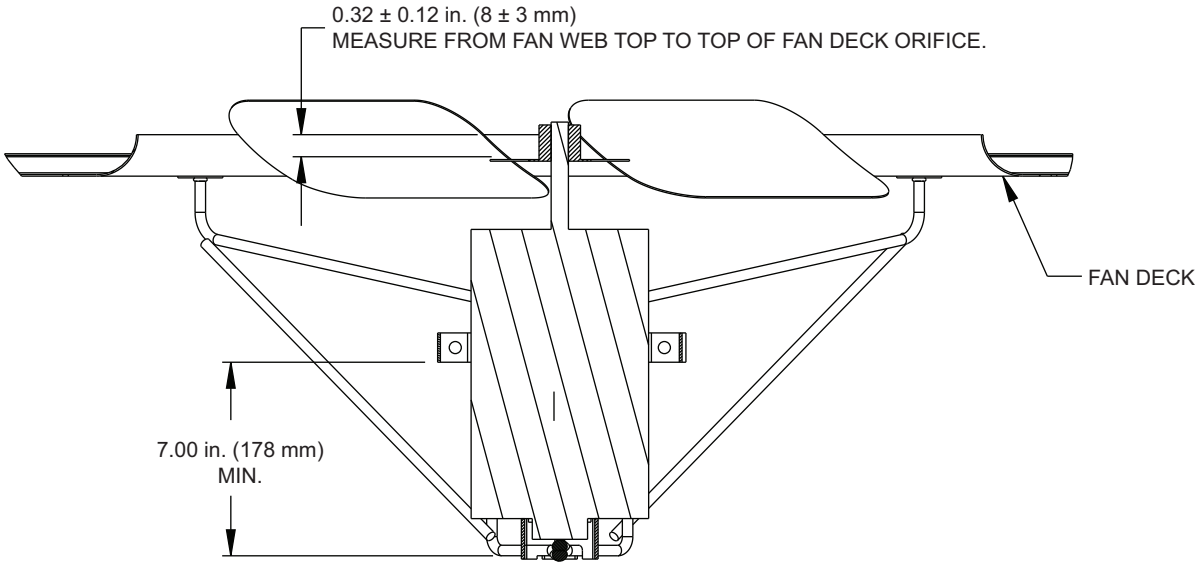


Fig. 177 — Value Fan Mounted Position

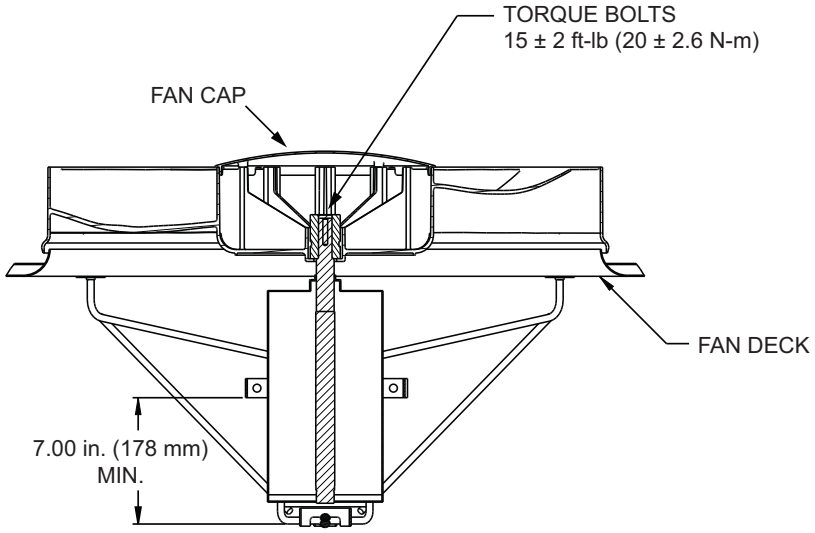


Fig. 178 — Aeroacoustic Fan (Gray Bolt) Mounted Position

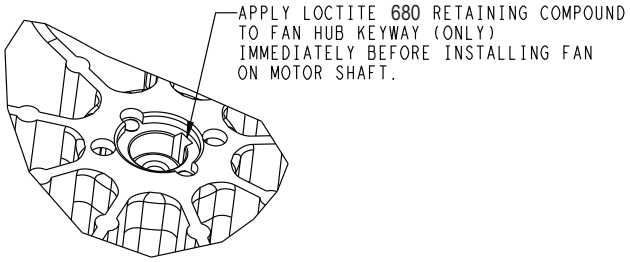


Fig. 179 — Aeroacoustic Fan (Black Bolt) Fan Hub Keyway

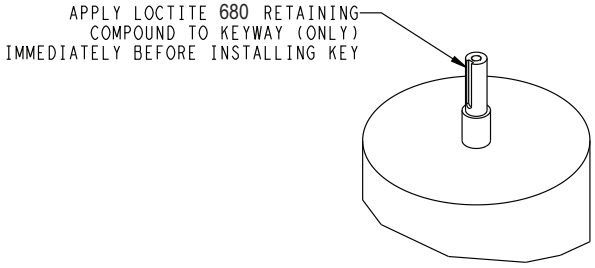


Fig. 180 — Aeroacoustic Fan (Black Bolt) Fan Motor Keyway

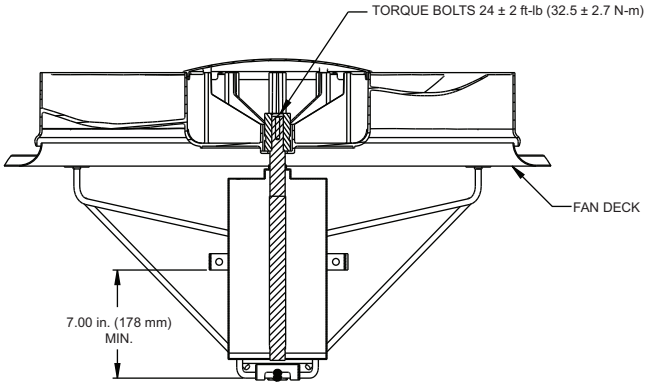


Fig. 181 — Aeroacoustic Fan (Black Bolt) Mounted Position

Filter Drier — This is a required field supplied and installed device. Replace whenever the moisture/liquid indicator shows moisture in the system.

High Pressure Switch — All 38AP units are equipped with one high pressure switch per circuit, for high pressure protection. The high pressure switch is an automatic reset device. For pressure settings, see High Pressure Switch (HPS) on page 28. See Fig. 33-43 for typical locations of the high pressure switch on each circuit.

REPLACING SWITCH

⚠ WARNING

Care should be exercised while removing high pressure switch. Refrigerant system is under pressure. DO NOT remove high pressure switch before the condensing unit has been isolated and the refrigerant has been removed using standard refrigeration practices. Be sure to use proper personal protection equipment to guard against accidental exposure to refrigerant.

The high pressure switch is mounted on a female flare fitting. There is no Schrader valve under the high pressure switch. If the high pressure switch must be removed, the condensing unit must be isolated and the refrigerant removed using standard refrigeration practices before removing the high pressure switch, using a back-up wrench to secure the fitting. Be sure to loop cable and secure with a wire tie to create a strain relief as shown in Fig. 48 on page 40.

Moisture/Liquid Indicator — This is a required field supplied and installed device. A clear flow of liquid refrigerant indicates sufficient charge in the system. Bubbles indicate undercharged system or the presence of non-condensables. Moisture in the system measured in parts per million (ppm) changes the color of the indicator. See the specific manufacturer's instructions for moisture indication. Change the filter driers at the first sign of moisture in the system.

IMPORTANT: Unit must be in operation at least 12 hours before moisture indicator can give an accurate reading. With unit running, indicating element must be in contact with liquid refrigerant to give a true reading.

Motormaster® V Controls — If the Motormaster controller is properly configured, powered, has a control signal, and has the Run jumper closed, the controlled fan motor should be operating. The Motormaster V controller has internal diagnostics that are available on the device. The default display is the frequency command for the drive. If the drive is in a stop state, the display will indicate "---". If the drive is commanded to start, the display will indicate the commanded frequency. The motor speed may lag the commanded speed until the motor's actual speed reaches the commanded speed.

→ **⚠ WARNING**

The opening of a branch-circuit protective device may be an indication that a fault has been interrupted. To reduce the risk of fire or electric shock, current carrying parts and other components of the controller should be examined and replaced if damaged.

TROUBLESHOOTING — The drive is programmed to restart automatically after a fault and will attempt to restart three times after most faults (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. To do a manual reset, if the fault condition has been removed, cycle power to the unit to reset the VFD.

Troubleshooting the Motormaster V controller requires a combination of observing system operation and VFD information. The drive provides 2 kinds of troubleshooting modes: a status matrix using the 3-digit display (Parameters P57, P58) and real time monitoring of key inputs and outputs. The collective group is displayed through parameters P50 through P60. All values are read-only. These parameters can be accessed without a password. Pressing the Mode button twice will change the display to P50. Use the up and down arrow buttons to reach the desired parameter. Press the Mode button to view the parameter value. The upper right decimal point will blink indicating the parameter value. See Table 71 for a list of troubleshooting parameters.

→ Fault Codes — Motormaster V fault codes will be displayed in parameter P50. Up to 8 faults will be displayed in a 3-digit format. The first digit is the alarm occurrence, 1 through 8. The next 2 digits are the fault code. See Fig. 182 for an example of the fault code. Faults are stored from most recent to oldest. Table 72 lists Motormaster fault codes.

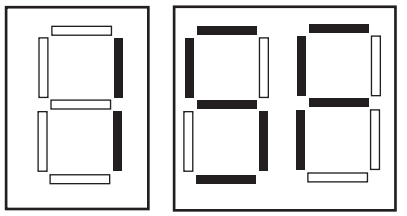
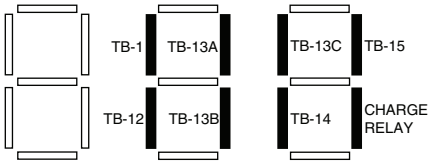
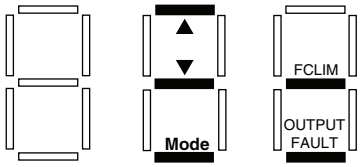


Fig. 182 — Motormaster V P50 Fault Code Display

Manual Control — The Motormaster V controller can be configured for manual control to allow the user to control the motor speed to test its operation. To disable automatic control mode and enter manual speed control mode follow the instructions in the section Motormaster V Drive Configuration on page 126 to obtain access to the parameter mode. Change the following parameter:

1. Change parameter P05 to 01. This will allow for manual speed control.
2. With the Run jumper closed, push the up and down arrow buttons to set manual speed of the controlled motor.
3. Be sure to set P05 back to 04 to restore 4 to 20 mA control once the test is complete.

Table 71 — Motormaster® V Troubleshooting Parameters

PARAMETER	DESCRIPTION	COMMENTS
P50	Fault History	This parameter lists the last 8 faults that tripped the drive. Use the up and down arrow buttons to scroll through the faults. The left hand digit of the display is the fault number. The remaining two digits are the fault code. Fault codes are defined in Table 71. Faults are stored from most recent to older faults; for example, 1xx, 2xx, 3xx, etc., where "xx" is the Fault Code listed in Table 71. The display will read " - -" if the Fault History is empty.
P51	Software Version	This parameter is the software version for the Motormaster V controller. The software version is displayed in two parts. The first part is the software version. The second part is the revision number.
P52	DC Bus Voltage	This parameter value indicates the DC bus voltage in percent of nominal. Nominal DC bus voltage is determined by multiplying the drive's nameplate input voltage rating by 1.4.
P53	Motor Voltage	This parameter displays the output voltage in percent of the drive's nameplate output voltage rating.
P54	Motor Load	This parameter displays the motor load in percent of the drive's output current rating.
P55	0 to 10 vdc Analog Input	This parameter indicates the level of the 0 to 10 vdc analog input signal at TB-5. A value of 100% indicates a 10 vdc at TB-5.
P56	4 to 20 mA Input Analog Input	This parameter indicates the level of the 4 to 20 mA analog input signal at TB-25. A value of 20% indicates a 4 mA input at TB-25. A value of 100% indicates a 20 mA at TB-25.
P57	Terminal Strip Status	This parameter indicates the status of several terminals using vertical segments of the LED display. An illuminated segment indicates that the terminal is closed with respect to TB-2. The Charge Relay is not a terminal and should always be illuminated. See the diagram below for segment meanings. 
P58	Keypad and Protection Status	This parameter indicates the status of the buttons on the keypad and the status of the protective circuitry in the drive, using the horizontal segments of the LED display. An illuminated segment indicates that the button is depressed and the protective circuit is active. See the diagram below for segment meanings. 
P59	TB-30 Analog Output	This parameter displays the level of the analog output at TB-30. A value of 100% indicates a 10 vdc. This output is not used on 38AP units.
P60	TB-31 Analog Output	This parameter displays the level of the analog output at TB-31. A value of 100% indicates a 10 vdc. This output is not used on 38AP units.

LEGEND

FCLIM — Fast Current Limit

Table 72 — Motormaster® V 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 P48 - 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 P25) 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 that Parameter P25 (see Table 55 on page 127) is set correctly.
Er	Error: Invalid data has been entered or an invalid command was attempted.	
GF	Data Fault: User data and OEM defaults in the EPM are corrupted	Restore factory defaults P48, see fault code CF. 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 P15. Check settings in communication software to match P15.
LC	Fault Lockout: The drive has failed three start attempts and requires a manual reset.	Correct fault condition.
LCS	Loss of control signal	
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.	Check VFD wiring to motor. Be sure motor is connected to T1, T2, and T3. Reduce boost or increase acceleration values. If unsuccessful, replace drive.
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.
SP	Start pending: The drive is in between restart attempts.	Correct fault condition.
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 between 0 and 5 v.

LEGEND

EPM — Electronic Programming Module
VFD — Variable Frequency Drive

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). See Fig. 33-43 for typical locations 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. 183 for transducer connections to the J8 connector on the MBB.

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 gage. Pressure readings should be within ± 5 psig (35 kPa). If the two readings are not reasonably close, check the pressure transducer harness wiring at the MBB connection and at the transducer plug. If the wiring is good, replace the pressure transducer.

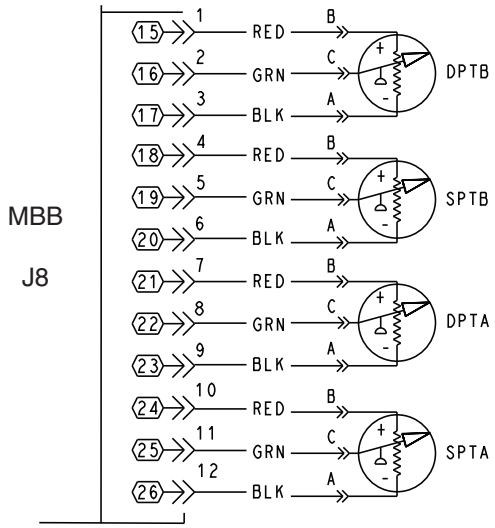


Fig. 183 — Typical 38AP Pressure Transducer Wiring

REPLACING TRANSDUCER — The pressure transducer should be mounted on an access fitting with a Schrader valve. Use caution when removing the transducer. Use a back-up wrench to secure the fitting while removing and installing the pressure transducer. Be sure to loop cable and secure with a wire tie to create a strain relief as shown in Fig. 48 on page 40.

⚠WARNING

Care should be exercised while removing any device, pressure sensing device or cap from an access fitting. Refrigerant system is under pressure. Be sure to use proper personal protection equipment to guard against accidental exposure to refrigerant.

Temperature Relief Devices — All units have temperature relief devices to protect against damage from excessive pressures caused by extreme high temperatures (i.e., fire). These devices protect the high and low side and are installed in the liquid line between the condenser coils and the liquid line service valve.

Thermistors — Several styles of thermistors are used in the 38AP units. See Thermistors on page 28 for specific information on each thermistor. Thermistor connections are made to both the MBB and AUX Board. See Fig. 184 and 185.

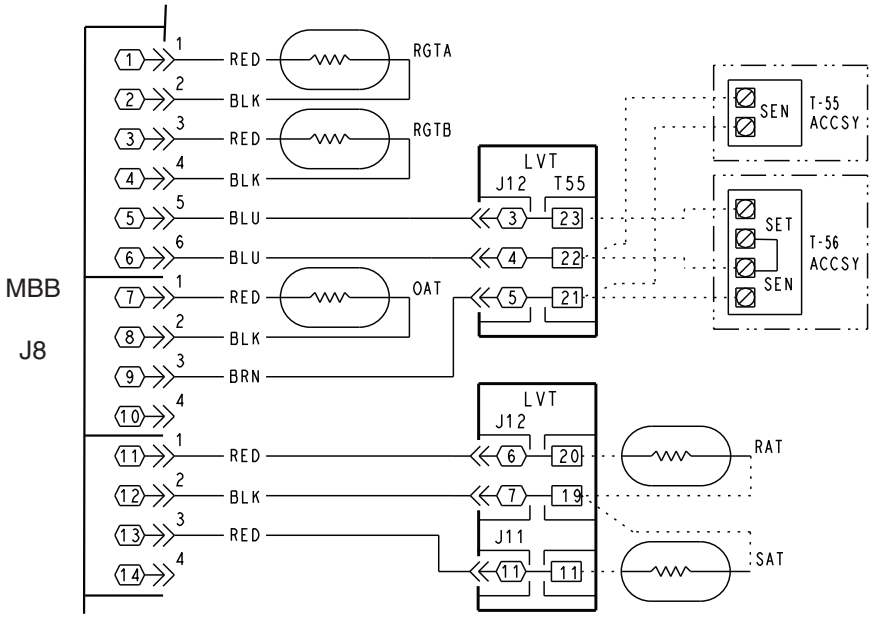


Fig. 184 — Typical Main Base Board (MBB) Thermistor Connections

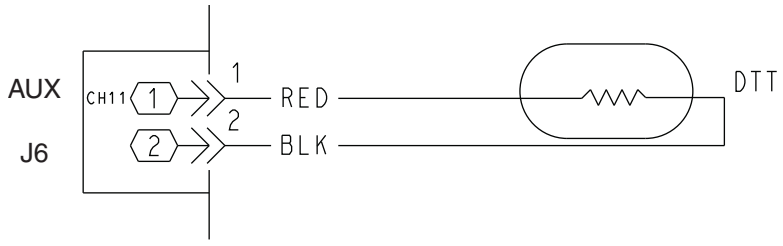


Fig. 185 — Typical AUX Board (AUX) Thermistor Connections (Digital Compressor Option Only)

TROUBLESHOOTING — To perform a thermistor-temperature sensor check, a high quality digital volt-ohmmeter is required.

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J8 terminal strip on the main base board or J6 terminal strip of the AUX Board. See Fig. 184 and 185.
2. Using the voltage reading obtained, read the sensor temperature from Tables 73-77.
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 THERMISTORS — Special instructions for replacing the return gas thermistor (RGT), Outdoor air thermistor (OAT), and discharge temperature thermistor (DTT) are listed below. All other thermistors can be replaced simply by replacing the old with the new.

⚠ CAUTION

Be sure to route wiring away from all refrigerant piping. Heat from the piping can damage wiring.

Discharge Temperature Thermistor (DTT) —This thermistor is only used when the unit is equipped with a digital compressor. Mount the thermistor in the appropriate location. Once in place and wired, insulate the device with cork insulation tape to form a watertight seal around the thermistor and minimize the ambient influence on the sensor. See Fig. 45 on page 39.

Outdoor Air Thermistor (OAT) — This thermistor for 38APD/APS025-060 units is mounted close to the base of the unit. It must be mounted off the base rail for an accurate outdoor ambient temperature. See Fig. 46 on page 39 for mounting dimensions.

Return Gas Thermistor (RGT) — Return gas thermistors are mounted in thermistor wells. The well assembly consists of three parts, the thermistor well body, seal disc and nut. See Fig. 186. Remove seal disc and nut from the existing thermistor and install on the new thermistor. Before introducing a thermistor into the well body, add a small amount of thermal conductive grease to the thermistor well and end of probe. Insert the probe into well. Tighten the retaining nut $^1/_4$ turn past finger tight using a back-up wrench. Be sure to loop cable and secure with a wire tie to create a strain relief as shown in Fig. 48 on page 40. Once in place and wired, insulate the device with cork insulation tape, similar to Presstite, to form a watertight seal around the thermistor and minimize the ambient influence on the sensor.

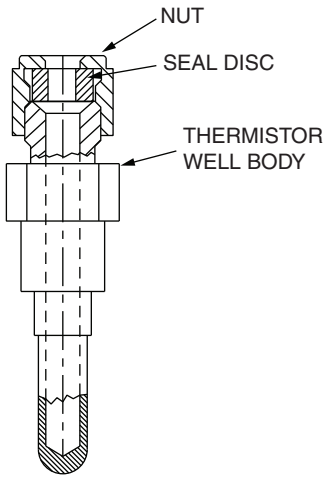


Fig. 186 — Thermistor Well Assembly

Table 73 — 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 74 — 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 75 — 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 76 — 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 77 — 86K Thermistor Temperatures (°C/°F) vs. Resistance

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

MAINTENANCE

Recommended Maintenance Schedule — The following are recommended guidelines only. Jobsite conditions may dictate that maintenance schedule be 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.
- Check accuracy of transducers, replace if greater than ± 5 psig (35 kPa) variance from calibrated gage.
- 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.
- Lubricate fan shaft with rust inhibitor, propeller-style (metal) or AeroAcoustic fans with gray bolt, if necessary.
- Lubricate door hinges.
- Perform service test to confirm operation of all components.
- If the unit is equipped with a UPC, check the battery and replace if necessary.
- If the unit is equipped with a ground fault interrupter-convenience outlet, GFI-CO (208/230, 460, or 575-3-60 only), test the operation of the device. Replace if necessary.

Lubrication

CONDENSER FAN BLADES — Two types of condenser fans are offered in the 38AP units. Each is addressed below.

Propeller (Metal) Fan and AeroAcoustic Fan with Gray Bolt — The fan shaft and hub are greased during the assembly process in the factory. If grease is required, the recommended grease is Tectyl 506G (Ashland Petroleum Company).

AeroAcoustic Fan with Black Bolt — This assembly uses Loctite 680 Retaining Compound. DO NOT lubricate the fan shaft or fan hub.

CONDENSER FAN MOTOR BEARINGS — The condenser fan motors have sealed bearings so no field lubrication is required.

DOOR HINGES — All door hinges should be lubricated at least once a year.

Microchannel Heat Exchanger (MCHX) Maintenance and Cleaning Recommendations —

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. Once coil maintenance is complete, using the scrolling marquee or Navigator™ display to indicate to the control Coil Cleaning Maintenance Done (***Run Status→PM→COIL→C.L.MN***), by toggling the value from **NO** to **YES**.

1. Remove any foreign objects or debris attached to the core face 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.

⚠ CAUTION

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

4. Clean condenser face by spraying the coil steadily and uniformly from top to bottom while directing the spray straight toward the coil. Do not exceed 900 psig or 30 degree angle. The nozzle must be at least 12 in. from the coil 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.

Navigator™ Display Module — The Navigator module can be cleaned with a mild detergent. Isopropyl alcohol or a glass cleaner can be used on all Navigator surfaces.

Refrigeration Circuit

LEAK TESTING — Units are shipped with a nitrogen holding charge which must be removed prior to charging the system with R-410A. If there is no pressure in the system, introduce enough nitrogen to search for the leak. Repair the leak using good refrigeration practices. After leaks are repaired, system must be evacuated and dehydrated using methods described in GTAC II, Module 4, System Dehydration.

CHARGING — If charging is required, see Start-Up section on page 41 for charging procedures.

Ground Fault Interrupter-Convenience Outlet (GFI-CO) — Some units may be equipped with a ground fault interrupter-convenience outlet, GFI-CO (208/230, 460, or 575-3-60 only). Periodically, test the ground fault feature of this device. Test the GFI-CO by pressing the "Test" button on the device and check for power at the device. If the device is incorrectly wired, the GFI-CO may not trip and power may be present at the outlet. If power is present, disconnect all power to the unit and confirm wiring. If wiring is correct, replace the device.

If no power is present following the test, reset the device. To restore power to the device, press the "Reset" button on the GFI-CO.

TROUBLESHOOTING

Table 78 is an abbreviated list of symptoms, probable causes, and potential remedies.

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 listed in Table 79. Active pre-alerts/alerts/alarms are shown in Currently Active Alarms, ***Alarms→CRNT***. Up to 20 current alarms will be displayed. Pressing ENTER and ESCAPE buttons simultaneously will expand the alarm code description only. Time and date stamps are available in Alarm History.

If the unit is in alarm and unable to operate, Control Mode will show ***Run Status→VIEW→STAT*=4** (Off Emrgcy). Automatic alarms will reset without operator intervention if the condition corrects itself. Manual alarms will require operator intervention to reset the alarm.

RESETTING ALARMS — Before resetting any alarm, first determine the cause of the alarm and correct it. After determining and correcting the cause of the alarm, toggle ***Alarms→RCRN*** (Reset All Current Alarms) from **NO** to **YES**. The control may prompt the user for a password, by displaying PASS and WORD. See Configuration and Service Password on page 22 for information on the password. If the condition has been resolved, the alerts/alarms will be cleared from the active alert/alarm set.

ALARM HISTORY — The scrolling marquee and Navigator™ display have the ability to display the latest alarms and alerts up to 20 events. This is a first-in, first-out alarm buffer. As a Pre-alert, Alert, or Alarm is generated, it is written to the Alarm History. To access Alarm History, enter ***Alarms→HIST***. Use the arrow keys to move through the history. The latest pre-alerts, alerts and alarms will appear first on the list. Pressing ENTER and ESCAPE simultaneously will provide a time and date stamp and expand the pre-alert/alert/alarm code.

Table 78 — Troubleshooting

SYMPTOM	POSSIBLE CAUSES	POSSIBLE REMEDIES
Unit does not run	Check for power to unit	Check overcurrent protection device. Check non-fused disconnect (if equipped). Restore power to unit. Check for 24 volts at the control boards.
	Wrong/incorrect unit configuration	Check unit configuration. If unit is controlled by a Local Schedule, check to be sure that the Day of the Week is properly set. Enable-Off-Remote Switch is not in a position to allow the unit to operate. Fan Status Switch is open.
	Active alarm	Check alarm status. See Alarms and Alerts beginning on page 162 and follow troubleshooting instructions.
	Active operating mode	Check for Operating Modes. See the Operating Modes section beginning on page 135 and follow troubleshooting instructions.
	No cooling load	Cooling Load is satisfied.
Unit runs when it is not called for	Incorrect unit configuration	If unit is controlled by a Local Schedule, check to be sure that the Day of the Week is properly set.
Unit operates too long or continuously	Low refrigerant charge	Check for leak and add refrigerant.
	Compressor or control contacts welded	Replace contactor or relay.
	Non-condensables in refrigerant circuit	Remove refrigerant and recharge.
Circuit does not run	Active alarm	Check alarm status. See Alarms and Alerts beginning on page 162 and follow troubleshooting instructions.
	Active operating mode	Check for Operating Modes. See the Operating Modes section beginning on page 135 and follow troubleshooting instructions.
Circuit does not load	Active alarm	Check alarm status. See Alarms and Alerts beginning on page 162 and follow troubleshooting instructions.
	Active operating mode	Check for Operating Modes. See the Operating Modes section beginning on page 135 and follow troubleshooting instructions.
	Low Saturated Suction Temperature	See Alarms, Pre-Alerts, and Alerts A120, A121, P120,121, T120,121, page 168.
	Faulty compressor discharge check-valve	Replace compressor.
Compressor does not run	Active alarm	Check alarm status. See Alarms and Alerts beginning on page 162 and follow troubleshooting instructions.
	Active operating mode	Check for Operating Modes. See the Operating Modes section beginning on page 135 and follow troubleshooting instructions.
	Inoperative compressor contactor	Check control wiring. Check contactor operation, replace if necessary.

Table 79 —Alarm and Alert Codes

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	DETAILS PAGE REFERENCE
COMM FAIL	Alert	Communications Failure	If communications between the scrolling marquee and the Main Base Board (MBB) are lost, unit may continue to run. If the communication is internal to the MBB, the unit will shut down or not be allowed to start.	Automatic once communciations are re-established	166
T048	Alert	Circuit A Compressor Availability Alert	Circuit is shut down	Manual	166
T049	Alert	Circuit B Compressor Availability Alert	Circuit shut down	Manual	166
A051	Alarm	Circuit A, Compressor 1 Stuck On Failure	All compressor outputs de-energized. Head pressure control remains active.	Manual	166
T051	Alert	Circuit A, Compressor 1 Chattering Failure	Affected compressor is shut down	Manual	166
		Circuit A, Compressor 1 Failure	Affected compressor is shut down	Manual	166
A052	Alarm	Circuit A, Compressor 2 Stuck On Failure	All compressor outputs de-energized. Head pressure control remains active.	Manual	166
T052	Alert	Circuit A, Compressor 2 Chattering Failure	Affected compressor is shut down	Manual	166
		Circuit A, Compressor 2 Failure	Affected compressor is shut down	Manual	166
A053	Alarm	Circuit A, Compressor 3 Stuck On Failure	All compressor outputs de-energized. Head pressure control remains active.	Manual	166
T053	Alert	Circuit A, Compressor 3 Chattering Failure	Affected compressor is shut down	Manual	166
		Circuit A, Compressor 3 Failure	Affected compressor is shut down	Manual	166
A055	Alarm	Circuit B, Compressor 1 Stuck On Failure	All compressor outputs de-energized. Head pressure control remains active.	Manual	166
T055	Alert	Circuit B, Compressor 1 Chattering Failure	Affected compressor is shut down	Manual	166
		Circuit B, Compressor 1 Failure	Affected compressor is shut down	Manual	166
A056	Alarm	Circuit B, Compressor 2 Stuck On Failure	All compressor outputs de-energized. Head pressure control remains active.	Manual	166
T056	Alert	Circuit B, Compressor 2 Chattering Failure	Affected compressor is shut down	Manual	166
		Circuit B, Compressor 2 Failure	Affected compressor is shut down	Manual	166
A057	Alarm	Circuit B, Compressor 3 Stuck On Failure	All compressor outputs de-energized. Head pressure control remains active.	Manual	166
T057	Alert	Circuit B, Compressor 3 Chattering Failure	Affected compressor is shut down	Manual	166
		Circuit B, Compressor 3 Failure	Affected compressor is shut down	Manual	166
A060	Alarm	Supply Air Thermistor Failure	Unit shut down	Automatic	167
	Alarm	Remote Supply Air Temperature Update not received	Unit shut down	Automatic	167
A061	Alarm	Return Air Thermistor Failure	Unit shut down	Automatic	167
	Alarm	Remote Return Air Temperature Update not received	Unit shut down	Automatic	167
T068	Alert	Circuit A Return Gas Thermistor Failure	Circuit shut down	Automatic	167
T069	Alert	Circuit B Return Gas Thermistor Failure	Circuit shut down	Automatic	167
T073	Alert	Outside Air Thermistor Failure	Outside Air Temperature Reset will be disabled and the unit will run under normal set point control. Outdoor Ambient Lockout is disabled.	Automatic	167
T074	Alert	Space Temperature Thermistor Failure	Space Temperature Reset will be disabled.and the unit will run under normal set point control.	Automatic	167
T082	Alert	Space Temperature Offset Sensor Failure	Space Temperature Offset disabled. Unit will run under normal control without space temperature offset.	Automatic	167
T090	Alert	Circuit A Discharge Pressure Transducer Failure	Circuit A shut down	Automatic	167
T091	Alert	Circuit B Discharge Pressure Transducer Failure	Circuit B shut down	Automatic	167

LEGEND

A/D — Analog/Digital
AUX — Auxiliary
EEPROM — Electrically Erasable Programmable Read-Only Memory

Table 79 —Alarm and Alert Codes (cont)

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	EXPLANATION PAGE REFERENCE
T092	Alert	Circuit A Suction Pressure Transducer Failure	Circuit is shut down	Automatic	167
T093	Alert	Circuit B Suction Pressure Transducer Failure	Circuit is shut down	Automatic	167
T094	Alert	Discharge Gas Thermistor Failure	Digital compressor is disabled	Automatic	167
T110	Alert	Circuit A Loss of Charge	Circuit is not allowed to start	Manual	168
T111	Alert	Circuit B Loss of Charge	Circuit is not allowed to start	Manual	168
T112	Alert	Circuit A High Suction Temperature	Circuit is shut down	Manual	168
T113	Alert	Circuit B High Suction Temperature	Circuit is shut down	Manual	168
T114	Alert	Circuit A Low Suction Superheat	Circuit is shut down	Manual	168
T115	Alert	Circuit B Low Suction Superheat	Circuit is shut down	Manual	168
P118	Pre-Alert	High Discharge Gas Temperature	This is a non-broadcast alarm. Compressor A1 is shut down.	Automatic, when discharge temperature is less than 250 F (121.1 C).	168
T118	Alert	High Discharge Gas Temperature	Compressor A1 is shut down.	Manual	168
A120	Alarm	Circuit A Low Saturated Suction Temperature Alarm	Circuit is shut down	Manual	168
P120	Pre-Alert	Circ.A Low Sat. Suct.Temp — One Comp Shutdown	This is a non-broadcast alarm. If more than one compressor in the circuit is running, one of the compressors will be shut down. A 15-minute prohibition timer is added to the compressor.	Automatic	168
T120	Alert	Circuit A Low Saturated Suction Temperature Alert	The circuit is shut down. A 15-minute prohibition timer is added to the last compressor.	Automatic	168
A121	Alarm	Circuit B Low Saturated Suction Temperature Alarm	Circuit is shut down	Manual	168
P121	Pre-Alert	Circ.B Low Sat. Suct.Temp — One Comp Shutdown	This is a non-broadcast alarm. If more than one compressor in the circuit is running, one of the compressors will be shut down. A 15-minute prohibition timer is added to the compressor.	Automatic	168
T121	Alert	Circuit B Low Saturated Suction Temperature Alert	The circuit is shut down. A 15-minute prohibition timer is added to the last compressor.	Automatic	168
P122	Pre-Alert	Circuit A High Pressure Switch Chattering	This is a non-broadcast alarm. Circuit shuts down or is not allowed to start. A 15-minute prohibition timer is added to the circuit restart.	Automatic	169
		Circuit A High Pressure Switch Trip	This is a non-broadcast alarm. Circuit shuts down or is not allowed to start. A 15-minute prohibition timer is added to the circuit restart.	Automatic	170
T122	Alert	Circuit A High Pressure Switch Chattering	Circuit is shut down or is not allowed to start	Manual	169
		Circuit A High Pressure Switch Trip	Circuit is shut down or is not allowed to start	Manual	170
P123	Pre-Alert	Circuit B High Pressure Switch Chattering	This is a non-broadcast alarm. Circuit shuts down or is not allowed to start. A 15-minute prohibition timer is added to the circuit restart.	Automatic	169
		Circuit B High Pressure Switch Trip	This is a non-broadcast alarm. Circuit shuts down or is not allowed to start. A 15-minute prohibition timer is added to the circuit restart.	Automatic	170
T123	Alert	Circuit B High Pressure Switch Chattering	Circuit is shut down or is not allowed to start	Manual	169
		Circuit B High Pressure Switch Trip	Circuit is shut down or is not allowed to start	Manual	170
A126	Alarm	Circuit A High Head Pressure	Circuit is shut down	Manual	170
T126	Alert	Circuit A High Head Pressure	Circuit is shut down	Automatic	170
A127	Alarm	Circuit B High Head Pressure	Circuit is shut down	Manual	170
T127	Alert	Circuit B High Head Pressure	Circuit is shut down	Automatic	170
A140	Alarm	Reverse Rotation Detected	Unit is shut down	Manual	171
A150	Alarm	Unit Is In Emergency Stop	Unit is shut down or is not allowed to start	Automatic	173

LEGEND

A/D — Analog/Digital
AUX — Auxiliary
EEPROM — Electrically Erasable Programmable Read-Only Memory

Table 79 —Alarm and Alert Codes (cont)

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	DETAILS PAGE REFERENCE
A151	Alarm	Illegal Configuration - AUX Board Incorrect Revision Illegal Configuration - AUX Board Software Rev Must be 3 or Higher Illegal Configuration - AUX Board should be AUX1, Not AUX2 Illegal Configuration - Control Type Set to Invalid Type for Split Illegal Configuration - Dual Thermostat Type on Single Ckt Unit Illegal Configuration - Dual Thermostat and Switch Demand Limit Illegal Configuration - Invalid Unit Size Has Been Entered Illegal Configuration - Unit Configuration Set to Invalid Type	Unit is not allowed to start	Automatic	173
A152	Alarm	Unit Down Due to Multiple Failures	Unit is not allowed to start	Automatic	174
T153	Alert	Real Time Clock Hardware Failure	Occupancy Schedules are disabled. Unit changes to Occupied and operates under local control.	Automatic	174
A154	Alarm	Serial EEPROM Hardware Failure	Unit is shut down or is not allowed to start	Manual	174
T155	Alert	Serial EEPROM Storage Failure	None	Manual	174
A156	Alarm	Critical Serial EEPROM Storage Failure Error	Unit is shut down or is not allowed to start	Manual	174
A157	Alarm	A/D Hardware Failure	Unit is shut down or is not allowed to start	Manual	174
T170	Alert	Loss of Communication with the Compressor Expansion Module	Compressor Expansion Module functions are disabled	Automatic	174
T173	Alert	Loss of Communication with the Energy Management Module	Energy Managemet Module functions are disabled	Automatic	174
T174	Alert	4-20 mA Cooling Setpoint Input Failure	For ***Configuration→OPT2→C.TYP=7*** without Return Air and Supply Air Thermistors, unit is shut down or not allowed to start. For ***Configuration→OPT2→C.TYP=9***, 4-20 mA set point function is disabled. For ***Configuration→OPT2→C.TYP=7*** with Return Air and Supply Air Thermistors, or ***C.TYP=9***, unit operates with Cooling Set Point 1 ***Setpoints→COOL→CSP.1*** as the Active Set Point ***Run Status→VIEW→ SETP***	Automatic	174
A175	Alarm	Loss of Communication with AUX Board	AUX Board functions, digital compressor and Motormaster® operations are disabled	Automatic	175
T176	Alert	4-20 mA Reset Input Failure	4-20 mA Cooling Temperature Reset function is disabled	Automatic	175
T177	Alert	4-20 mA Demand Limit Failure	4-20 mA Cooling Demand Limit function is disabled	Automatic	175
A200	Alarm	Indoor Fan Status Failure — Fan Not Running	Unit is shut down or is not allowed to start	Automatic	175
T201	Alert	Circuit A Indoor Fan Status Failure — Fan Not Running	Circuit is shut down or is not allowed to start	Automatic	175
T202	Alert	Circuit B Indoor Fan Status Failure — Fan Not Running	Circuit is shut down or is not allowed to start	Automatic	175
T303	Alert	Coil — Scheduled Maintenance Due	None	Manual	175
T500	Alert	Current Sensor Board Failure — A1	Compressor A1 is shut down	Automatic	175
T501	Alert	Current Sensor Board Failure — A2	Compressor A2 is shut down	Automatic	175
T502	Alert	Current Sensor Board Failure — A3	Compressor A3 is shut down	Automatic	175
T503	Alert	Current Sensor Board Failure — B1	Compressor B1 is shut down	Automatic	175
T504	Alert	Current Sensor Board Failure — B2	Compressor B2 is shut down	Automatic	175
T505	Alert	Current Sensor Board Failure — B3	Compressor B3 is shut down	Automatic	175

LEGEND

A/D — Analog/Digital
AUX — Auxiliary
EEPROM — Electrically Erasable Programmable Read-Only Memory

ALARM AND ALERT DETAILS

COMM FAIL — Communication Failure

Criteria for Trip: This alarm is generated any time the LEN (Local Equipment Network) communication is lost. An A152 alarm may be generated also.

Action To Be Taken: If communication between the scrolling marquee and Main Base Board is lost, the unit may continue to run. If problem is internal to the Main Base Board, the machine shuts down or is not allowed to start.

Reset Method: Automatic once communication is restored.

Possible Causes: If this condition is encountered, check the following items:

- Check the MBB Instance Jumper. It should be set to "1." If it is missing or installed on "2," this alarm will be generated.
- Check the LEN for a wiring error or short to ground.
- Check all Input connections for a short to ground.
- Check the machine grounding.
- Check the power supply for the Main Base Board. It should be 24 vac. Voltages less than 18 vac can cause this problem.
- If the unit has an AUX Board installed and is not addressed correctly, it will cause a COMM FAIL alarm. Check the AUX Board address.

T048 — Circuit A Compressor Availability Alert

T049 — Circuit B Compressor Availability Alert

Criteria for Trip: This alarm is generated any time another alarm has locked out at least one compressor on 2-compressor circuits or 2 compressors in a 3-compressor circuit. As a result, the unit will not have enough compressors available to perform the oil management routine. The control will shut the circuit down.

Action To Be Taken: The circuit shuts down or is not allowed to start.

Reset Method: Manual

Possible Causes: If this condition is encountered, check the following items:

- See the offending alarm.
- For 2-compressor circuit units, the routine will require both compressors to operate for the oil management routine. If one compressor fails, the T048/T049 alert will be generated. This feature can be disabled by changing the value of ***TCOM***, Two Comp Ckt Oil Mgmt (***Configuration→SERV***) from **ENBL** to **DSBL**. Caution must be exercised when making this change to ensure oil return at all loading conditions.

A051 — Compressor A1 Stuck On Failure

A052 — Compressor A2 Stuck On Failure

A053 — Compressor A3 Stuck On Failure

A055 — Compressor B1 Stuck On Failure

A056 — Compressor B2 Stuck On Failure

A057 — Compressor B3 Stuck On Failure

Criteria for Trip: The following conditions must be true:

1. A compressor OFF command must be called for by the MBB 10 seconds prior.
2. The compressor Current Sensing Board (CS) detects compressor current for a period of 4 continuous seconds while the compressor is commanded OFF.

Action To Be Taken: The affected compressor is commanded OFF. The head pressure control algorithm will be activated to energize fans to maintain proper head pressure. All other compressors will be commanded OFF.

Reset Method: Manual

Possible Causes: If this condition is encountered, check the following items:

- Check for a welded compressor contactor.
- Check for a faulty Current Sensing Board.
- Check the Main Base Board relay output for the compressor command.
- Check for a wiring error.

T051 — Circuit A, Compressor 1 Chattering Failure

T052 — Circuit A, Compressor 2 Chattering Failure

T053 — Circuit A, Compressor 3 Chattering Failure

T055 — Circuit B, Compressor 1 Chattering Failure

T056 — Circuit B, Compressor 2 Chattering Failure

T057 — Circuit B, Compressor 3 Chattering Failure

Criteria for Trip: The following conditions must be true:

1. The compressor is commanded ON.
2. The current sensor does not detect steady compressor current while the compressor is commanded ON.

Action To Be Taken: The compressor is turned OFF.

Reset Method: Manual

Possible Causes: If this condition is encountered, check the following items:

- Check refrigerant charge. A chattering high pressure switch can cause this alarm.
- Check compressor contactor wiring.
- Check control voltage.
- Check for a wiring error.

T051 — Circuit A, Compressor 1 Failure

T052 — Circuit A, Compressor 2 Failure

T053 — Circuit A, Compressor 3 Failure

T055 — Circuit B, Compressor 1 Failure

T056 — Circuit B, Compressor 2 Failure

T057 — Circuit B, Compressor 3 Failure

Criteria for Trip: The following conditions must be true:

1. The compressor is commanded ON.
2. The current sensor does not detect compressor current while the compressor is commanded ON.

Action To Be Taken: The compressor is turned OFF.

Reset Method: Manual

Possible Causes: If this condition is encountered, check the following items:

- Check for a Compressor Overload trip. Either the compressor internal overload protector is open or the external overload protector (Kriwan/CoreSense module) has activated.
- If the unit is a 208/230 volt unit, be sure that the control transformer is wired to the correct voltage tap. Low voltage to the Current Sensing Board can cause this alarm.
- Check the unit for low refrigerant charge. If the compressor operates for an extended period of time with low refrigerant charge, the compressor advanced scroll temperature protection (ASTP) device will open, which will cause the compressor to trip on its overload protection device.
- Check for a compressor circuit breaker trip.
- Check the Current Sensing Board to be sure that it is operating correctly.
- Check for a wiring error.
- For compressors that use the Kriwan/CoreSense compressor protection module, check the following items:

  -Check the motor temperature lead connection.

  -If the compressor is a replacement compressor, verify that the correct Kriwan/CoreSense module is installed. Replacement compressors are shipped with a 115-volt module. The 38AP units operate with a 24-volt module

that is shipped with the compressor, but not installed. The 115-volt module must be removed and replaced with the 24-volt module shipped with the compressor. Failure to do so will not allow the M1-M2 contacts to close, resulting in this alarm.

A060 — Supply Air Thermistor Failure

A060 — Supply Air Temperature Update Not Received

A061 — Return Air Thermistor Failure

A061 — Return Air Temperature Update Not Received

Criteria for Trip: Two alarm criteria are used:

- The sensor is required for the Control Type (***Configuration→OPT2→C.TYP*=1, 3, 5, or 9**) and the sensor reading is outside the range of –40 to 245 F (–40 to 118 C). If this condition is true, the thermistor failure alarm will be generated.
- If the sensor is required for the Control Type (***C.TYP*=1**, 3, 5, or 9) and the sensor is being written to by CCN or a third-party control, the sensor must be updated every 3 minutes. If it is not updated, then the Update Not Received alarm will be generated.

Action To Be Taken: The unit will be shut down.

Reset Method: Automatic, once the condition is resolved

Possible Causes: If this condition is encountered, check the following items:

- Check for a faulty thermistor.
- Check for a wiring error.
- If temperatures are being transmitted, check transmission timing and communication wiring.

T068 — Circuit A Compressor Return Gas Temperature Thermistor Failure

T069 — Circuit B Compressor Return Gas Temperature Thermistor Failure

Criteria for Trip: This alert occurs when the compressor return gas temperature thermistor is outside the range of –40 to 245 F (–40 to 118 C).

Action To Be Taken: Circuit is shut down.

Reset Method: Automatic, once the condition resolves

Possible Causes: If this condition is encountered, check the following items:

- Check for a faulty thermistor.
- Check for a wiring error.

T073 — Outside Air Thermistor Failure

Criteria for Trip: This alert occurs when the outdoor air temperature thermistor is outside the range of –40 to 245 F (–40 to 118 C).

Action to be taken: If the unit is set for outdoor air temperature reset, reset will be disabled and the unit will run under normal set point control.

If the unit is configured to use outdoor ambient lockout, the unit will be shut down or not allowed to start. If the unit is required to be operating, disable Low Ambient Lockout, ***Set Points→COOL→OAT.L*= 20 F** (–28.9 C).

Reset Method: Automatic, once the condition resolves.

Possible Causes: If this condition is encountered, check the following items:

- Check for a faulty thermistor.
- Check for a wiring error.

T074 — Space Temperature Thermistor Failure

Criteria for Trip: This alert occurs when the Space Temperature Thermistor is outside the range of –40 to 245 F (–40 to 118 C).

Action To Be Taken: If the sensor is being used as the control input to determine capacity ***Configuration→OPT2→ C.TYP*=5** (SPT Multi), the control's response depends on the failure mode. If the sensor fails open, the unit will be OFF with the Control Mode, ***Run Status→VIEW→STAT*=9** (SPT Satisfied) and Space Temp Control Mode, ***Run Status→ VIEW→SPT.M*=0** (Cool Off). If the sensor fails closed or shorted, the unit will be ON and Space Temp Control Mode, ***Run Status→VIEW→SPT.M*=2** (Hi Cool).

If the sensor is being used to support space temperature reset, the function will be disabled and the unit will continue to run.

Reset Method: Automatic, once the condition resolves.

Possible Causes: If this condition is encountered, check the following items:

- Check for a faulty thermistor.
- Check for a wiring error.
- Check to see that the override button has not permanently shorted the sensor. Holding the button down too long for an override period will cause this alarm.

T082 — Space Temperature Offset Sensor Failure

Criteria for Trip: This alert occurs when the space temperature offset potentiometer is outside the range of –40 to 356 F (–40 to 180 C).

Action To Be Taken: Space temperature offset function will be disabled. The unit will run under normal control without the space temperature offset.

Reset Method: Automatic, once the condition resolves.

Possible Causes: If this condition is encountered, check the following items:

- Check for a faulty offset potentiometer.
- Check for a wiring error.

T090 — Circuit A Discharge Pressure Transducer Failure

T091 — Circuit B Discharge Pressure Transducer Failure

Criteria for Trip: Transducer reading is outside the range of 0.0 to 667.0 psig (0.0 to 4599 kPa).

Action To Be Taken: Circuit is shut down.

Reset Method: Automatic, once the condition resolves.

Possible Causes: If this condition is encountered, check the following items:

- Check for a faulty transducer.
- Check for a wiring error.
- Check the Main Base Board transducer channel for proper operation.

T092 — Circuit A Suction Pressure Transducer Failure

T093 — Circuit B Suction Pressure Transducer Failure

Criteria for Trip: Transducer reading is outside the range of 0.0 to 420.0 psig (0.0 to 2896 kPa).

Action To Be Taken: Circuit is shut down.

Reset Method: Automatic, once the condition resolves.

Possible Causes: If this condition is encountered, check the following items:

- Check for a faulty transducer.
- Check for a wiring error.
- Check the Main Base Board transducer channel for proper operation.

T094 — Discharge Gas Thermistor Failure

Criteria for Trip: The following conditions must be true:

1. The unit must have a digital compressor installed and enabled on circuit A.
2. Discharge gas temperature is outside the range of –40 to 350 F (–40 to 177 C).

Action To Be Taken: The digital compressor operation is discontinued.

Reset Method: Automatic, once the condition resolves.

Possible Causes: If this condition is encountered, check the following items:
- Check the wiring for the discharge temperature thermistor (DTT).
- Check the discharge temperature thermistor for accuracy.
- Check the unit refrigerant charge.
- If the unit does not include a digital compressor, check the configuration to be sure that a digital compressor is not enabled, ***Configuration→UNIT→A1.TY*=NO**
- If the unit has been configured for a digital compressor and communication with the AUX Board has been lost (T175 — Loss of Communication with AUX Board), this alarm will be generated. Resolve the T175 issue and the alarm should clear.

T110 — Circuit A Loss of Charge

T111 — Circuit B Loss of Charge

Criteria for Trip: The following conditions must be true:

1. The circuit is OFF.
2. The circuit's discharge pressure is less than 26 psi (179.3 kPa).

The alert criteria are ignored during the following conditions:

1. The first minute following power-up
2. If the outdoor air temperature is less than –5 F (–20.6 C)
3. For 1 minute following the outdoor air temperature rising above –5 F (–20.6 C)

Action To Be Taken: The circuit is not allowed to start.

Reset Method: Manual

Possible Causes: If this condition is encountered, check the following items:
- Check the refrigerant charge for the circuit.
- Check the discharge pressure transducer for the circuit for accuracy.
- Check the discharge pressure transducer wiring.
- Check the outside air thermistor (OAT) sensor for accuracy.
- Check the outside air thermistor (OAT) sensor wiring.

T112 — Circuit A High Suction Temperature

T113 — Circuit B High Suction Temperature

Criteria for Trip: The following conditions must be true:

1. The circuit is ON.
2. The circuit's saturated suction temperature is greater than 70 F (21.1 C) after 5 minutes of operation.

Action To Be Taken: The circuit is shutdown.

Reset Method: Manual

Possible Causes: If this condition is encountered, check the following items:
- Check the TXV operation.
- Check to be sure the TXV bulb is correctly located.
- Check TXV equalizer line if properly installed
- Check TXV capacity is proper for the application.
- Check for high return air temperatures.
- Check the suction pressure transducer for the circuit for accuracy.

T114 — Circuit A Low Suction Superheat

T115 — Circuit B Low Suction Superheat

Criteria for Trip: The following conditions must be true:

1. The circuit is ON.
2. The circuit superheat is less than 5 F (2.8 C) for 5 continuous minutes.

Superheat is a calculated value based on saturated suction temperature converted from the circuit suction pressure and return gas temperature. In units with a digital compressor, the compressor's operation will cause the suction pressure to rise and fall when operating. In this case, suction pressure is an average or the lowest suction pressure readings over the period of time. This has the tendency to artificially increase the reported superheat, since the lowest suction pressure (saturated suction temperature) is used.

Action To Be Taken: The circuit is shut down.

Reset Method: Manual.

Possible Causes: If this condition is encountered, check the following items:
- Check the charge for the system.
- Check the TXV for proper installation and operation.
- Check the TXV for proper sizing.
- Check the evaporator coil for a refrigerant restriction.
- Check for airflow during operation.
- Check the suction pressure transducer for accuracy.
- Check the return gas thermistor for accuracy.
- Check to be sure the return gas thermistor for the circuit is insulated with cork insulation tape to obtain a more accurate reading.

P118 — High Discharge Gas Temperature

T118 — High Discharge Gas Temperature

Criteria for Trip: This alert is part of the compressor protection algorithm for digital compressor units. The following conditions must be true:

1. This alert will be triggered if the unit has a digital compressor and it is enabled (***Configuration→UNIT→ A1.TY=YES***).
2. The discharge gas temperature (***Temperatures→ CIR.A→D.GAS***) is greater than 268 F (131.1 C).

Action To Be Taken: Compressor A1 is shut down. If this is the first or second occurrence within a 32-minute window, the pre-alert P118 will be generated. This is a non-broadcast alert. If this is the third occurrence within the 32-minute window, the alert T118 is generated.

Reset Method: The first two times compressor A1 is shut down due to the pre-alert P118, the pre-alert will automatically reset after the discharge temperature is less than 250 F (121.1 C) and the compressor will restart. The third occurrence will result in the alert T118 and will require a manual reset.

Multiple P118 pre-alerts may be stored in the alarm history. 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.

Possible Causes: If this condition is encountered, check the following items:
- Check to be sure that the circuit is properly charged. If a leak is found, repair the leak and recharge the circuit.
- Check the discharge temperature thermistor (DTT) for accuracy.
- Check the discharge temperature thermistor (DTT) connections.

A120 — Circuit A Low Saturated Suction Temperature Alarm

A121 — Circuit B Low Saturated Suction Temperature Alarm

P120 — Circuit A Low Saturated Suction Temperature Pre-Alert

P121 — Circuit B Low Saturated Suction Temperature Pre-Alert

T120 — Circuit A Low Saturated Suction Temperature Alert

T121 — Circuit B Low Saturated Suction Temperature Alert

Criteria for Trip: This alert or alarm is used to keep the evaporator from freezing and the saturated suction temperature above the low limit for the compressors.

At least one compressor in the circuit must be ON and one of the following conditions must be true:

1. The circuit's saturated suction temperature is less than 20 F (–6.7 C) for 4 minutes continuously,
2. The circuit's saturated suction temperature is less than 10 F (–12.2 C) for 2 minutes continuously,
3. The circuit's saturated suction temperature is less than 0° F (–17.8 C) for 1 minute continuously,
4. The circuit's saturated suction temperature is less than –20 F (–28.9 C) for 20 seconds continuously.

Action To Be Taken: If the circuit contains more than one operating compressor and the operating conditions meet the criteria above, one compressor in the affected circuit will be shut down with an appropriate local alert (P120/P121) generated. This is a non-broadcast alert/alarm. The alarm LED will not be lit, nor will the pre-alert be broadcast on a network. A 15-minute time guard will be added to the compressor. If the saturated suction temperature continues to be less than the criteria listed above, then another compressor will be shut down until the last compressor on the circuit is shut down at which time the appropriate alert or alarm will be issued (T120, T121, A120, A121).

If the circuit contains one operating compressor and the operating conditions meet the criteria above, the affected circuit will be shut down and the appropriate alert (T120, T121) generated. A 15-minute time guard will be added to the compressor.

Reset Method: The first two occurrences that a circuit is shut down entirely due to this condition, 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 occurs, 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 15-minute 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 as well as T120 or T121 alerts may be stored in the alarm history. 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.

Possible Causes: If this condition is encountered, check the following items:

- Check to be sure that the circuit is properly charged. If a leak is found, repair the leak and recharge the circuit.
- Check for proper air flow for the evaporator coil.
- If the alarms are occurring during cold ambient conditions, consider installing Motormaster® head pressure control.
- If wind baffles are required, check to see if they are installed.
- Check the suction pressure transducer accuracy.
- Check for a low load condition (low return air temperature). Check the control system to see if the unit should be operating.
- In control systems which rely on the supply air temperature:
  - Check the accuracy of the supply air sensor.
  - Check the supply air temperature sensor to be sure that it is correctly sensing the mixed supply air temperature, especially in a face split coil.
- Check for restrictions in the liquid line. Be sure all service valves are open.
- Check the filter drier. Change the core(s) if necessary.
- Check the operation of the liquid line solenoid valves, if equipped. Be sure that the correct valve operates for the circuit.
- Be sure that the liquid line solenoid valve is installed correctly (flow), if equipped.
- For the circuit TXV(s):
  - Check the superheat setting of the TXV. A very high setting will cause low saturated suction condition.
  - Check to be sure the proper TXV is installed.
  - Check the operation of the TXV.
  - Check the location of the TXV bulb and that it is properly installed on the correct suction line.
  - Check the TXV equalizer line to be sure that it is properly connected to the correct suction line and open to suction pressure.
- Check for a low airflow condition. Low airflow can cause a low saturated suction condition.
- Check for dirty air filters causing an airflow restriction.
- Check the nozzle in the distributor to be sure it is correct.
- Check for a blocked or mis-circuited evaporator coil.

P122 - Circuit A High Pressure Switch Chattering Pre-Alert

P123 - Circuit B High Pressure Switch Chattering Pre-Alert

T122 - Circuit A High Pressure Switch Chattering

T123 - Circuit B High Pressure Switch Chattering

Criteria for Trip: This alert has multiple criteria. The Main Base Board (MBB) monitors the HPS. The 38AP units employ one HPS for each circuit. For High Pressure Switch Chattering Alert the following conditions must be true:

1. The circuit is ON or OFF.
2. The Main Base Board (MBB) detects a Closed-Open-Closed-Open pattern of the high pressure switch circuit within a 16-second window.

If all of the conditions listed above are true, a pre-alert (P122/P123) will be generated for the first two occurrences. This is a non-broadcast alert. The third occurrence will result in the alert (T122/T123). If the circuit runs for 15 minutes without tripping the pre-alert condition or if the circuit has cycled three times, the strike counter is reset.

Action To Be Taken: The circuit shuts down immediately or is not allowed to start.

Reset Method: The pre-alerts (P122/P123) will automatically reset for the first two occurrences of this condition. After the pre-alert is generated, there is a 15-minute time delay and the high pressure switch must reset before the circuit will attempt to restart. Following the second automatic reset of the pre-alert, the next occurrence (T122/T123) will require a manual reset.

Possible Causes: If this condition is encountered, check the following items:

- Check the wiring of the high pressure switch circuit.
- Check the wiring of the liquid line solenoid valve, if equipped. Be sure that the correct valve operates for the circuit.
- Check for non-condensables in the refrigerant circuit.
- Check for condenser air re-circulation.
- Check for the proper refrigerant charge (overcharged).
- Check for operation beyond the limit of the machine.
- Check the condenser coils for debris or restriction.
- Check the evaporator coil for a refrigerant restriction.
- For the TXV(s) (thermostatic expansion valves):
  - Check for the proper TXV. The 38AP units require bleed port TXVs. Failure to use this type of valve may result in high pressure switch trips at start-up.
  - Check the TXV for proper operation.
- Check the condenser fans and motors for proper rotation and operation.
- Check the liquid line service valve to be sure that it is open.

- Check to be sure that the long line check valve assembly is mounted correctly. The arrows indicate direction of flow.
- Check the Discharge Pressure Transducer for accuracy.

P122 - Circuit A High Pressure Trip Pre-Alert

P123 - Circuit B High Pressure Trip Pre-Alert

T122 - Circuit A High Pressure Trip

T123 - Circuit B High Pressure Trip

Criteria for Trip: This alert has multiple criteria. The Main Base Board (MBB) monitors the HPS (high pressure switch). The 38AP units employ one HPS for each circuit. For High Pressure Trip Pre-Alert and Alert:

1. The alarm criterion is checked when the circuit is ON or OFF.
2. The circuit HPS opens for 4 seconds or more.

If all of the conditions listed above are true a pre-alert (P122/P123) will be generated for the first two occurrences. This is a non-broadcast alert. The third occurrence will result in the alert (T122/T123). If the circuit runs for 15 minutes without tripping the pre-alert condition or if the circuit has cycled three times, the strike counter is reset.

Action To Be Taken: The circuit shuts down immediately or is not allowed to start.

Reset Method: The pre-alerts (P122/P123) will automatically reset for the first two occurrences of this condition. After the pre-alert is generated, there is a 15-minute time delay and the high pressure switch must reset before the circuit will attempt to restart. Following the second automatic reset of the pre-alert, the next occurrence (T122/T123) will require a manual reset.

Possible Causes: If this condition is encountered, check the following items:
- Check the wiring of the high pressure switch circuit.
- Check the wiring of the liquid line solenoid valve, if equipped. Be sure that the correct valve operates for the circuit.
- Check for non-condensables in the refrigerant circuit.
- Check for condenser air re-circulation.
- Check for the proper refrigerant charge (overcharged).
- Check for operation beyond the limit of the machine.
- Check the condenser coils for debris or restriction.
- Check the evaporator coil for a refrigerant restriction.
- For the TXV(s) (thermostatic expansion valves):
  - Check for the proper TXV. The 38AP units require bleed port TXVs. Failure to use this type of valve may result in High Pressure Switch Trips at start-up.
  - Check the TXV for proper operation.
- Check the condenser fans and motors for proper rotation and operation.
- Check the liquid line service valve to be sure that it is open.
- Check to be sure that the long line check valve assembly is mounted correctly. The arrows indicate direction of flow.
- Check the discharge pressure transducer for accuracy.

A126 - Circuit A High Head Pressure

T126 - Circuit A High Head Pressure

A127 - Circuit B High Head Pressure

T127 - Circuit B High Head Pressure

Criteria for Trip: The following conditions must be true:

1. The circuit is ON.
2. All outdoor fans for the circuit or all common outdoor fans must be ON.
3. The compressor's operation is outside of the operating envelope. See Fig. 156 and 157 on page 138 for the compressor operating envelope, or see the following calculations. These are shown graphically in Fig. 187 and 188.
   a. If circuit saturated suction temperature is greater than or equal to –20.0 F (–28.9 C) but less than –10.0 F (–23.3 C) and circuit saturated condensing temperature is greater than 2.5 times circuit saturated suction temperature + 140.0 F (104.4 C).
   b. If circuit saturated suction temperature is greater than or equal to –10.0 F (–23.3 C) but less than 15.0 F (–9.4 C) and circuit saturated condensing temperature is greater than circuit saturated suction temperature + 125.0 F (69.4 C).
   c. If circuit saturated suction temperature is greater than or equal 15.0 F (–9.4 C) but less than 40.0 F (4.4 C) and circuit saturated condensing temperature is greater than 0.4 times circuit saturated suction temperature + 134.0 F (63.8 C).
   d. If circuit saturated suction temperature is greater than or equal 40.0 F (4.4 C) but less than 45.0 F (7.3 C) and circuit saturated condensing temperature is greater than circuit saturated suction temperature + 110.0 F (61.1 C).
   e. If circuit saturated suction temperature is greater than or equal 45.0 F (7.3 C) and circuit saturated condensing temperature is greater than 155.0 F (68.3 C).

The first four daily occurrences of these conditions will generate a T126 or T127 alert for the appropriate circuit. With the fifth daily occurrence, the condition will generate the A126 or A127 alarm for the appropriate circuit.

Action To Be Taken: The circuit shuts down immediately.

Reset Method: For T126/T127, the alert will automatically reset for the first 4 daily occurrences once the circuit saturated condensing temperature falls below the trip criteria. The circuit will restart once the time guard has been satisfied. For A126/A127, the alarm requires a manual reset.

Possible Causes: If this condition is encountered, check the following items:
- Check for non-condensables in the refrigerant circuit.
- Check for condenser air re-circulation.
- Check for the proper refrigerant charge (overcharged).
- Check for operation beyond the limit of the machine.
- Check the condenser coils for debris or restriction.
- Check the evaporator coil for a refrigerant restriction.
- Check the TXV for proper operation.
- Check the condenser fans and motors for proper rotation and operation.
- Check the liquid line service valve to be sure that it is open.
- Check the suction and discharge pressure transducers for accuracy.
- Confirm unit configuration.

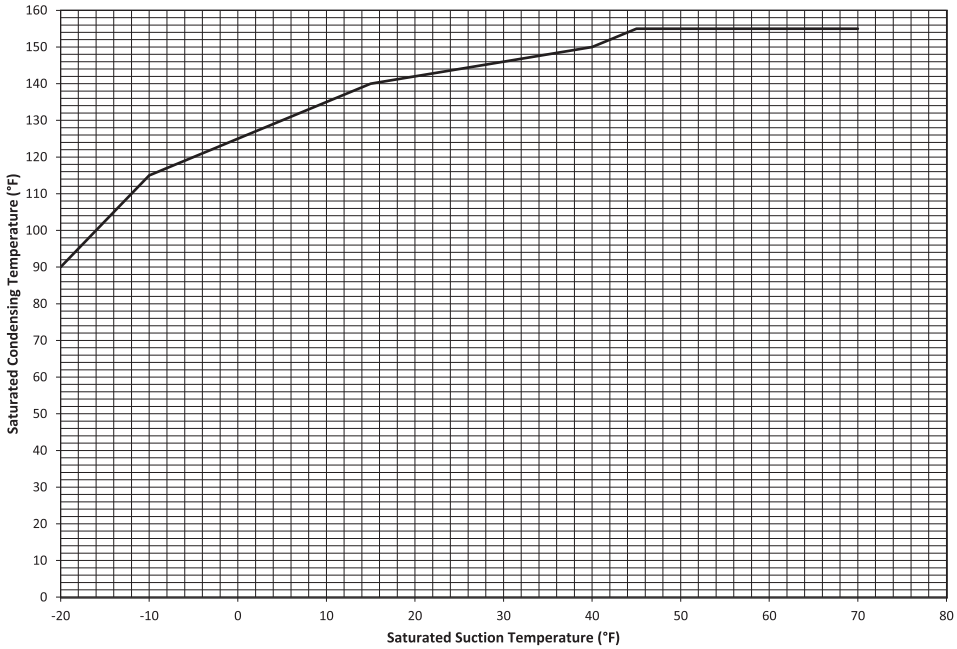


Fig. 187 — Maximum Saturated Condensing Temperature (°F)

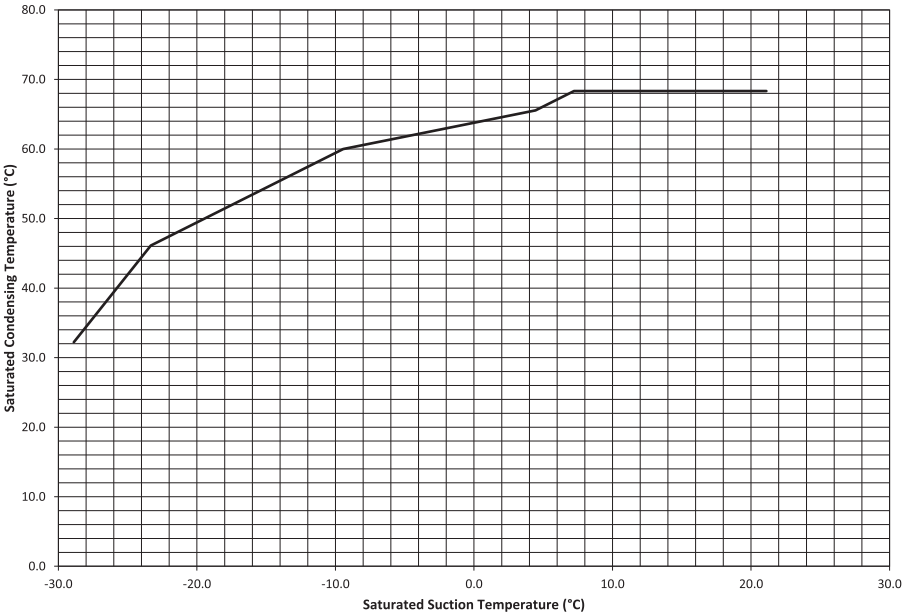


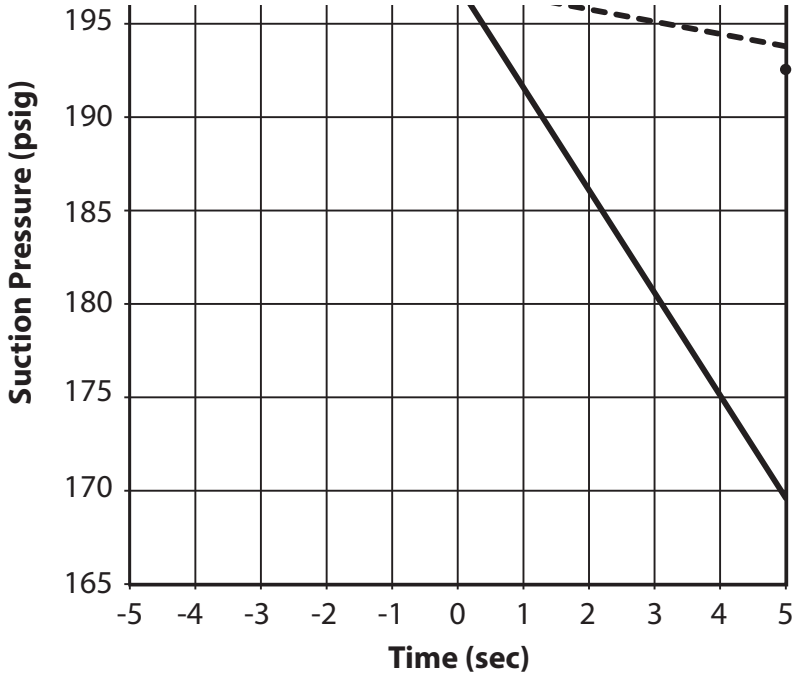
Fig. 188 — Maximum Saturated Condensing Temperature (°C)

A140 — Reverse Rotation Detected

Criteria for Trip: The alarm criterion is checked when the first compressor in a circuit is started. The control writes the value of the suction pressure 5 seconds before starting the first compressor in the circuit. At the time the compressor is started, another reading is obtained. A rate of change is calculated based on the two values and extrapolated to the expected value 5 seconds later. The suction pressure is obtained 5 seconds after the compressor has been started. If the suction pressure is not at least 1.25 psig (8.62 kPa) lower than the expected value or the upper limit for proof of proper rotation, a reverse rotation alarm is declared.

The example below lists sample suction pressures of a starting circuit. Figures 189 and 190 show reverse rotation detection for this example.

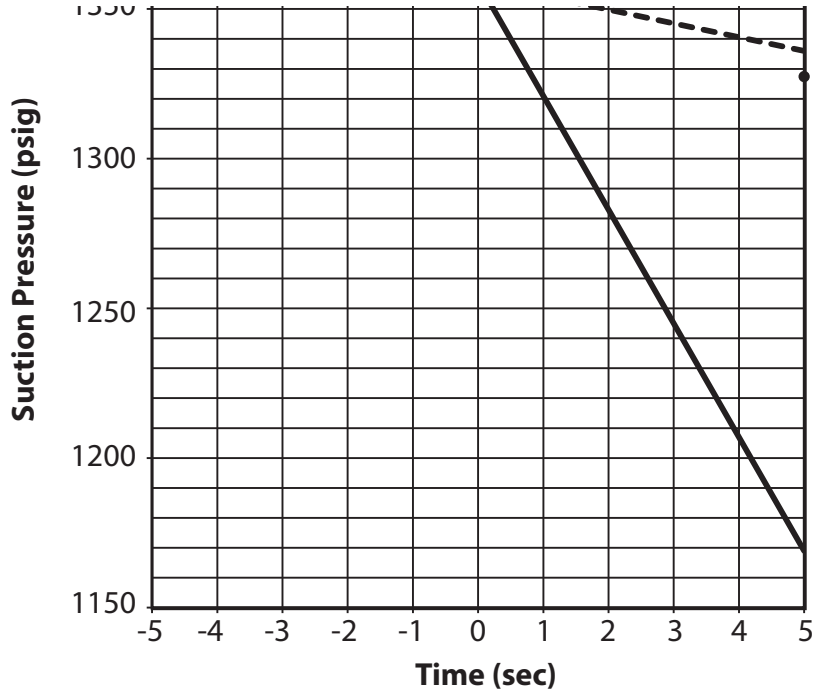
TIME	SUCTION PRESSURE psig (kPa)	SATURATED SUCTION TEMPERATURE °F (°C)
t=–5 (5 seconds before compressor start)	200.4 (1382)	70 (21.1)
t=0 (compressor start)	197.1 (1359)	69 (20.6)
t=5 (5 seconds after compressosr start)	169.6 (1169)	60 (15.6)



LEGEND

Suction Pressure (psig)
Extrapolated Suction Pressure (psig)
• Upper Limit for Proof of Proper Rotation (psig)

Fig. 189 — Reverse Rotation Detection (psig)



LEGEND

Suction Pressure (psig)
Extrapolated Suction Pressure (psig)
• Upper Limit for Proof of Proper Rotation (psig)

Fig. 190 — Reverse Rotation Detection (kPa)

Using the rate of change of the suction from the example, five (5) seconds after t=0, the suction pressure should be 193.8 psig (1336 kPa), if the compressor did not start. Subtracting the 1.25 psig (8.62 kPa) from extrapolated suction pressure, 192.55 psig (1328 kPa) determines the upper limit that if the suction pressure is above this level the unit will fault on reverse rotation. This point is denoted by a black dot in Fig. 189 and 190. In the example, the suction pressure is lower than the upper limit, and therefore is allowed to continue operation.

Action To Be Taken: The unit shuts down immediately.

Reset Method: Manual.

Possible Causes: If this condition is encountered, check the following items:

- Check the wiring of the incoming power for proper phasing. This alarm may be disabled once the reverse rotation check has been verified by setting Reverse Rotation Enable ***Configuration→SERV→REV.R*=DSBL**.
- Check Control Type (***Configuration→OPT2→C.TYP***) setting. If the A1 compressor is a digital compressor and is enabled (***Configuration→UNIT→A1.TY*=YES**), ***C.TYP*** must be selected for a digital compressor compatible control option, **1** (VAV), **3** (TSTAT MULTI), **5** (SPT MULTI), **7** (PCT CAP), or **9** (VAV SETPOINT).

A150 — Unit is in Emergency Stop

Criteria for Trip: This alarm is indicated when a CCN Emergency Stop command is received. If the CCN point name EMSTOP in the CCN Status Table is set to "Emstop," the unit will shut down and generate this alarm.

Action To Be Taken: The unit is shut down or not allowed to start.

Reset Method: Automatic, once the Emergency Stop command is revoked. This alarm will clear when the EMSTOP point value is returned to "Enable."

Possible Causes: If this condition is encountered, check the value of the CCN point, EMSTOP. If it is "Emstop," change it to "Enable."

A151 — Illegal Configuration Alarm

Criteria for Trip: This alarm is indicated when an illegal configuration has been entered. There are several different configuration alarms. When expanding the alarm, the control will indicate which configuration is incorrect. For example, if the wrong size is configured, the A151 expansion will indicate "ILLEGAL CONFIG - INVALID UNIT SIZE."

Action To Be Taken: The unit is not allowed to start.

Reset Method: Automatic, once the illegal configuration is corrected.

Possible Causes: If this condition is encountered, check the items shown in Table 80 based on the illegal configuration.

Table 80 — Illegal Configurations (Alarm A151)

ILLEGAL CONFIGURATION	POSSIBLE CAUSES
AUX BOARD INCORRECT REVISION	Check to see if the AUX Board is an older revision not compatible with the current software.
	Check the red LED on the AUX Board to be sure that it is blinking in unison with the other boards in the unit. If it is not, it is not communicating: - Check the LEN Communication wiring for continuity to the Main Base Board. - Check the AUX Board DIP Switch settings for the address.
	For 208 volt systems, check the control transformer to be sure that it is tapped correctly.
	Consider cycling power to the AUX Board.
AUX BOARD SOFTWARE REV MUST BE 3 OR HIGHER	Check to see if the AUX Board is an older revision not compatible with the current software. The AUX Board software revision can be found in the vendor part number, CEPL130567-03. The -03 indicates Revision 03.
AUX BOARD SHOULD BE AUX1, NOT AUX2	Check the part number of the AUX Board. It should have the Carrier Part Number 32GB500442EE (UTEC Part Number CEPL130567-03). This board is required for the digital compressor output as well as the Motormaster drive signal. An AUX2 Board, Carrier Part Number 332GB500432EE (UTEC Part Number CEPL130568-02) does not have the capability to supply these outputs.
CONTROL TYPE SET TO INVALID TYPE FOR SPLIT	Check ***Configuration→OPT2→C.TYP*** for a valid control type.
DUAL THERMOSTAT TYPE ON SINGLE CKT UNIT	Check to see if ***Configuration→OPT2→C.TYP* = 8** (DUAL TSTAT) control type is configured for a single circuit machine, ***Configuration→UNIT→NCKT* = 1** (Single Circuit)
DUAL THERMOSTAT AND SWITCH DEMAND LIMIT	Check to see if ***Configuration→OPT2→C.TYP* = 8** (DUAL TSTAT) control type is configured with switch control demand limit enabled, ***Configuration→RSET→DMDC* = 1** (Switch).
INVALID UNIT SIZE HAS BEEN ENTERED	Check to be sure that a valid unit size ***Configuration→UNIT→SIZE*** has been entered.
UNIT CONFIGURATION SET TO INVALID TYPE	Digital compressor, ***Configuration→UNIT→A1.TY*=YES**, and hot gas ***Configuration→ OPT1→MLV*=YES** are both enabled. Only one can be enabled.

A152 — Unit Down Due to Failure

Criteria for Trip: This alarm is generated if both circuits are off due to alerts and/or alarms.

Action To Be Taken: The unit is not allowed to start.

Reset Method: Automatic, once the other alerts/alarms are corrected

Possible Causes: If this condition is encountered, see the appropriate alert/alarm information in Table 79 on page 163.

T153 — Real Time Clock Hardware Failure Alert

Criteria for Trip: This alert is indicated when the Main Base Board (MBB) time clock is not initialized or fails to increment.

Action To Be Taken: Occupancy defaults to Occupied. Unit defaults to Local On mode, ignoring any schedules.

Reset Method: Automatic, when the time is initialized or starts incrementing again.

Possible Causes: If this condition is encountered, check the following items:

- Check the Hour and Minute (***Time Clock→TIME→HH.MM***), and reset the time. If the error returns, replace the board.
- If the unit is connected to a CCN network, and time broadcast is enabled, repeated broadcasts of time behind that of the controller will cause this alarm to be generated. Disconnect the unit from the network to troubleshoot the time clock. Check the network settings and clock.

A154 — Serial EEPROM Hardware Failure

Criteria for Trip: This alarm is indicated when a problem with the Serial EEPROM (Electrically Erasable Programmable Read-Only Memory) on the Main Base Board (MBB) has been detected.

Action To Be Taken: The unit is shut down or not allowed to start.

Reset Method: Manual.

Possible Causes: If this condition is encountered, reset the power to the unit. If the error returns, replace the board.

T155 — Serial EEPROM Storage Failure

Criteria for Trip: Configuration data in the serial EEPROM cannot be verified which may mean Main Base Board replacement. It is possible a re-initialization of the database or particular storage area(s) by cycling power may correct this problem.

Action To Be Taken: None.

Reset Method: Manual.

Possible Causes: If this condition is encountered, reset the power to the unit. If the error returns, replace the board.

A156 — Critical Serial EEPROM Storage Failure

Criteria for Trip: Critical configuration data in the serial EEPROM chip cannot be verified which may mean MBB replacement. Recovery is automatic but typically board replacement is necessary.

Action To Be Taken: Unit shuts down or is not allowed to start.

Reset Method: Manual.

Possible Causes: If this condition is encountered, reset the power to the unit. If the error returns, replace the board.

A157 — A/D Hardware Failure

Criteria for Trip: A problem with the analog to digital conversion chip on the Main Base Board has caused the chip to fail.

Action To Be Taken: Unit shuts down or is not allowed to start.

Reset Method: Manual

Possible Causes: If this condition is encountered, reset the power to the unit. If the error returns, replace the board.

T170 — Loss of Communication with the Compressor Expansion Module

Criteria for Trip: This alert is generated when the Main Base Board (MBB) cannot establish communication with the Compressor Expansion Module (CXB). This board is found on the 38APD070-130 units only.

Action To Be Taken: All CXB functions are disabled.

Reset Method: Automatic once communication is re-established.

Possible Causes: If this condition is encountered, check the following items:

- Confirm unit configuration, ***Configuration→UNIT→SIZE***.
- Check LEN communication wiring.
- Check CXB DIP Switch settings.
- Check for control power to the CXB.

T173 — Loss of Communication with the Energy Management Module

Criteria for Trip: This alert is generated when the Main Base Board (MBB) cannot establish communication with the Energy Management Module (EMM).

Action To Be Taken: All EMM functions, Switch Controlled Demand Limit, Y3/Y4 Thermostat Input, 4-20 mA Demand Limit, 4-20 mA Temperature Reset, 4-20 mA Percent Capacity, and 4-20 mA Cooling Set Point, are disabled.

Reset Method: Automatic once communication is re-established.

Possible Causes: If this condition is encountered, check the following items:

- Confirm unit configuration, EMM Module Installed (***Configuration→OPT1→EMM***). If a feature requiring the EMM is enabled, the control will automatically start searching for the board. If it is not installed, disable the feature requiring the EMM.
- Check LEN communication wiring.
- Check EMM DIP switch settings.
- Check for control power to the EMM.

T174 — 4 to 20 mA Cooling Set Point Input Failure

Criteria for Trip: The following conditions must be true:

1. The unit must be configured for either Control Type ***Configuration→OPT2→C.TYP*=7** [PCT CAP] or **9** [VAV SETPOINT].
2. The Energy Management Module is required and must be configured, EMM Module Installed, ***Configuration→OPT1→EMM*=YES**.
3. The signal is less than 2 mA or greater than 22 mA.

Action To Be Taken: For ***Configuration→OPT2→C.TYP*=7** (PCT CAP) without return air and supply air thermistors, the function is disabled and the unit is not allowed to start or run. For ***Configuration→OPT2→C.TYP*=9** (VAV SETPOINT), the function is disabled. For ***C.TYP*=7** with return air and supply air thermistors and ***C.TYP*=9,** the unit controls will use Cooling Set Point 1 ***(Setpoints→COOL→CSP.1)*** as the Active Set Point (***Run Status→VIEW→SETP***).

Reset Method: Automatic once signal is restored.

Possible Causes: If this condition is encountered, check the following items:

- Confirm the input signal the control is reading. Check the value of 4-20 Cooling Demand (***Inputs Mode→4-20→ CL.MA***). Compare this to expected signal strength.
- Confirm that the signal wiring polarity, LVT-8 (–) and LVT-10 (+), is correct.
- Confirm Energy Management Module configuration, EMM Module Installed, ***Configuration→OPT1→ EMM*=YES**.

A175 — Loss of Communication with AUX board

Criteria for Trip: A communication problem with the AUX Board has been detected by the Main Base Board. The AUX Board is required for digital compressor operation and low ambient head pressure control (Motormaster®) operation.

Action to be taken: Functions associated with the AUX Board, digital compressor and Motormaster controller operation are stopped.

Reset Method: Automatic once the condition is resolved.

Possible Causes: If this condition is encountered, check the following items:

- Check the configurations. If Compressor A1 Digital ***Configuration→UNIT→A1.TY*=YES** and no AUX Board is installed, this alarm will be generated. Similarly, if Motormaster Select ***Configuration→M.MST→MMR.S=YES*** and no AUX Board is installed, this alarm will be generated.
- Check the address of the AUX Board.
- Check the LEN wiring to the AUX Board.
- Check the power supply to the AUX Board.

T176 — 4 to 20 mA Reset Input Failure

Criteria for Trip: 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.

Action to be taken: The cooling reset function will be disabled when this occurs.

Reset Method: Manual

Possible Causes: If this condition is encountered, check the following items:

- Confirm the input signal the control is reading. Check the value of 4-20 Reset Signal (***Inputs Mode→4-20→RSET***). Compare this to expected signal strength.
- Confirm signal polarity, LVT-8 (–) and LVT-9 (+)
- Confirm Energy Management Module configuration, EMM Module Installed, ***Configuration→OPT1→EMM*=YES**.

T177 — 4 to 20 mA Demand Limit Input Failure

Criteria for Trip: This alert indicates that 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.

Action to be taken: The cooling demand limit function will be disabled when this occurs.

Reset Method: Manual.

Possible Causes: If this condition is encountered, check the following items:

- Confirm the input signal the control is reading. Check the value of 4-20 Demand Signal (***Inputs Mode→4-20→DMND***). Compare this to expected signal strength.
- Confirm signal polarity, LVT-8 (–) and LVT-7 (+)
- Confirm Energy Management Module configuration, EMM Module Installed, ***Configuration→OPT1→EMM*=YES**.

A200 — Indoor Fan Status Failure - Fan Not Running

Criteria for Trip: This alarm is generated when the following conditions are true:

1. 38AP unit is Enabled (***Inputs→GEN.I→STST*=STRT**).
2. Airflow switch is open (***Inputs→GEN.I→ID.F.A*=OFF**).

Action To Be Taken: Unit is not allowed to start, or is shut down.

Reset Method: Automatic once the condition is resolved.

Possible Causes: If this condition is encountered, check the following items:

- Confirm that airflow is present in the air handler if an airflow switch is used.
- Check airflow switch circuit wiring.
- If no airflow switch is used, confirm the jumper is in place between LVT-16 and LVT-18.

T201 — Circuit A Indoor Fan Status Failure - Fan Not Running

T202 — Circuit B Indoor Fan Status Failure - Fan Not Running

Criteria for Trip: This alarm is generated when the following conditions are true:

1. 38AP unit is Enabled (***Inputs→GEN.I→STST*=STRT**).
2. Control Type is Dual Thermostat (***Configuration→OPT2→C.TYP*=8**).
3. Airflow switch 1 is open (***Inputs→GEN.I→ ID.F.A*=OFF**) (T201) or airflow switch 2 is open (***Inputs→GEN.I→ID.F.B*=OFF**) (T202).

Action To Be Taken: For T201, circuit A is not allowed to start, or is shut down. For T202, circuit B is not allowed to start, or is shut down.

Reset Method: Automatic once the condition is resolved.

Possible Causes: If this condition is encountered, check the following items:

- Confirm that airflow is present in the air handler if an airflow switch is used.
- Check airflow switch circuit wiring.
- If no airflow switch 1 is used, confirm the jumper is in place between LVT-16 and LVT-18 for T201.
- If no airflow switch 2 is used, confirm the jumper is in place between LVT-17 and LVT-18 for T202.

T303 — Coil - Scheduled Maintenance Due

Criteria for Trip: This alarm is generated when the Coil Service Countdown (***Run Status→PM→COIL→C.L.DN***) has expired.

Action To Be Taken: None, service alert only.

Reset Method: Manual. Perform coil maintenance. Before the alert can be cleared, Coil Cleaning Maint Done ***(Run Status→PM→COIL→C.L.MN***) must be toggled from **NO** to **YES**. Reset the alert.

Possible Causes: If this condition is encountered, check Coil Service Countdown.

T500 — Current Sensor Board A1 Failure

T501 — Current Sensor Board A2 Failure

T502 — Current Sensor Board A3 Failure

T503 — Current Sensor Board B1 Failure

T504 — Current Sensor Board B2 Failure

T505 — Current Sensor Board B3 Failure

Criteria for Trip: This alarm is generated when the Current Sensing Board (CSB) output read by the Main Base Board (MBB) or Compressor Expansion Module (CXB) is at a constant high value.

Action To Be Taken: Affected compressor is shut down.

Reset Method: Automatic, when signal returns to normal.

Possible Causes: If this condition is encountered, check the following items:

- Check the CSB to be sure that it is wired properly.
- On 208 volt systems, be sure that the control transformer is wired for 208 volts. It has been noted with some systems that operate on 208 volts, when the wire is located on the 230 volt tap, nuisance T500-T505 alarms have been generated.
- Consider replacing the CSB.

APPENDIX A — DISPLAY TABLES

Scrolling Marquee Display Menu Structure

MENU	ITEM
RUN STATUS	VIEW (Auto Display)
	RUN (Unit Run Hours and Start)
	HOUR (Circ and Comp Run Hours)
	STRT (Compressor Starts)
	PM (Preventative Maintenance)
	VERS (Software Version Numbers)
SERVICE TEST	TEST (Service Test Mode)
	OUTS (Outputs)
	CMPA (Circuit A Compressor Test)
	CMPB (Circuit B Compressor Test)
TEMPERATURES	UNIT (Entering and Leaving Unit Temperatures)
	CIR.A (Temperatures Circuit A)
	CIR.B (Temperatures Circuit B)
PRESSURES	PRC.A (Pressures Circuit A)
	PRC.B (Pressure Circuit B)
SETPOINTS	COOL (Cooling Setpoints)
	HEAD (Head Pressure Setpoints)
INPUTS	GEN.I (General Inputs)
	CRCT (Circuit Inputs)
	4-20 (4-20 mA Inputs)
OUTPUTS	GEN.O (General Outputs)
	CIR.A (Outputs Circuit A)
	CIR.B (Outputs Circuit B)
CONFIGURATION	DISP (Display Configuration)
	UNIT (Unit Configuration)
	CCN (CCN Network Configs)
	OPT1 (Unit Options 1 Hardware)
	OPT2 (Unit Options 2 Controls)
	M.MST (Motormaster)
	RSET (Reset Cool Temp)
	SLCT (Setpoint and Ramp Load)
	SERV (Service Configuration)
	BCST (Broadcast Configuration)
TIME CLOCK	TIME (Time of Day)
	DATE (Month, Date, Day, and Year)
	DST (Daylight Savings Time)
	HOL.L (Local Holiday Schedules)
	SCH.N (Schedule Number)
	SCH.L (Local Occupancy Schedule)
	OVR (Schedule Override)
OPERATING MODES	MODE (Modes)
ALARMS	CRNT (Current Active Alarms)
	RCRN (Reset All Current Alarms)
	HIST (Alarm History)

APPENDIX A — DISPLAY TABLES (cont)

Run Status Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
VIEW	AUTO VIEW OF RUN STATUS			
	RAT	XXX.X °F (°C)	Return Air Temperature	
	SAT	XXX.X °F (°C)	Supply Air Temperature	
	SETP	XXX.X °F (°C)	Active Set Point	
	CTPT	XXX.X °F (°C)	Control Point	
	LOD.F	XXX	Load/Unload Factor	
	STAT	X	Control Mode	Range: 1 to 9 1=Off Local 2=Off CCN 3=Off Time 4=Off Emrgcy 5=On Local 6=On CCN 7=On Time 8=IDFS Not On 9=SPT Satisfied
	SPT.M	X	Space Temp Control Mode	Range: 0 to 3 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	HH:MM	Time of Day	00:00-23:59
	MNTH	XX	Month of Year	Range: 1 to 12 1=January 2=February etc.
	DATE	XX	Day of Month	Range: 1 to 31
	YEAR	XXXX	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	SUB-ITEM	SUB-SUB-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	Range: 0 to 65,500 hrs Default: 8760 hrs
		C.L.DN		XXXX HRS	Coil Service Countdown	
		C.L.MN		YES/NO	Coil Cleaning Maint.Done	User Input
		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				CESR131466-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		ON/OFF	Service Test Mode	To enable Service Test mode, move Enable/Off/Remote contact switch to OFF. Change TEST to ON and move switch to ENABLE
OUTS	OUTPUTS			
	FAN1	OFF/ON	Fan 1 Relay	
	FAN2	OFF/ON	Fan 2 Relay	
	FAN3	OFF/ON	Fan 3 Relay	
	FAN4	OFF/ON	Fan 4 Relay	
	FAN5	OFF/ON	Fan 5 Relay	
	V.HPA	XXX%	Var Head Press % Cir A	
	V.HPB	XXX%	Var Head Press % Cir B	
	DIG.S	XX sec	Comp A1 Unload Time	Range: 0 to 15 sec.
	LSV.A	OFF/ON	Liquid Line Solenoid A	
	LSVA2	OFF/ON	Liquid Line Solenoid A2	
	LSV.B	OFF/ON	Liquid Line Solenoid B	
	LSVB2	OFF/ON	Liquid Line Solenoid B2	
	RMT.A	OFF/ON	Remote Alarm Relay	
CMPA	CIRCUIT A COMPRESSOR TEST			
	CC.A1	OFF/ON	Compressor A1 Relay	
	UL.TM	XX sec	Comp A1 Unload Time	Based on Unit Model Range: 0 to 10 = 38AP025-030 0 to 8 = 38AP040-130
	CC.A2	OFF/ON	Compressor A2 Relay	
	CC.A3	OFF/ON	Compressor A3 Relay	
	MLV	OFF/ON	Minimum Load Valve Relay	
CMPB	CIRCUIT B COMPRESSOR TEST			
	CC.B1	OFF/ON	Compressor B1 Relay	
	CC.B2	OFF/ON	Compressor B2 Relay	
	CC.B3	OFF/ON	Compressor B3 Relay	

APPENDIX A — DISPLAY TABLES (cont)

Temperatures Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
UNIT	ENTERING AND LEAVING UNIT TEMPERATURES			
	RAT	XXX.X °F (°C)	Return Air Temperature	See Note 1
	SAT	XXX.X °F (°C)	Supply Air Temperature	See Note 1
	OAT	XXX.X °F (°C)	Outside Air Temperature	See Note 1
	SPT	XXX.X °F (°C)	Space Temperature	See Notes 1 and 2
CIR.A	TEMPERATURES CIRCUIT A			
	SCT.A	XXX.X °F (°C)	Saturated Condensing Tmp	
	SST.A	XXX.X °F (°C)	Saturated Suction Temp	
	RGT.A	XXX.X °F (°C)	Compressor Return Gas Temp	See Note 1
	D.GAS	XXX.X °F (°C)	Discharge Gas Temp	
	SH.A	XXX.X ΔF (ΔC)	Suction Superheat Temp	
CIR.B	TEMPERATURES CIRCUIT B			
	SCT.B	XXX.X °F (°C)	Saturated Condensing Tmp	
	SST.B	XXX.X °F (°C)	Saturated Suction Temp	
	RGT.B	XXX.X °F (°C)	Compressor Return Gas Temp	See Note 1
	SH.B	XXX.X ΔF (ΔC)	Suction Superheat Temp	

NOTES:
1. Normal scrolling marquee rotation is Item, Value, and Units; for example, OAT, 72.5, °F. In case of a fault, the normal rotation is modified to indicate the fault; for example, OAT, 72.5, °F, FAIL.
2. If ***Configuration→OPT1→SPT.S*=DSBL**, the display will read 0.0 °F (–17.8 °C).

Pressures Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
PRC.A	PRESSURES CIRCUIT A			
	DP.A	XXX.X psig (kPa)	Discharge Pressure	See Note
	SP.A	XXX.X psig (kPa)	Suction Pressure	See Note
PRC.B	PRESSURES CIRCUIT B			
	DP.B	XXX.X psig (kPa)	Discharge Pressure	See Note
	SP.B	XXX.X psig (kPa)	Suction Pressure	See Note

NOTE: Normal scrolling marquee rotation is Item, Value, and Units; for example, DP.A, 238.4, PSIG. In case of a fault, the normal rotation is modified to indicate the fault; for example, DP.A, 238.4, PSIG, FAIL.

APPENDIX A — DISPLAY TABLES (cont)

Setpoints Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
COOL	COOLING SET POINTS			
	CSP.1	XX.X °F (°C)	Cooling Set Point 1	Range: 40 to 80 F (4.4 to 26.7 C) Default: 60 F (15.6 C)
	CSP.2	XX.X °F (°C)	Cooling Set Point 2	Range: 40 to 80 F (4.4 to 26.7 C) Default: 55 F (12.8 C)
	SPS.P	XXX.X °F (°C)	Space T Cool Set Point	Range: 65 to 80 F (18.3 to 26.7 C) Default: 78 F (25.6 C) Recommended Setting: 78 F (25.6 C)
	SPT.O	XX.X ΔF (ΔC)	Space Temperature Offset	See Note
	ST.P.O	XXX.X °F (°C)	Space T SP Plus Offset	See Note
	P.CAP	XXX.X %	Percent Cap. Requested	See Note
	L.C.ON	X.X ΔF (ΔC)	Lo Cool On Set Point	Range: –1.0 to 2.0 ΔF (–0.6 to 1.1 ΔC) Default: 1.0 ΔF (0.6 ΔC)
	H.C.ON	XX.X ΔF (ΔC)	Hi Cool On Set Point	Range: 0.5 to 20.0 ΔF (0.3 to 11.1 ΔC) Default: 3.0 ΔF (1.7 ΔC) Recommended Setting: 3.0 ΔF (1.7 ΔC)
	L.C.OF	X.X ΔF (ΔC)	Lo Cool Off Set Point	Range: 0.5 to 2.0 ΔF (0.3 to 1.1 ΔC) Default: 0.5 ΔF (0.3 ΔC) Recommended Setting: 0.5 ΔF (0.3 ΔC)
	OAT.L	XX.X °F (°C)	OAT Lockout Temperature	Range: –20.0 to 80.0 F (-28.9 to 26.7 C) Default: 30.0 F (–1.1 C)
HEAD	HEAD PRESSURE SET POINTS			
	H.SP	XXX.X °F (°C)	Head Set Point On	Range: 85 to 120 F (29.4 to 48.9 C) Default: 115 F (46.1 C)
	H.SP.F	XX.X °F (°C)	Head Set Point Off	Range: 45 to 90 F (7.2 to 32.2 C) Default: 72.0 F (22.2 C)
	F.ON	XXX.X °F (°C)	Fan On Set Point	See Note
	F.OFF	XXX.X °F (°C)	Fan Off Set Point	See Note
	F.DLT	XX.X ΔF (ΔC)	Fan Stage Delta	Range: 0.0 to 50.0 ΔF (0.0 to 27.8 ΔC) Default: 15.0 ΔF (8.3 ΔC)
	F.TME	XXX sec	Fan Delta Active Time	Range: 0 to 300 seconds Default: 60 seconds

NOTE: These values are values read or calculated by the controller and cannot be changed from this item.

APPENDIX A — DISPLAY TABLES (cont)

Inputs Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
GEN.I	GENERAL INPUTS			
	STST	STRT/STOP	Start/Stop Switch	
	ID.F.A	ON/OFF	Indoor Fan Status-CIRA	
	Y.1	ON/OFF	Y1 Thermostat Input	
	Y.2	ON/OFF	Y2 Thermostat Input	
	ID.F.B	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	OPEN/CLSE	High Pressure Switch A	
	FKB1	ON/OFF	Compressor B1 Feedback	
	FKB2	ON/OFF	Compressor B2 Feedback	
	FKB3	ON/OFF	Compressor B3 Feedback	
	HPSB	OPEN/CLSE	High Pressure Switch B	
4-20	4-20 MA INPUTS			
	DMND	XX.X mA	4-20 ma Demand Signal	
	RSET	XX.X mA	4-20 ma Reset Signal	
	CL.MA	XX.X mA	Cap Req/Setpoint Signal	

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.X %	Var Head Press Out Cir A	
	V.HPB	XXX.X %	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	
	CC.A2	ON/OFF	Compressor A2 Relay	
	CC.A3	ON/OFF	Compressor A3 Relay	
	LSV.A	ON/OFF	Liquid Line Solenoid A	
	L.V.A2	ON/OFF	Liquid Line Solenoid A2	
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	
	L.V.B2	ON/OFF	Liquid Line Solenoid B2	

APPENDIX A — DISPLAY TABLES (cont)

Configuration Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY METR=OFF (METR=ON)	ITEM DESCRIPTION	COMMENT METR=OFF (METR=ON)
DISP	DISPLAY CONFIGURATION			
	TEST	ON/OFF	Test Display LEDs	Default: OFF
	METR	ON/OFF	Metric Display	Default: OFF
	LANG	X	Language Selection	Range: 0 to 3 0 = English 1 = Espanol 2 = Francais 3 = Portuguese Default: 0
	PAS.E	ENBL/DSBL	Password Enable	Default: ENBL
	PASS	XXXX	Service Password	Range: 0 to 9999 Default: 1111
UNIT	UNIT CONFIGURATION			
	SIZE	XXX TONS* (tons)	Unit Size	Based on Unit Model Range: 025 to 130 (23 to 118) 25 (23) = 38APD,APS025 27 (24) = 38APD,APS027 30 (27) = 38APD,APS030 40 (36) = 38APD,APS040 50 (45) = 38APD,APS050 60 (54) = 38APD060 65 (59) = 38APS065 70 (63) = 38APD070 80 (73) = 38APD080 90 (82) = 38APD090 100 (91) = 38APD100 115 (104) = 38APD115 130 (118) = 38APD130
	NCKT	X	Number of Refrigerant Circuits	Based on Unit Model Range 1 to 2 1=38APS 2=38APD
	SZ.A1	XX TONS (tons)	Compressor A1 Size	These values are set by SIZE. and are not field-configurable. See Configuration→UNIT Data Table on page 185.
	SZ.A2	XX TONS (tons)	Compressor A2 Size	
	SZ.A3	XX TONS (tons)	Compressor A3 Size	
	SZ.B1	XX TONS (tons)	Compressor B1 Size	
	SZ.B2	XX TONS (tons)	Compressor B2 Size	
	SZ.B3	XX TONS (tons)	Compressor B3 Size	
	FAN.S	X	Fan Sequence Number	
	A1.TY	YES/NO	Compressor A1 Digital	Based on Unit Model Default: YES = Factory Equipped NO = Not Equipped
	MAX.T	XX SECS	Maximum A1 Unload Time	Based on Unit Model Range: 0 to 10 = 38AP025-030 0 to 8 = 38AP040-130
CCN	CCN NETWORK CONFIGS			
	CCNA	XXX	CCN Address	Range: 0 to 239 Default: 1
	CCNB	XXX	CCN Bus Number	Range: 0 to 239 Default: 1
	BAUD	X	CCN Baud Rate	Range: 1 to 5 1 = 2400 2 = 4800 3 = 9600 4 =19,200 5 =38,400 Default: 3

*The Navigator™ display always uses capital letters, regardless of the METR setting.

APPENDIX A — DISPLAY TABLES (cont)

Configuration Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
OPT1	UNIT OPTIONS 1 HARDWARE			
	MLV.S	YES/NO	Minimum Load Valve Select	Default: YES = Factory Equipped NO = Not Equipped
	CSB.E	ENBL/DSBL	CSB Boards Enable	Default: ENBL
	SPT.S	ENBL/DSBL	Space Temp Sensor	Default: DSBL
	SP.O.S	ENBL/DSBL	Space Temp Offset Enable	Default: DSBL
	SP.O.R	XX ΔF (ΔC)	Space Temp Offset Range	Range: 1 to 10 ΔF (0.6 to 5.6 ΔC) Default: 5 ΔF (2.8 ΔC)
	RAT.T	X	RAT Thermistor Type	Range 0 to 2 0 = 5 kΩ 1 = 10 kΩ 2 = None Default: 0
	SAT.T	X	SAT Thermistor Type	Range 0 to 2 0 = 5 kΩ 1 = 10 kΩ 2 = None Default: 0
	EMM	YES/NO	EMM Module installed	Default: YES = Factory Equipped NO = Not Equipped
OPT2	UNIT OPTIONS 2 CONTROLS			
	C.TYP	X	Machine Control Type	Range: 1 to 9 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 Default: 4
	CTRL	X	Control Method	Range: 0 to 3 0 = Switch 1 = Occupancy 2 = Occupancy 3 = CCN Control Default: 0
	LOAD	X	Loading Sequence Select	Range: 1 to 2 1 = Equal 2 = Staged Default: 1
	LLCS	X	Lead/Lag Circuit Select	Range: 1 to 3 1 = Automatic 2 = Circuit A Leads 3 = Circuit B Leads Default: 1
	DELY	XX MIN	Minutes Off Time	Range: 0 to 15 Minutes Default: 0

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	Default: YES = Factory Equipped NO = Not Equipped
	P.GAN	XX	Head Pressure P Gain	Range: –20 to 20 Default: 1.0
	I.GAN	XX.X	Head Pressure I Gain	Range: –20 to 20 Default: 1.0
	D.GAN	XX.X	Head Pressure D Gain	Range: –20 to 20 Default: 1.0
	MIN.S	XXX.X%	Minimum Fan Speed	Range 0 to 100% Default: 8%
RSET			RESET COOL TEMP	
	CRST	X	Cooling Reset Type	Range: 0 to 4 0 = No Reset 1 = 4-20 Input 2 = Out Air Temp 3 = Return (Not Supported) 4 = Space Temp Default: 0
	MA.DG	XX.X ΔF (ΔC)	4-20 – Degrees Reset	Range: –30 to 30 ΔF (–16.7 to 16.7 ΔC) Default: 10.0 ΔF (5.6 ΔC)
	RM.NO	XXX.X °F (°C)	Remote – No Reset Temp	Range: 0.0 to 125.0 F (17.8 to 51.7 C) Default: 10.0 F (–12.2 C)
	RM.F	XXX.X °F (°C)	Remote – Full Reset Temp	Range: 0.0 to 125.0 F (17.8 to 51.7 C) Default: 10.0 F (–12.2 C)
	RM.DG	XX.X ΔF (ΔC)	Remote – Degrees Reset	Range: –30 to 30 ΔF (–16.7 to 16.7 ΔC) Default: 0.0 ΔF (0.0 ΔC)
	RT.NO	XX.X ΔF (ΔC)	Return – No Reset Temp	Feature Not Supported Range: 0.0 to 30.0 ΔF (0.0 to 16.7 ΔC) Default: 10.0 ΔF (5.6 ΔC)
	RT.F	XX.X ΔF (ΔC)	Return – Full Reset Temp	Feature Not Supported Range: 0.0 to 10.0 ΔF (0.0 to 5.6 ΔC) Default: 0.0 ΔF (0.0 ΔC)
	RT.DG	XX.X ΔF (ΔC)	Return – Degrees Reset	Feature Not Supported Range: –30.0 to 30.0 ΔF (–16.7 to 16.7 ΔC) Default: 0.0 ΔF (0.0 ΔC)
	DMDC	X	Demand Limit Select	Range: 0 to 3 0 = None 1 = Switch 2 = 4-20 Input 3 = CCN Loadshed Default: 0
	DM20	XXX%	Demand Limit at 20 mA	Range: 0 to 100% Default: 100%
	SHNM	XX	Loadshed Group Number	Range: 0 to 99 Default: 0
	SHDL	XX%	Loadshed Demand Delta	Range: 0 to 60% Default: 0%
	SHTM	XXX min	Maximum Loadshed Time	Range: 0 to 120 Minutes Default: 60 Minutes
	DLS1	XXX%	Demand Limit Switch 1	Range: 0 to 100% Default: 80%
	DLS2	XXX%	Demand Limit Switch 2	Range: 0 to 100% Default: 50%
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

APPENDIX A — DISPLAY TABLES (cont)

Configuration Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
SERV	SERVICE CONFIGURATION			
	EN.A1	ENBL/DSBL	Enable Compressor A1	Factory default is based on SIZE. If compressor size >0, item default is ENBL. See Configuration→UNIT Data Table below.
	EN.A2	ENBL/DSBL	Enable Compressor A2	
	EN.A3	ENBL/DSBL	Enable Compressor A3	
	EN.B1	ENBL/DSBL	Enable Compressor B1	
	EN.B2	ENBL/DSBL	Enable Compressor B2	
	EN.B3	ENBL/DSBL	Enable Compressor B3	
	REV.R	ENBL/DSBL	Reverse Rotation Enable	Default: ENBL
	TCOM	ENBL/DSBL	Two Comp Ckt Oil Mgmt	Default: ENBL
BCST	BROADCAST CONFIGURATION			
	T.D.B	ON/OFF	CCN Time/Date Broadcast	Default: OFF
	OAT.B	ON/OFF	CCN OAT Broadcast	Default: OFF
	G.S.B	ON/OFF	Global Schedule Broadcst	Default: OFF
	BC.AK	ON/OFF	CCN Broadcast Ack'er	Default: OFF

Configuration→UNIT Data

MODEL	Configuration→UNIT METR=OFF (ON)						
	SZ.A1	SZ.A2	SZ.A3	SZ.B1	SZ.B2	SZ.B3	FAN.S
38APD025	12 TONS (11 tons)	0	0	12 TONS (11 tons)	0	0	1
38APD027	13 TONS (12 tons)	0	0	13 TONS (12 tons)	0	0	1
38APD030	15 TONS (14 tons)	0	0	15 TONS (14 tons)	0	0	1
38APD040	10 TONS (9 tons)	10 TONS (9 tons)	0	9 TONS (8 tons)	9 TONS (8 tons)	0	2
38APD050	12 TONS (11 tons)	12 TONS (11 tons)	0	13 TONS (12 tons)	13 TONS (12 tons)	0	2
38APD060	13 TONS (12 tons)	13 TONS (12 tons)	0	15 TONS (14 tons)	15 TONS (14 tons)	0	3
38APD070	15 TONS (14 tons)	15 TONS (14 tons)	0	11 TONS (10 tons)	11 TONS (10 tons)	11 TONS (10 tons)	8
38APD080	15 TONS (14 tons)	15 TONS (14 tons)	0	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	4
38APD090	13 TONS (12 tons)	13 TONS (12 tons)	13 TONS (12 tons)	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	5
38APD100	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	5
38APD115	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	20 TONS (18 tons)	20 TONS (18 tons)	20 TONS (18 tons)	6
38APD130	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	25 TONS (23 tons)	25 TONS (23 tons)	25 TONS (23 tons)	7
38APS025	12 TONS (11 tons)	12 TONS (11 tons)	0	0	0	0	1
38APS027	13 TONS (12 tons)	13 TONS (12 tons)	0	0	0	0	1
38APS030	15 TONS (14 tons)	15 TONS (14 tons)	0	0	0	0	1
38APS040	13 TONS (12 tons)	13 TONS (12 tons)	13 TONS (12 tons)	0	0	0	2
38APS050	15 TONS (14 tons)	15 TONS (14 tons)	15 TONS (14 tons)	0	0	0	2
38APS065	0	0	0	20 TONS (18 tons)	20 TONS (18 tons)	20 TONS (18 tons)	9

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	24-Hour Format Range 00:00 - 23:59
DATE	MONTH, DATE, DAY, AND YEAR			
	MNTH	XX	Month of Year	Range: 1 to 12 1 - 12 (1 = January, 2 = February, etc.)
	DOM	XX	Day of Month	Range: 01 -31
	DAY	X	Day of Week	Range 1 to 7 1 - 7 (1 = Sunday, 2 = Monday, etc.)
	YEAR	XXXX	Year of Century	
DST	DAYLIGHT SAVINGS TIME			
	STR.M	XX	Month	Range: 1 to 12 1 = January 2 = February, etc. Default: 4 (April)
	STR.W	X	Week	Range: 1 to 5 Default: 1
	STR.D	X	Day	Range: 1 to 7 1 = Monday 2 = Tuesday, etc. Default: 7
	MIN.A	XX	Minutes to Add	Range: 0 to 90 Default: 60
	STP.M	XX	Month	Range: 1 to 12 1 = January 2 = February, etc Default: 10 (October)
	STP.W	X	Week	Range: 1 to 5 Default: 5
	STP.D	X	Day	Range: 1 to 7 1 = Monday 2 = Tuesday, etc. Default: 7
	MIN.S	XX	Minutes to Subtract	Range: 0 to 90 Default: 60
HOL.L	LOCAL HOLIDAY SCHEDULES			
HD.01	HOLIDAY SCHEDULE 01			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.02	HOLIDAY SCHEDULE 02			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
HD.03	HOLIDAY SCHEDULE 03			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.04	HOLIDAY SCHEDULE 04			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.05	HOLIDAY SCHEDULE 05			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.06	HOLIDAY SCHEDULE 06			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.07	HOLIDAY SCHEDULE 07			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.08	HOLIDAY SCHEDULE 08			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0

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	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.10	HOLIDAY SCHEDULE 10			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.11	HOLIDAY SCHEDULE 11			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.12	HOLIDAY SCHEDULE 12			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.13	HOLIDAY SCHEDULE 13			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.14	HOLIDAY SCHEDULE 14			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
HD.15	HOLIDAY SCHEDULE 15			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.16	HOLIDAY SCHEDULE 16			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.17	HOLIDAY SCHEDULE 17			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.18	HOLIDAY SCHEDULE 18			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.19	HOLIDAY SCHEDULE 19			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0

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	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.21	HOLIDAY SCHEDULE 21			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.22	HOLIDAY SCHEDULE 22			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.23	HOLIDAY SCHEDULE 23			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.24	HOLIDAY SCHEDULE 24			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.25	HOLIDAY SCHEDULE 25			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
HD.26	HOLIDAY SCHEDULE 26			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.27	HOLIDAY SCHEDULE 27			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.28	HOLIDAY SCHEDULE 28			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.29	HOLIDAY SCHEDULE 29			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0
HD.30	HOLIDAY SCHEDULE 30			
	MON	XX	Holiday Start Month	Range: 0 to 12 0 = No Holiday 1 = January 2 = February, etc. Default: 0
	DAY	XX	Start Day	Range: 0 to 31 0 = No Holiday 1 to 31 (Day of Month) Default: 0
	LEN		Duration (days)	Range: 0 to 99 Default: 0

APPENDIX A — DISPLAY TABLES (cont)

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	SUB-SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
SCH.N			XX	Schedule Number	Range: 0 to 99 0=No Schedule 1 to 64=Local Schedule 65 to 99=CCN Global Schedule Default: 0
SCH.L		LOCAL OCCUPANCY SCHEDULE			
		OCCUPANCY PERIOD 1			
	PER.1	OCC.1	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.1	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.1	YES/NO	Monday In Period	Default: NO
		TUE.1	YES/NO	Tuesday In Period	Default: NO
		WED.1	YES/NO	Wednesday In Period	Default: NO
		THU.1	YES/NO	Thursday In Period	Default: NO
		FRI.1	YES/NO	Friday In Period	Default: NO
		SAT.1	YES/NO	Saturday In Period	Default: NO
		SUN.1	YES/NO	Sunday In Period	Default: NO
		HOL.1	YES/NO	Holiday In Period	Default: NO
		OCCUPANCY PERIOD 2			
	PER.2	OCC.2	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.2	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.2	YES/NO	Monday In Period	Default: NO
		TUE.2	YES/NO	Tuesday In Period	Default: NO
		WED.2	YES/NO	Wednesday In Period	Default: NO
		THU.2	YES/NO	Thursday In Period	Default: NO
		FRI.2	YES/NO	Friday In Period	Default: NO
		SAT.2	YES/NO	Saturday In Period	Default: NO
		SUN.2	YES/NO	Sunday In Period	Default: NO
		HOL.2	YES/NO	Holiday In Period	Default: NO
		OCCUPANCY PERIOD 3			
	PER.3	OCC.3	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.3	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.3	YES/NO	Monday In Period	Default: NO
		TUE.3	YES/NO	Tuesday In Period	Default: NO
		WED.3	YES/NO	Wednesday In Period	Default: NO
		THU.3	YES/NO	Thursday In Period	Default: NO
		FRI.3	YES/NO	Friday In Period	Default: NO
		SAT.3	YES/NO	Saturday In Period	Default: NO
		SUN.3	YES/NO	Sunday In Period	Default: NO
		HOL.3	YES/NO	Holiday In Period	Default: NO
		OCCUPANCY PERIOD 4			
	PER.4	OCC.4	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.4	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.4	YES/NO	Monday In Period	Default: NO
		TUE.4	YES/NO	Tuesday In Period	Default: NO
		WED.4	YES/NO	Wednesday In Period	Default: NO
		THU.4	YES/NO	Thursday In Period	Default: NO
		FRI.4	YES/NO	Friday In Period	Default: NO
		SAT.4	YES/NO	Saturday In Period	Default: NO
		SUN.4	YES/NO	Sunday In Period	Default: NO
		HOL.4	YES/NO	Holiday In Period	Default: NO

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	SUB-SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
SCH.L (cont)	PER.5	OCCUPANCY PERIOD 5			
		OCC.5	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.5	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.5	YES/NO	Monday In Period	Default: NO
		TUE.5	YES/NO	Tuesday In Period	Default: NO
		WED.5	YES/NO	Wednesday In Period	Default: NO
		THU.5	YES/NO	Thursday In Period	Default: NO
		FRI.5	YES/NO	Friday In Period	Default: NO
		SAT.5	YES/NO	Saturday In Period	Default: NO
		SUN.5	YES/NO	Sunday In Period	Default: NO
		HOL.5	YES/NO	Holiday In Period	Default: NO
	PER.6	OCCUPANCY PERIOD 6			
		OCC.6	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.6	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.6	YES/NO	Monday In Period	Default: NO
		TUE.6	YES/NO	Tuesday In Period	Default: NO
		WED.6	YES/NO	Wednesday In Period	Default: NO
		THU.6	YES/NO	Thursday In Period	Default: NO
		FRI.6	YES/NO	Friday In Period	Default: NO
		SAT.6	YES/NO	Saturday In Period	Default: NO
		SUN.6	YES/NO	Sunday In Period	Default: NO
		HOL.6	YES/NO	Holiday In Period	Default: NO
	PER.7	OCCUPANCY PERIOD 7			
		OCC.7	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.7	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.7	YES/NO	Monday In Period	Default: NO
		TUE.7	YES/NO	Tuesday In Period	Default: NO
		WED.7	YES/NO	Wednesday In Period	Default: NO
		THU.7	YES/NO	Thursday In Period	Default: NO
		FRI.7	YES/NO	Friday In Period	Default: NO
		SAT.7	YES/NO	Saturday In Period	Default: NO
		SUN.7	YES/NO	Sunday In Period	Default: NO
		HOL.7	YES/NO	Holiday In Period	Default: NO
	PER.8	OCCUPANCY PERIOD 8			
		OCC.8	XX.XX	Period Occupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		UNC.8	XX.XX	Period Unoccupied Time	24-Hour Format Range: 00.00 to 23.59 Default: 00.00
		MON.8	YES/NO	Monday In Period	Default: NO
		TUE.8	YES/NO	Tuesday In Period	Default: NO
		WED.8	YES/NO	Wednesday In Period	Default: NO
		THU.8	YES/NO	Thursday In Period	Default: NO
		FRI.8	YES/NO	Friday In Period	Default: NO
		SAT.8	YES/NO	Saturday In Period	Default: NO
		SUN.8	YES/NO	Sunday In Period	Default: NO
		HOL.8	YES/NO	Holiday In Period	Default: NO

APPENDIX A — DISPLAY TABLES (cont)

Time Clock Mode and Sub-Mode Directory (cont)

SUB-MODE	SUB-SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
OVR	SCHEDULE OVERRIDE				
		OVR.T	X hrs	Timed Override Hours	Range: 0 to 4 Default: 0
		OVR.L	X hrs	Override Time Limit	Range: 0 to 4 Default: 0
		SPT.O	XX.X ΔF (ΔC)	Space Temperature Offset	See Note
		T.OVR	YES/NO	Timed Override	

NOTE: This value is read or calculated by the controller and cannot be changed from this item.

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	
	D.OIL	ON/OFF	Digital Oil Recover Mode	
	L.OUT	ON/OFF	OAT Below Lockout Temp	

Alarms Mode and Sub-Mode Directory

SUB-MODE	ITEM	DISPLAY	ITEM DESCRIPTION	COMMENT
CRNT	CURRENTLY ACTIVE ALARMS			
	AXXX TXXX PXXX		Expansion of the Pre-alert, Alert or Alarm only	Alarms are shown as AXXX. Pre-Alerts are shown as PXXX. Alerts are shown as TXXX. Up to 20 Alarms will be displayed.
	RESET ALL CURRENT ALARMS			
RCRN		NO/YES	Reset current alarms	
HIST	ALARM HISTORY			
	AXXX TXXX PXXX		Expansion of the Pre-alert, Alert or Alarm with Time and Date Stamp	Alarms are shown as AXXX. Pre-Alerts are shown as PXXX. Alerts are shown as TXXX. Up to 20 Alarms will be displayed.

APPENDIX B — CCN TABLES

Status Tables

A_UNIT (General Unit Parameters)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Control Mode	N 0 = SERVICE 1 = OFF Local 2 = OFF CCN 3 = OFF Time 4 = Emergency 5 = ON Local 6 = ON CCN 7 = ON Time 8 = IDF OFF 9 = SPT SATIS		STAT	Read Only
Space Temp Control Mode	N 0 = Cool Off 1 = Lo Cool 2 = Hi Cool 3 = Cool On		SPTMODE	Read Only
Occupied	NO/YES		OCC	Read Only
CCN Chiller	STOP/START		CHIL_S_S	Read/Write
Alarm State	N 0 = Normal 1 = Alert 2 = Alarm		ALM	Read Only
Cap Req/Setpoint Signal	NN.n	mA	COOL_MA	Read Only
Active Demand Limit	NNN	%	DEM_LIM	Read/Write
Override Modes in Effect	NO/YES		MODE	Read Only
Percent Total Capacity	NNN	%	CAP_T	Read Only
Requested Stage	NN		STAGE	Read Only
Active Setpoint	NNN.n	°F (°C)	SP	Read Only
Control Point	NNN.n	°F (°C)	CTRL_PNT	Read/Write
Return Air Temperature	NNN.n	°F (°C)	RETURN_T	Read/Write
Supply Air Temperature	NNN.n	°F (°C)	SUPPLY_T	Read/Write
Emergency Stop	Enable/EMStop		EMSTOP	Read/Write
Minutes Left for Start	5 Character ASCII		MIN_LEFT	Read Only

CIRCA_AN (Circuit A Analog Parameters)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
CIRCUIT A ANALOG VALUES				
Percent Total Capacity	NNN	%	CAPA_T	Read Only
Percent Available Cap.	NNN	%	CAPA_A	Read Only
Discharge Pressure	NNN.n	psig (kPa)	DP_A	Read Only
Suction Pressure	NNN.n	psig (kPa)	SP_A	Read Only
Head Setpoint ON	NNN.n	°F (°C)	HSP_ON	Read/Write
Head Setpoint OFF	NNN.n	°F (°C)	HSP_OFF	Read/Write
Saturated Condensing Tmp	NNN.n	°F (°C)	SCTA	Read Only
Saturated Suction Temp	NNN.n	°F (°C)	SSTA	Read Only
Var Head Press Out Cir A	NNN.n	%	VHPA_ACT	Read Only
Compr Return Gas Temp	NNN.n	°F (°C)	RGTA	Read Only
Discharge Gas Temp	NNN.n	°F (°C)	DIGCMPDT	Read Only
Suction Superheat Temp	NNN.n	ΔF (ΔC)	SH_A	Read Only

Status Tables (cont)

CIRCADIO (Circuit A Discrete Inputs/Outputs)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
CIRC.A DISCRETE OUTPUTS				
Compressor A1 Relay	OFF/ON		K_A1_RLY	Read Only
Comp A1 Load Percent	NNN.n	%	DIGITAL%	Read Only
Compressor A2 Relay	OFF/ON		K_A2_RLY	Read Only
Compressor A3 Relay	OFF/ON		K_A3_RLY	Read Only
Minimum Load Valve Relay	OFF/ON		MLV_RLY	Read Only
Liquid Line Solenoid A	OFF/ON		LLSV_A	Read Only
Liquid Line Solenoid A2	OFF/ON		LLSV_A2	Read Only
CIRC.A DISCRETE INPUTS				
Compressor A1 Feedback	OFF/ON		K_A1_FBK	Read Only
Compressor A2 Feedback	OFF/ON		K_A2_FBK	Read Only
Compressor A3 Feedback	OFF/ON		K_A3_FBK	Read Only
High Pressure Switch A	OPEN/CLOSE		HPSA	Read Only

CIRCB_AN (Circuit B Analog Parameters)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
CIRC.B ANALOG VALUES				
Percent Total Capacity	NNN	%	CAPB_T	Read Only
Percent Available Cap.	NNN	%	CAPB_A	Read Only
Discharge Pressure	NNN.n	psig (kPa)	DP_B	Read Only
Suction Pressure	NNN.n	psig (kPa)	SP_B	Read Only
Saturated Condensing Tmp	NNN.n	°F (°C)	SCTB	Read Only
Saturated Suction Temp	NNN.n	°F (°C)	SSTB	Read Only
Var Head Press Out Cir B	NNN.n	%	VHPB_ACT	Read Only
Compr Return Gas Temp	NNN.n	°F (°C)	RGTB	Read Only
Suction Superheat Temp	NNN.n	ΔF (ΔC)	SH_B	Read Only

CIRCBDIO (Circuit B Discrete Inputs/Outputs)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
CIRC.B DISCRETE OUTPUTS				
Compressor B1 Relay	OFF/ON		K_B1_RLY	Read Only
Compressor B2 Relay	OFF/ON		K_B2_RLY	Read Only
Compressor B3 Relay	OFF/ON		K_B3_RLY	Read Only
Minimum Load Valve Relay	OFF/ON		MLV_RLY	Read Only
Liquid Line Solenoid B	OFF/ON		LLSV_B	Read Only
Liquid Line Solenoid B2	OFF/ON		LLSV_B2	Read Only
CIRC.B DISCRETE INPUTS				
Compressor B1 Feedback	OFF/ON		K_B1_FBK	Read Only
Compressor B2 Feedback	OFF/ON		K_B2_FBK	Read Only
Compressor B3 Feedback	OFF/ON		K_B3_FBK	Read Only
High Pressure Switch B	OPEN/CLOSE		HPSB	Read Only

OPTIONS (Unit Parameters)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
FANS				
Fan Stage Circuit A	NNN		FANSTGEA	Read Only
Fan Stage Circuit B	NNN		FANSTGEB	Read Only
Fan 1 Relay	OFF/ON		FAN_1	Read Only
Fan 2 Relay	OFF/ON		FAN_2	Read Only
Fan 3 Relay	OFF/ON		FAN_3	Read Only
Fan 4 Relay	OFF/ON		FAN_4	Read Only
Fan 5 Relay	OFF/ON		FAN_5	Read Only
UNIT ANALOG VALUES				
Return Air Temperature	NNN.n	°F (°C)	RETURN_T	Read/Write
Supply Air Temperature	NNN.n	°F (°C)	SUPPLY_T	Read/Write
TEMPERATURE RESET				
4-20 mA Reset Signal	NN.n	mA	RST_MA	Read Only
Outside Air Temperature	NNN.n	°F (°C)	OAT	Read/Write
Space Temperature	NNN.n	°F (°C)	SPT	Read/Write
DEMAND LIMIT				
4-20 mA Demand Signal	NN.n	mA	LMT_MA	Read Only
Demand Limit Switch 1	OFF/ON		DMD_SW1	Read Only
Demand Limit Switch 2	OFF/ON		DMD_SW2	Read Only
CCN Loadshed Signal	N		DL_STAT	Read Only
MISCELLANEOUS				
Supply Air Setpoint	NNN.n	°F (°C)	SAT_SP	Read Only

TSTAT_IN (Thermostat Input)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Indoor Fan Status-CIRA	OFF/ON		IDFA_FS	Read Only
Y1 Thermostat Input	OFF/ON		Y1	Read Only
Y2 Thermostat Input	OFF/ON		Y2	Read Only
indoor Fan Status-CIRB	OFF/ON		IDFB_FS	Read Only
Y3 Thermostat Input	OFF/ON		Y3	Read Only
Y4 Thermostat Input	OFF/ON		Y4	Read Only

ALARMS (Active Alarms)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Active Alarm #1	4 Character ASCII Axxx Pxxx Txxx		ALARM01C	Read Only
Active Alarm #2			ALARM02C	Read Only
Active Alarm #3			ALARM03C	Read Only
Active Alarm #4			ALARM04C	Read Only
Active Alarm #5			ALARM05C	Read Only
Active Alarm #6			ALARM06C	Read Only
Active Alarm #7			ALARM07C	Read Only
Active Alarm #8			ALARM08C	Read Only
Active Alarm #9			ALARM09C	Read Only
Active Alarm #10			ALARM10C	Read Only
Active Alarm #11			ALARM11C	Read Only
Active Alarm #12			ALARM12C	Read Only
Active Alarm #13			ALARM13C	Read Only
Active Alarm #14			ALARM14C	Read Only
Active Alarm #15			ALARM15C	Read Only
Active Alarm #16			ALARM16C	Read Only
Active Alarm #17			ALARM17C	Read Only
Active Alarm #18			ALARM18C	Read Only
Active Alarm #19			ALARM19C	Read Only
Active Alarm #20			ALARM20C	Read Only
Active Alarm #21			ALARM21C	Read Only
Active Alarm #22			ALARM22C	Read Only
Active Alarm #23			ALARM23C	Read Only
Active Alarm #24			ALARM24C	Read Only
Active Alarm #25			ALARM25C	Read Only

CURRMODS (Current Operating Modes)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Ramp Load Limited	OFF/ON		MODE_5	Read Only
Timed Override in effect	OFF/ON		MODE_6	Read Only
Slow Change Override	OFF/ON		MODE_9	Read Only
Minimum OFF time active	OFF/ON		MODE_10	Read Only
Temperature Reset	OFF/ON		MODE_14	Read Only
Demand Limited	OFF/ON		MODE_15	Read Only
Low Temperature Cooling	OFF/ON		MODE_17	Read Only
High Temperature Cooling	OFF/ON		MODE_18	Read Only
High SCT Circuit A	OFF/ON		MODE_21	Read Only
High SCT Circuit B	OFF/ON		MODE_22	Read Only
Minimum Comp. On Time	OFF/ON		MODE_23	Read Only
Low Sound Mode	OFF/ON		MODE_25	Read Only
Digital Oil Recover Mode	OFF/ON		MODE_DFL	Read Only
Time Guard Active	OFF/ON		MODE_TG	Read Only
OAT Below Lockout Temp	OFF/ON		OATLMODE	Read Only

LEARNFNS

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
SCT Delta for Comp A1	NNN.N	ΔF (ΔC)	A1SCTDT	Read Only
SCT Delta for Comp A2	NNN.N	ΔF (ΔC)	A2SCTDT	Read Only
SCT Delta for Comp B1	NNN.N	ΔF (ΔC)	B1SCTDT	Read Only
SCT Delta for Comp B2	NNN.N	ΔF (ΔC)	B2SCTDT	Read Only

LOADFACT (Capacity Control)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
CAPACITY CONTROL				
Load/Unload Factor	NNN		SMZ	Read Only
Control Point	NNN.n	°F (°C)	CTRL_PNT	Read/Write
Return Air Temperature	NNN.n	°F (°C)	RETURN_T	Read/Write
Supply Air Temperature	NNN.n	°F (°C)	SUPPLY_T	Read/Write
Ramp Load Limited	OFF/ON		MODE_5	Read Only
Slow Change Override	OFF/ON		MODE_9	Read Only
Low Temperature Cooling	OFF/ON		MODE_17	Read Only
High Temperature Cooling	OFF/ON		MODE_18	Read Only
Minimum Comp. On Time	OFF/ON		MODE_23	Read Only

PM-COIL (Condenser Coil Preventative Maintenance)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Coil Cleaning Srvc Inter	NNNNN Range: 0 to 65,500 Default: 8760	hours	SI_COIL	Read/Write
Coil Service Countdown	NNNNN	hours	CL_CDOWN	Read Only
Coil Cleaning Maint.Done	NO/YES		CL_MAINT	Read Write
Coil Cleaning Maint.Date	00/00/00 00:00		COIL_PM0	Read Only
Coil Cleaning Maint.Date	00/00/00 00:00		COIL_PM1	Read Only
Coil Cleaning Maint.Date	00/00/00 00:00		COIL_PM2	Read Only
Coil Cleaning Maint.Date	00/00/00 00:00		COIL_PM3	Read Only
Coil Cleaning Maint.Date	00/00/00 00:00		COIL_PM4	Read Only

APPENDIX B — CCN TABLES (cont)

Maintenance Tables (cont)

RUNTEST

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Percent Total Capacity	NNN	%	CAPA_T	Read Only
Percent Available Cap.	NNN	%	CAPA_A	Read Only
Discharge Pressure	NNN.n	psig (kPa)	DP_A	Read Only
Suction Pressure	NNN.n	psig (kPa)	SP_A	Read Only
Head Setpoint ON	NNN.n	°F (°C)	HSP_ON	Read Only
Head Setpoint OFF	NNN.n	°F (°C)	HSP_OFF	Read Only
Saturated Condensing Tmp	NNN.n	°F (°C)	SCTA	Read Only
Saturated Suction Temp	NNN.n	°F (°C)	SSTA	Read Only
Compr Return Gas Temp	NNN.n	°F (°C)	RGTA	Read Only
Discharge Gas Temp	NNN.n	°F (°C)	DIGCMPDT	Read Only
Suction Superheat Temp	NNN.n	ΔF (ΔC)	SH_A	Read Only
Compressor A1 Relay	OFF/ON		K_A1_RLY	Read Only
Compressor A2 Relay	OFF/ON		K_A2_RLY	Read Only
Compressor A3 Relay	OFF/ON		K_A3_RLY	Read Only
Minimum Load Valve Relay	OFF/ON		MLV_RLY	Read Only
Compressor A1 Feedback	OFF/ON		K_A1_FBK	Read Only
Compressor A2 Feedback	OFF/ON		K_A2_FBK	Read Only
Compressor A3 Feedback	OFF/ON		K_A3_FBK	Read Only
Percent Total Capacity	NNN	%	CAPB_T	Read Only
Percent Available Cap.	NNN	%	CAPB_A	Read Only
Discharge Pressure	NNN.n	psig (kPa)	DP_B	Read Only
Suction Pressure	NNN.n	psig (kPa)	SP_B	Read Only
Head Setpoint ON	NNN.n	°F (°C)	HSP_ON	Read Only
Head Setpoint OFF	NNN.n	°F (°C)	HSP_OFF	Read Only
Saturated Condensing Tmp	NNN.n	°F (°C)	SCTB	Read Only
Saturated Suction Temp	NNN.n	°F (°C)	SSTB	Read Only
Compr Return Gas Temp	NNN.n	°F (°C)	RGTB	Read Only
Suction Superheat Temp	NNN.n	ΔF (ΔC)	SH_B	Read Only
Compressor B1 Relay	OFF/ON		K_B1_RLY	Read Only
Compressor B2 Relay	OFF/ON		K_B2_RLY	Read Only
Compressor B3 Relay	OFF/ON		K_B3_RLY	Read Only
Minimum Load Valve Relay	OFF/ON		MLV_RLY	Read Only
Compressor B1 Feedback	OFF/ON		K_B1_FBK	Read Only
Compressor B2 Feedback	OFF/ON		K_B2_FBK	Read Only
Compressor B3 Feedback	OFF/ON		K_B3_FBK	Read Only
Fan 1 Relay	OFF/ON		FAN_1	Read Only
Fan 2 Relay	OFF/ON		FAN_2	Read Only
Fan 3 Relay	OFF/ON		FAN_3	Read Only
Fan 4 Relay	OFF/ON		FAN_4	Read Only
Fan 5 Relay	OFF/ON		FAN_5	Read Only
Outside Air Temperature	NNN.n		OAT	Read Only
Space Temperature	NNN.n		SPT	Read Only
Return Air Temperature	NNN.n		RAT	Read Only
Supply Air Temperature	NNN.n		SAT	Read Only
Compressor A1 Size	NNN	TONS	SIZE_A1	Read Only
Compressor A2 Size	NNN	TONS	SIZE_A2	Read Only
Compressor A3 Size	NNN	TONS	SIZE_A3	Read Only
Compressor B1 Size	NNN	TONS	SIZE_B1	Read Only
Compressor B2 Size	NNN	TONS	SIZE_B2	Read Only
Compressor B3 Size	NNN	TONS	SIZE_B3	Read Only

APPENDIX B — CCN TABLES (cont)

Maintenance Tables (cont)

STRTHOUR (Starts and Run Hours)

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

TESTMODE

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Service Test Mode	OFF/ON		NET_CTRL	Read Only
Compressor A1 Relay	OFF/ON		S_A1_RLY	Read Only
Compressor A2 Relay	OFF/ON		S_A2_RLY	Read Only
Compressor A3 Relay	OFF/ON		S_A3_RLY	Read Only
Compressor B1 Relay	OFF/ON		S_B1_RLY	Read Only
Compressor B2 Relay	OFF/ON		S_B2_RLY	Read Only
Compressor B3 Relay	OFF/ON		S_B3_RLY	Read Only
Fan 1 Relay	OFF/ON		S_FAN_1	Read Only
Fan 2 Relay	OFF/ON		S_FAN_2	Read Only
Fan 3 Relay	OFF/ON		S_FAN_3	Read Only
Fan 4 Relay	OFF/ON		S_FAN_4	Read Only
Fan 5 Relay	OFF/ON		S_FAN_5	Read Only
Liquid Line Solenoid A	OFF/ON		S_LLSV_A	Read Only
Liquid Line Solenoid A2	OFF/ON		S_LLSVA2	Read Only
Liquid Line Solenoid B	OFF/ON		S_LLSV_B	Read Only
Liquid Line Solenoid B2	OFF/ON		S_LLSVB2	Read Only
Comp A1 Unload Time	NN	sec	S_A1ULTM	Read Only
Minimum Load Valve Relay	OFF/ON		S_MLV	Read Only
Remote Alarm Relay	OFF/ON		S_ALM	Read Only
Var Head Press % Cir A	NNN	%	S_VHPA	Read Only
Var Head Press % Cir B	NNN	%	S_VHPB	Read Only

VERSIONS (Software Versions)

DESCRIPTION		VALUE	NETWORK ACCESS
MBB	**CESR131466-**	5 Character ASCII	Read Only
AUX	**CESR131333-**	5 Character ASCII	Read Only
CXB	**CESR131173-**	5 Character ASCII	Read Only
EMM	**CESR131174-**	5 Character ASCII	Read Only
Marquee	**CESR131171-**	5 Character ASCII	Read Only
Navigator	**CESR130227-**	5 Character ASCII	Read Only
MBB	**CESR131466-**	5 Character ASCII	Read Only

OCCDEFM/OCCPC01S

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Current Mode (1=Occup.)	N Range: 0 = Unoccupied 1 = Occupied		MODE	Read Only
Current Occup. Period #	N Range: 0 to 8		PER-NO	Read Only
Timed-Override in Effect	No/Yes		OVERLAST	Read Only
Timed-Override Duration	N Range: 0 to 4	hours	OVR_HRS	Read Only
Current Occupied Time	00:00 to 23:59		STRTTIME	Read Only
Current Unoccupied Time	00:00 to 24:00		ENDTIME	Read Only
Next Occupied Day	Monday Tuesday Wednesday Thursday Friday Saturday Sunday		NXTOCDAY	Read Only
Next Occupied Time	00:00 to 23:59		NXTOCTIM	Read Only
Next Unoccupied Day	Monday Tuesday Wednesday Thursday Friday Saturday Sunday		NXTUNDAY	Read Only
Next Unoccupied Time	00:00 to 23:59		NXTUNTIM	Read Only
Previous Unoccupied Day	Monday Tuesday Wednesday Thursday Friday Saturday Sunday		PRVUNDAY	Read Only
Previous Unoccupied Time	00:00 to 24:00		PRVUNTIM	Read Only

Configuration Tables

DISPLAY (Marquee Display Set Up)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Service Password	NNNN Default: 1111 Range: 0000 to 9999		PASSWORD	Read/Write
Password Enable	Disable/Enable Default: Enable		PASS_EBL	Read/Write
Metric Display	Off/On Default: Off		DISPUNIT	Read/Write
Language Selection	N Range: 0 = English 1 = Espanol 2 = Francais 3 = Portugues Default: 0		LANGUAGE	Read/Write

HPA (Head Pressure Circuit A)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
SCT Delta for Comp A1	NNN.n	ΔF (ΔC)	A1SCTDT	Configuration
SCT Delta for Comp A2	NNN.n	ΔF (ΔC)	A2SCTDT	Configuration

HPB (Head Pressure Circuit B)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
SCT Delta for Comp B1	NNN.n	ΔF (ΔC)	B1SCTDT	Configuration
SCT Delta for Comp B2	NNN.n	ΔF (ΔC)	B2SCTDT	Configuration

OPTIONS1 (Options 1 Configuration)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Motormaster Select	No/Yes Default: No/Yes*		MM_SLCT	Configuration
Minimum Load Vlv Select	No/Yes Default: No		MLV_FLG	Configuration
CSB Boards Enable	Disable/Enable Default: Enable		CSB_ENA	Configuration
Space Temp Sensor	Disable/Enable Default: Disable		SPTSENS	Configuration
Space Temp Offset Enable	Disable/Enable Default: Disable		SPTOSENS	Configuration
Space Temp Offset Range	NN Range: 1 to 10 (0.6 to 5.6) Default: 5 (2.8)	ΔF (ΔC)	SPTO_RNG	Configuration
RAT Thermistor Type	N Range: 0 = 5k 1 = 10k 2 = None Default: 1		RATTYPE	Configuration
SAT Thermistor Type	N Range: 0 = 5k 1 = 10k 2 = None Default: 1		SATTYPE	Configuration
EMM Module installed	No/Yes Default: No/Yes*		EMM_BRD	Configuration

*Based on unit model. If the unit is equipped with the option, the default is Yes, otherwise, No.

OPTIONS2 (Options 2 Configuration)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Machine Control Type	N Range: 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 Default: 4		CTRLTYPE	Configuration
Control Method	N Range: 0 = Switch 1 = Occupancy 2 = Occupancy 3 = CCN Default: 0		CONTROL	Configuration
Loading Sequence Select	N Range: 1 = Equal 2 = Staged Default: 1		SEQ_TYPE	Configuration
Lead/Lag Circuit Select	N Range: 1 = Automatic 2 = Circuit A Leads 3 = Circuit B Leads Default: 1		LEAD_TYP	Configuration
Ramp Load Select	Disable/Enable Default: Enable		RAMP_EBL	Configuration
Minutes Off Time	NN Range: 0 to 15 Default: 0	min	DELAY	Configuration
Min Delay Between Stages	NN Range: 30 to 90 Default: 90	sec	STAGEDEL	Configuration
Deadband Multiplier	N.n Range: 1.0 to 4.0 Default: 1.0		Z_GAIN	Configuration

RESTCON (Temperature Reset and Demand Limit)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
COOLING RESET				
Cooling Reset Type	N Range: 0 = No Reset 1 = 4-20 mA Input 2 = Out Air Temp 3 = Not Supported 4 = Space Temp Default: 0		CRST_TYP	Configuration
4-20 MA RESET				
4-20 - Degrees Reset	NNN.n Range: –30 to 30 (–16.7 to 16.7) Default: 10 (5.6)	ΔF (ΔC)	420_DEG	Configuration
REMOTE RESET				
Remote - No Reset Temp	NNN.N Range: 0.0 to 125.0 (–17.8 to 51.7) Default: 10.0 (12.2)	°F (°C)	REM_NO	Configuration
Remote - Full Reset Temp	NNN.N Range: 0.0 to 125.0 (–17.8 to 51.7) Default: 10.0 (12.2)	°F (°C)	REM_FULL	Configuration
Remote - Degrees Reset	NNN.n Range: –30 to 30 (–16.7 to 16.7) Default: 10 (5.6)	ΔF (ΔC)	REM_DEG	Configuration
RETURN TEMPERATURE RESET				
Return - No Reset Temp	Feature Not Supported NNN.n Range: 0.0 to 30.0 (0.0 to 16.7) Default: 10.0 (5.6)	ΔF (ΔC)	RTN_NO	Configuration
Return - Full Reset Temp	Feature Not Supported NNN.n Range: 0.0 to 10.0 (0.0 to 16.7) Default: 0.0 (0.0)	ΔF (ΔC)	RTN_FULL	Configuration
Return - Degrees Reset	Feature Not Supported NNN.n Range: –30 to 30 (–16.7 to 16.7) Default: 0.0 (0.0)	ΔF (ΔC)	RTN_DEG	Configuration
DEMAND LIMIT				
Demand Limit Select	N Range: 0 = None 1 = Switch 2 = 4-20 Input 3 = CCN Loadshed Default: 0		DMD_CTRL	
Demand Limit at 20 mA	NNN Range: 0 to 100 Default: 100	%	DMT20MA	
Loadshed Group Number	NN Range: 0 to 99 Default: 0		SHED_NUM	
Loadshed Demand Delta	NN Range: 0 to 60 Default: 0	%	SHED_DEL	
Maximum Loadshed Time	NNN Range: 0 to 120 Default: 60	min	SHED_TIM	
Demand Limit Switch 1	NNN Range: 0 to 100 Default: 80	%	DLSWSP1	
Demand Limit Switch 2	NNN Range: 0 to 100 Default: 50	%	DLSWSP2	

SCHEDOVR (Timed Override Set Up)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Schedule Number	NN Range: 0 to 99 0 = No Schedule 1 to 64 = Local Schedule 65 to 99 = CCN Global Schedule		SCHEDNUM	Read/Write
Override Time Limit	N Range: 0 to 4 Default: 0	hours	OTL	Read/Write
Timed Override Hours	N Range: 0 to 4 Default: 0	hours	OVR_EXT	Read/Write
Timed Override	No/Yes Default: No		TIMEOVER	Read Only

UNIT (Unit Configuration)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Unit Size	NNN Based on Unit Model Range: 025 to 130 25 = 38APD,APS025 27 = 38APD,APS027 30 = 38APD,APS030 40 = 38APD,APS040 50 = 38APD,APS050 60 = 38APD060 65 = 38APS065 70 = 38APD070 80 = 38APD080 90 = 38APD090 100 = 38APD100 115 = 38APD115 130 = 38APD130	TONS	SIZE	Configuration
Number of Refrig Ckts	N Based on Unit Model Range: 1 = One (38APS) 2 = Two (38APD)		NUMCKTS	Configuration
Compressor A1 Size	NNN See UNIT Data Table on page 185 for appropriate data.	TONS	SIZE_A1	Read Only
Compressor A2 Size		TONS	SIZE_A2	Read Only
Compressor A3 Size		TONS	SIZE_A3	Read Only
Compressor B1 Size		TONS	SIZE_B1	Read Only
Compressor B2 Size		TONS	SIZE_B2	Read Only
Compressor B3 Size		TONS	SIZE_B3	Read Only
Fan Sequence Number	N See UNIT Data Table on page 185 for appropriate data.		FAN_TYPE	Read Only
Compressor A1 Digital?	Yes		CPA1TYPE	Configuration
Maximum A1 Unload Time	NN Range: 0 to 10 (38AP025-030) 0 to 8 (38AP040-130) Default: 10 (38AP025-030) 8 (38AP040-130)	sec	MAXULTME	Configuration
Allow Digital Low Load	No/Yes Default: No		DIG_XTND	Configuration

ALARMDEF/ALARMS01 (Alarm Configuration)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Alarm Routing Control	NNNNNNNN Range: 00000000 to 11111111 Default: 00000000		ALRM_CNT	Read/Write
Equipment Priority	N Range: 0 to 7 Default: 4		EQP_TYPE	Read/Write
Comm Failure Retry Time	NNN Range: 1 to 240 Default: 10	min	RETRY_TM	Read/Write
Re-Alarm Time	NNN Range: 1 to 254 255 (Disabled) Default: 30	min	RE-ALARM	Read/Write
Alarm System Name	8 alphanumeric characters Default: SPLIT		ALRM_NAM	Read/Write

BRODEFS/BROCASTS (Broadcast Definition)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
CCN Time/Date Broadcast	No/Yes Default: No		CCNBC	Read/Write
CCN OAT Broadcast	No/Yes Default: No		OATBC	Read/Write
Global Schedule Broadcst	No/Yes Default: No		GSBC	Read/Write
CCN Broadcast Ack'er	No/Yes Default: No		CCNBCACK	Read/Write
DAYLIGHT SAVINGS START:				
Month	NN Range: 1 to 12 Default: 4		STARTM	Read/Write
Week	N Range: 1 to 5 Default: 1		STARTW	Read/Write
Day	N Range: 1 to 7 Default: 7		STARTD	Read/Write
Minutes to Add	NN Range: 0 to 90 Default: 60	min	MINADD	Read/Write
DAYLIGHT SAVINGS STOP:				
Month	NN Range: 1 to 12 Default: 10		STOPM	Read/Write
Week	N Range: 1 to 5 Default: 5		STOPW	Read/Write
Day	N Range: 1 to 7 Default: 7		STOPD	Read/Write
Minutes to Subtract	NN Range: 0 to 90 Default: 60	min	MINSUB	Read/Write

HOLIDAY/HOLDY01S to HOLDY30S (Holiday Definition)

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
Holiday Start Month	NN Range: 1 to 12 Default: 0		HOL-MON	Read/Write
Start Day	NN Range: 1 to 31 Default: 0		HOL-DAY	Read/Write
Duration (days)	NN Range: 0 to 99 Default: 0		HOL-LEN	Read/Write

NOTE: Only HOLDY01S is shown. HOLDY02S to HOLDY30S are identical in structure.

APPENDIX B — CCN TABLES (cont)

Service Table

SERVICE

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
COMPRESSOR ENABLE				
Enable Compressor A1	Default: Depends on Unit Model. If Compressor Size is greater than 0, value is Enable.		ENABLEA1	Read/Write
Enable Compressor A2			ENABLEA2	Read/Write
Enable Compressor A3			ENABLEA3	Read/Write
Enable Compressor B1			ENABLEB1	Read/Write
Enable Compressor B2			ENABLEB2	Read/Write
Enable Compressor B3			ENABLEB3	Read/Write
Reverse Rotation Enable	Disable/Enable Default: Enable		REVR_VER	Read/Write
Two Comp Ckt Oil Mgmt	Disable/Enable Default: Enable		TCOM_EBL	Read/Write

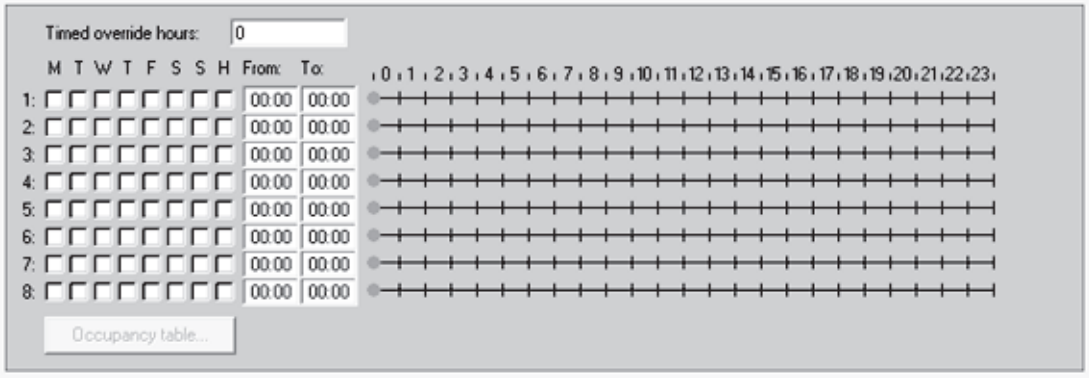
Setpoint Table

SETPOINT

DESCRIPTION	VALUE	UNITS	POINT NAME	NETWORK ACCESS
COOLING				
Cooling Setpoint 1	NNN.n Range: 40.0 to 80.0 (4.4 to 26.7) Default: 60.0 (15.6)	°F (°C)	CSP1	Read/Write
Cooling Setpoint 2	NNN.n Range: 40.0 to 80.0 (4.4 to 26.7) Default: 55.0 (12.8)	°F (°C)	CSP2	Read/Write
Space T Cool Setpoint	NNN.n Range: 65.0 to 80.0 (18.3 to 26.7) Default: 78.0 (25.6)	°F (°C)	SPT_SP	Read/Write
Space Temperature Offset	NN.n	°F (°C)	SPTO	Read Only
Space T SP Plus Offset	NNN.n	°F (°C)	SPSP_PO	Read Only
Percent Cap. Requested	NNN	%	PERCAP	Read Only
Lo Cool On Setpoint	NN.n Range: –1.0 to 2.0 (–0.6 to 1.1) Default: 1.0 (0.6)	ΔF (ΔC)	DMDLCON	Read/Write
HI Cool On Setpoint	NN.n Range: 0.5 to 20.0 (0.3 to 11.1)	ΔF (ΔC)	DMDHCON	Read/Write
Lo Cool Off Setpoint	NN.n Range: 0.5 to 2.0 (0.3 to 1.1) Default: 0.5 (0.3)	ΔF (ΔC)	DMDLCOFF	Read/Write
RAMP LOADING				
Cooling Ramp Loading	N.n Range: 0.2 to 2.0 Default: 1.0		CRAMP	Read/Write
Head Setpoint ON	NNN.n Default: 115.0 (46.1)	°F (°C)	HSP_ON	Read/Write
Head Setpoint OFF	NNN.n Default: 72.0 (22.2)	°F (°C)	HSP_OFF	Read/Write
Fan On Set Point	NNN.n Default: 105.0 (40.5)	°F (°C)	FANONSP	Read Only
Fan Off Set Point	NNN.n Default: 55.0 (12.8)	°F (°C)	FANOFFSP	Read Only
Fan Stage Delta	NNN.n Default: 15.0 (8.3)	ΔF (ΔC)	FSTGDLTA	Read/Write
Fan Delta Active Time	NNN Default: 60	sec	FANDLTTM	Read/Write
OAT Lockout Temperature	NNN.n Range: –20.0 to 80 (–28.9 to 26.7) Default: 30.0 (–1.1)	°F (°C)	OATLOCK	Read/Write

Time Schedule Tables

OCCPC01S



APPENDIX C — BACNET COMMUNICATION OPTION

The following section is used to configure the UPC Open controller which is used when the BACnet* communication option is selected. The UPC Open controller is mounted in the main control box per unit components arrangement diagrams.

TO ADDRESS THE UPC OPEN CONTROLLER — The user must give the UPC Open controller an address that is unique on the BACnet network. Perform the following procedure to assign an address:

1. If the UPC Open controller is powered, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the address each time power is applied to it.
2. Using the rotary switches (see Fig. A and B), set the controller's address. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.

As an example in Fig. B, if the controller's address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.

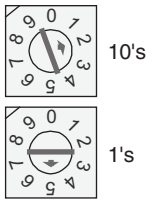


Fig. B — Address Rotary Switches

BACNET DEVICE INSTANCE ADDRESS — The UPC Open controller also has a BACnet Device Instance address. This Device Instance MUST be unique for the complete BACnet system in which the UPC Open controller is installed. The Device Instance is auto generated by default and is derived by adding the MAC address to the end of the Network Number. The Network Number of a new UPC Open controller is 16101, but it can be changed using i-Vu® Tools or BACView device. By default, a MAC address of 20 will result in a Device Instance of 16101 + 20 which would be a Device Instance of 1610120.

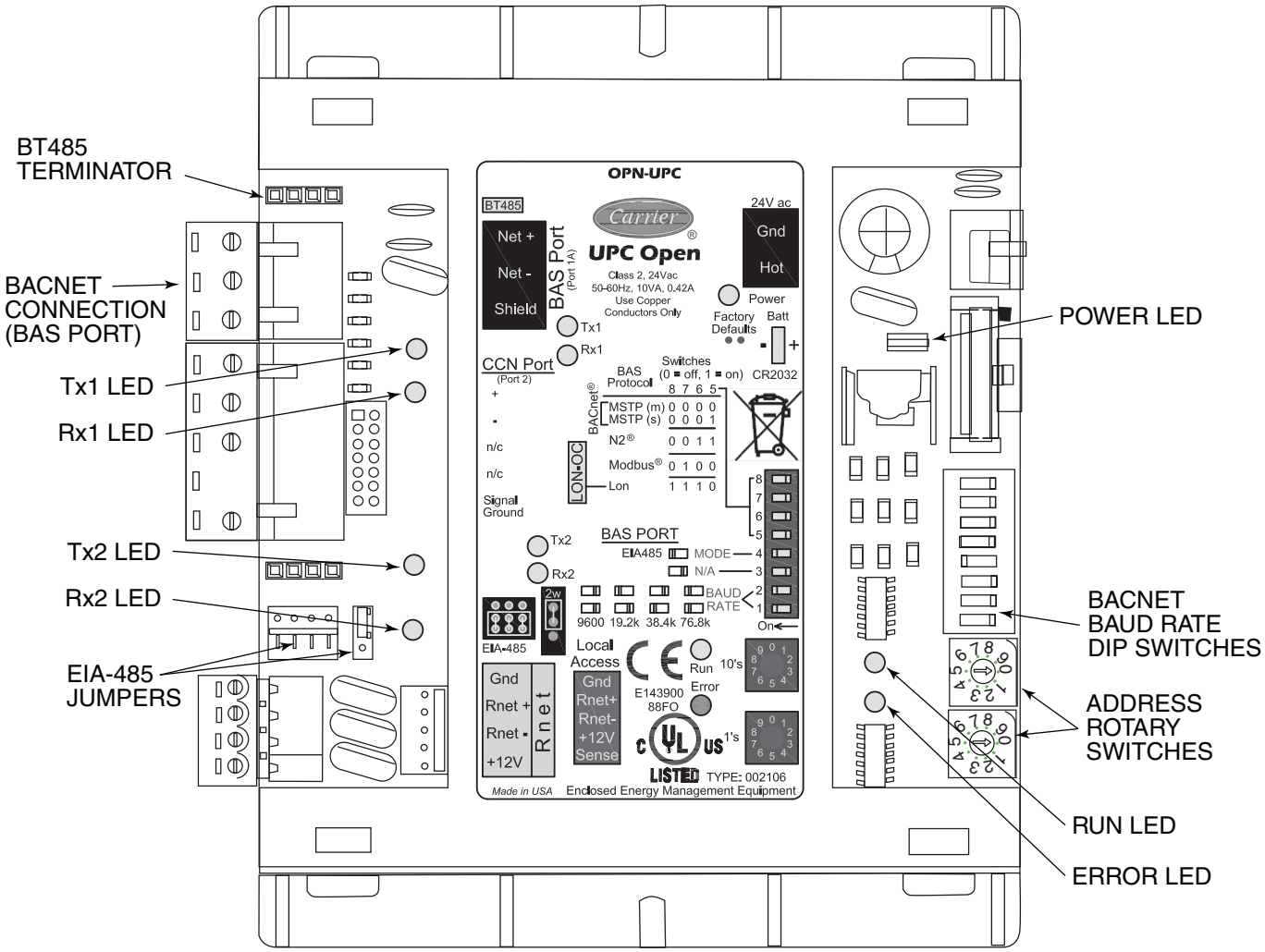


Fig. A — UPC Open Controller

* Sponsored by ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).

CONFIGURING THE BAS PORT FOR BACNET MS/TP — Use the same baud rate and communication settings for all controllers on the network segment. The UPC Open controller is fixed at 8 data bits, No Parity, and 1 Stop bit for this protocol's communications.

If the UPC Open controller has been wired for power, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the DIP switches and jumpers each time power is applied to it.

Set the BAS Port DIP switch DS3 to “enable.” Set the BAS Port DIP switch DS4 to “E1-485.” Set the BMS Protocol DIP switches DS8 through DS5 to “MSTP.” See Table A and Fig. C.

Table A — SW3 Protocol Switch Settings for MS/TP

DS8	DS7	DS6	DS5	DS4	DS3
Off	Off	Off	Off	On	Off

Verify that the EIA-485 jumpers below the CCN Port are set to EIA-485 and 2W.

The example in Fig. C shows the BAS Port DIP Switches set for 76.8k (Carrier default) and MS/TP.

Set the BAS Port DIP Switches DS2 and DS1 for the appropriate communications speed of the MS/TP network (9600, 19.2k, 38.4k, or 76.8k bps). See Table B and Fig. C.

Table B — Baud Selection Table

BAUD RATE	DS2	DS1
9,600	Off	Off
19,200	On	Off
38,400	Off	On
76,800	On	On

WIRING THE UPC OPEN CONTROLLER TO THE MS/TP NETWORK — The UPC Open controller communicates using BACnet on an MS/TP network segment communications at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps.

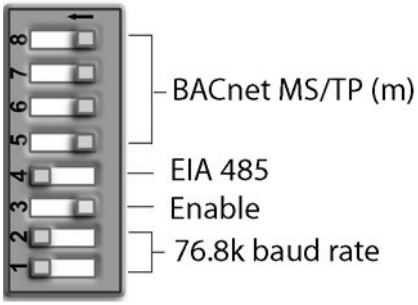


Fig. C — UPC Open Controller DIP Switches

Wire the controllers on an MS/TP network segment in a daisy-chain configuration. Wire specifications for the cable are 22 AWG (American Wire Gage) or 24 AWG, low-capacitance, twisted, stranded, shielded copper wire. The maximum length is 2000 ft (610 m).

Install a BT485 terminator on the first and last controller on a network segment to add bias and prevent signal distortions due to echoing. See Fig. A, D, and E.

To wire the UPC Open controller to the BAS network:

1. Pull the screw terminal connector from the controller's BAS Port.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the BAS port’s screw terminals labeled Net +, Net -, and Shield.

NOTE: Use the same polarity throughout the network segment.

4. Insert the power screw terminal connector into the UPC Open controller's power terminals if they are not currently connected.
5. Verify communication with the network by viewing a module status report. To perform a module status report using the BACview keypad/display unit, press and hold the “FN” key then press the “.” Key.

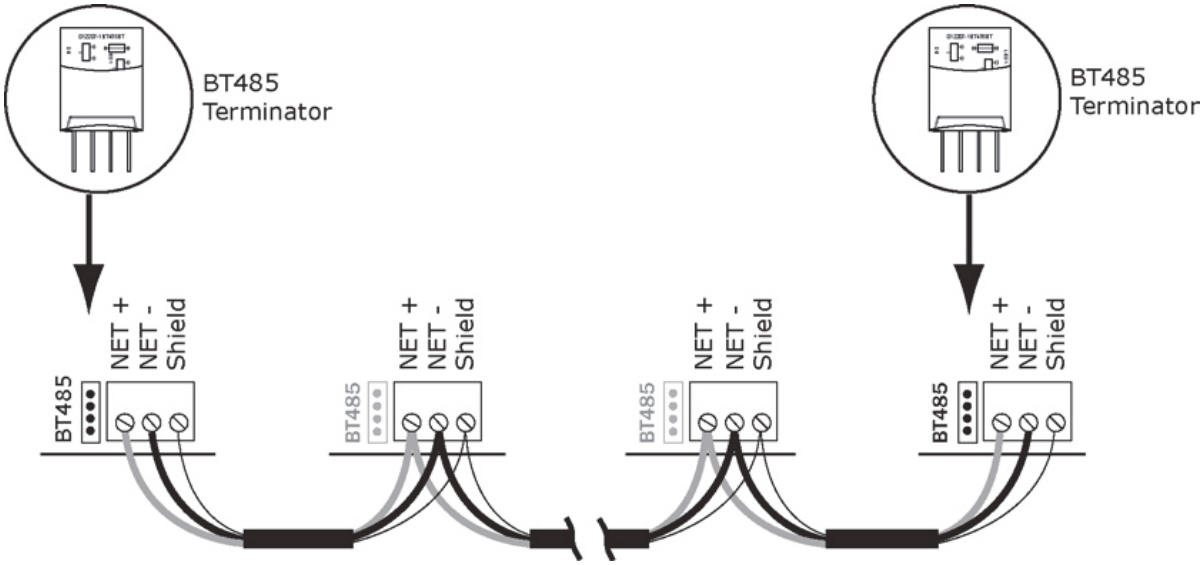


Fig. D — Network Wiring

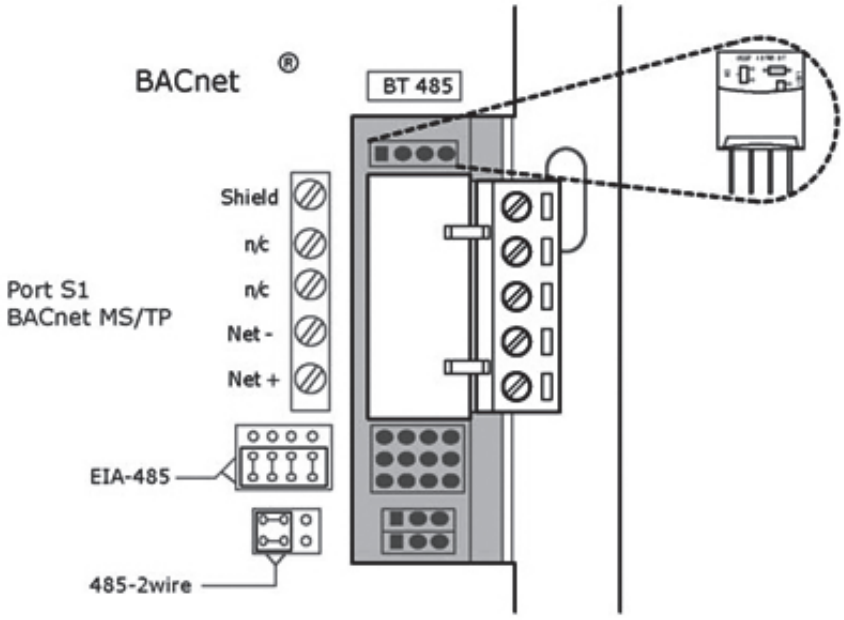


Fig. E — BT485 Terminator Installation

To install a BT485 terminator, push the BT485 terminator on to the BT485 connector located near the BACnet connector.

NOTE: The BT485 terminator has no polarity associated with it.

To order a BT485 terminator, contact your Carrier representative.

MS/TP WIRING RECOMMENDATIONS — Recommendations are shown in Tables C and D. The wire jacket and UL temperature rating specifications list two acceptable alternatives. The Halar* specification has a higher temperature rating and a tougher outer jacket than the SmokeGard† specification, and it is appropriate for use in applications where the user is concerned about abrasion. The Halar jacket is also less likely to crack in extremely low temperatures.

NOTE: Use the specified type of wire and cable for maximum signal integrity.

Table C — MS/TP Wiring Recommendations

SPECIFICATION	RECOMMMENDATION
Cable	Single twisted pair, low capacitance, CL2P, 22 AWG (7x30), TC foam FEP, plenum rated cable
Conductor	22 or 24 AWG stranded copper (tin plated)
Insulation	Foamed FEP 0.015 in. (0.381 mm) wall 0.060 in. (1.524 mm) O.D.
Color Code	Black/White
Twist Lay	2 in. (50.8 mm) lay on pair 6 twists/foot (20 twists/meter) nominal
Shielding	Aluminum/Mylar shield with 24 AWG TC drain wire
Jacket	SmokeGard Jacket (SmokeGard PVC) 0.021 in. (0.5334 mm) wall 0.175 in. (4.445 mm) O.D. Halar Jacket (E-CTFE) 0.010 in. (0.254 mm) wall 0.144 in. (3.6576 mm) O.D.
Dc Resistance	15.2 Ohms/1000 feet (50 Ohms/km) nominal
Capacitance	12.5 pF/ft (41 pF/meter) nominal conductor to conductor
Characteristic Impedance	100 Ohms nominal
Weight	12 lb/1000 feet (17.9 kg/km)
UL Temperature Rating	SmokeGard 167 F (75 C) Halar -40 to 302 F (-40 to 150 C)
Voltage	300 vac, power limited
Listing	UL: NEC CL2P, or better

LEGEND

AWG — American Wire Gage
CL2P — Class 2 Plenum Cable
DC — Direct Current
FEP — Fluorinated Ethylene Polymer
NEC — National Electrical Code
O.D. — Outside Diameter
TC — Tinned Copper
UL — Underwriters Laboratories

*Registered trademark of Solvay Plastics
†Trademark of AlphaGary-Mexichem Corp.

APPENDIX C — BACNET COMMUNICATION OPTION (cont)

Table D — Open System Wiring Specifications and Recommended Vendors

WIRING SPECIFICATIONS		RECOMMENDED VENDORS AND PART NUMBERS			
WIRE TYPE	DESCRIPTION	CONNECT AIR INTERNATIONAL	BELDEN	RMCORP	CONTRACTORS WIRE AND CABLE
MS/TP NETWORK (RS-485)	22 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications.	W221P-22227	—	25160PV	CLP0520LC
	24 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications.	W241P-2000F	82841	25120-OR	—
RNET	4 conductor, unshielded, CMP, 18 AWG, plenum rated.	W184C-2099BLB	6302UE	21450	CLP0442

LEGEND

AWG — American Wire Gage
CL2P — Class 2 Plenum Cable
CMP — Communications Plenum Rated
FEP — Fluorinated Ethylene Polymer
TC — Tinned Copper

LOCAL ACCESS TO THE UPC OPEN CONTROLLER — The user can use a BACview6 handheld keypad display unit or the Virtual BACview software as a local user interface to an Open controller. These items let the user access the controller network information. These are accessory items and do not come with the UPC Open controller.

The BACview6 unit connects to the local access port on the UPC Open controller. See Fig. F. The BACview software must be running on a laptop computer that is connected to the local access port on the UPC Open controller. The laptop will require an additional USB link cable for connection.

See the *BACview Installation and User Guide* for instructions on connecting and using the BACview6 device.

To order a BACview6 Handheld (BV6H), contact your Carrier representative.

CONFIGURING THE UPC OPEN CONTROLLER'S PROPERTIES — The UPC Open device and *Comfort*Link control must be set to the same CCN Address (Element) number and CCN Bus number. The factory default settings for CCN Element and CCN Bus number are 1 and 0 respectively.

If modifications to the default Element and Bus number are required, both the *Comfort*Link and UPC Open configurations must be changed.

The following configurations are used to set the CCN Address and Bus number in the *Comfort*Link controller. These configurations can be changed using the scrolling marquee display or accessory Navigator™ handheld device at the following items:

Configuration→CCN→CCN.A (CCN Address)

Configuration→CCN→CCN.B (CCN Bus Number)

The following configurations are used to set the CCN Address and Bus Number in the UPC Open controller. These configurations can be changed using the accessory BACview6 display.

Navigation: BACview→CCN
Home: Element Comm Stat
Element: 1
Bus: 0

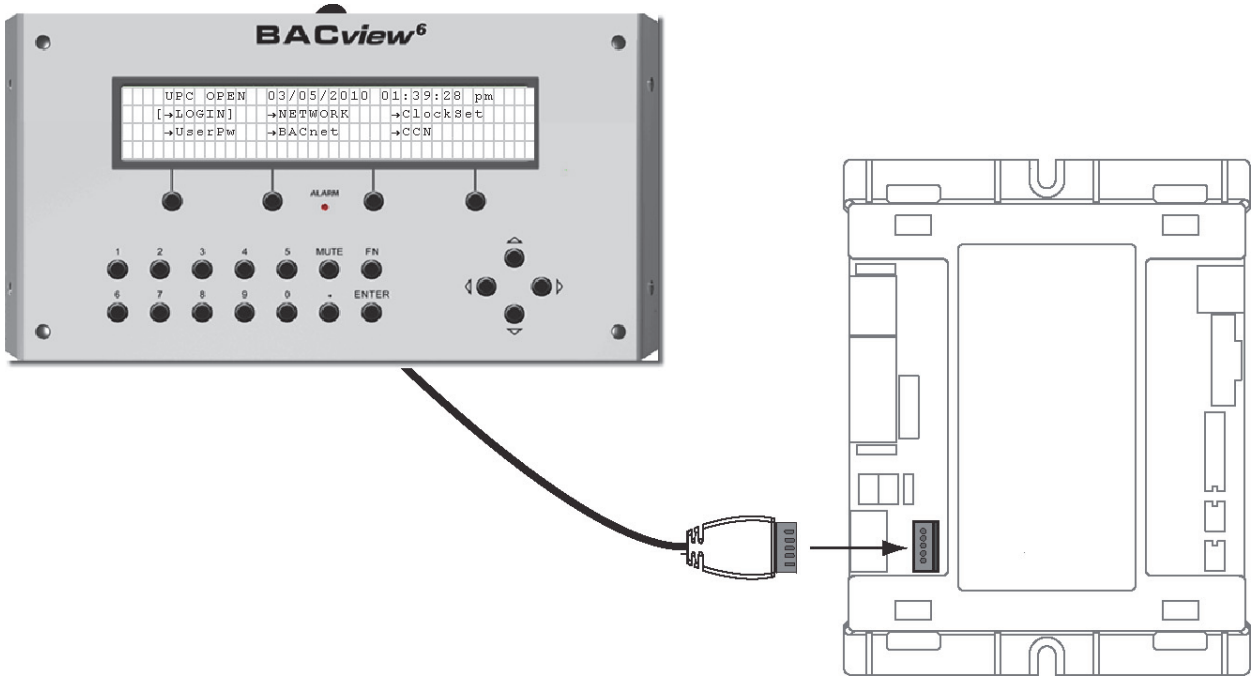


Fig. F — BACview6 Device Connection

For the CCN Time Broadcaster configuration, the UPC Open controller defaults to CCN Time Broadcaster. If the Chiller Lead/Lag/Standby application is used, then the Carrier technician must change the configuration to only one CCN Time Broadcaster on the CCN bus.

TROUBLESHOOTING — If there are problems wiring or addressing the UPC Open controller, contact your Carrier representative.

COMMUNICATION LEDS — The LEDs indicate if the controller is communicating with the devices on the network. See Tables E and F. The LEDs should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LEDs become. See Fig. A for location of LEDs on UPC Open module.

TESTING AND REPLACING THE UPC OPEN BATTERY — The UPC Open controller's 10-year lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends. The UPC Open controller's battery-backed real time clock keeps track of time in the event of a power failure.

IMPORTANT: Power must be **ON** to the UPC Open controller when replacing the battery, or the date, time, and trend data will be lost.

To determine when to replace the battery, measure the voltage. If the voltage is below 2.9 volts, replace the battery. This can be accomplished while the UPC Open controller is powered.

If the battery must be replaced, remove the battery from the controller, making note of the battery's polarity. Battery polarity indication is on the UPC Open casing near the battery. Insert the new battery, matching the battery's polarity with the polarity indicated on the UPC Open controller.

NETWORK POINTS LIST — The points list for the controller is shown in Table G.

Refer to Appendix B for additional information on CCN point names.

Table E — LED Status Indicators

LED	STATUS
POWER	Lights when power is being supplied to the controller. The UPC Open controller is protected by internal solid-state polyswitches on the incoming power and network connections. These polyswitches are not replaceable and will reset themselves if the condition that caused the fault returns to normal.
RX	Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2.
TX	Lights when the controller transmits data to the network segment; there is an Tx LED for Ports 1 and 2.
RUN	Lights based on controller status. See Table F.
ERROR	Lights based on controller status. See Table F.

Table F — Run and Error LEDs Controller and Network Status Indication

RUN LED	ERROR LED	STATUS
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with **Run** LED	Five minute auto-restart delay after system error
2 flashes per second	3 flashes, then off	Controller has just been formatted
2 flashes per second	1 flash per second	Controller is alone on the network
2 flashes per second	On	Exec halted after frequent system errors or control programs halted
5 flashes per second	On	Exec start-up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with **Run** LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with **Run** LED	Brownout

Table G — Network Points List

POINT DESCRIPTION	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
4-20 Cooling Demand	COOL_MA	R	mA		0-20	AV:6	cool_ma_1
4-20 mA Demand Signal	LMT_MA	R	mA		0-20	AV:36	lmt_ma_1
4-20 mA Reset Signal	RST_MA	R	mA		0-20	AV:33	rst_ma_1
Active Demand Limit	DEM_LIM	R/W	%	100	0-100	AV:2	dem_lim_1
Active Setpoint	SP	R	°F		-20-70	AV:4	sp_1
Alarm State	MSV Point for i-Vu / BACnet based on CCN point ALM	R			0 = Normal 1 = Alert 2 = Alarm	MSV:1	alm_msv_1
CCN Chiller	CHIL_S_S	R/W		Start	0 = Stop 1 = Start	BV:4	chil_s_s_1
CCN Loadshed Signal	DL_STAT	R			0-2	AV:37	dl_stat_1
Circuit A Run Hours	HR_CIRA	R	hr		0-9999	AV:59	hr_cira_1
Circuit A Starts	CY_CIRA	R			0-9999	AV:67	cy_cira_1
Circuit B Run Hours	HR_CIRB	R	hr		0-9999	AV:63	hr_cirb_1
Circuit B Starts	CY_CIRB	R			0-9999	AV:71	cy_cirb_1
Coil Cleaning Maint.Done	CL_MAINT	R/W		No	0 = No 1 = Yes	BV:54	cl_maint_1
Coil Cleaning Srvc Inter	SI_COIL	R/W	hr	8760	0-9999	AV:50	si_coil_1
Coil Service Countdown	CL_CDOWN	R	hr		0-9999	AV:49	cl_cdown_1
Comp A1 Load Percent	DIGITALP	R	%		0-100	AV:34	digitalp_1
Compr Return Gas Temp	RGTA	R	°F		0-125	AV:20	rgta_1
Compr Return Gas Temp	RGTB	R	°F		0-125	AV:28	rgtb_1
Compressor A1 Feedback	K_A1_FBK	R			ON_OFF	BV:16	k_a1_fbk_1
Compressor A1 Relay	K_A1_RLY	R			ON_OFF	BV:13	k_a1_rly_1
Compressor A1 Run Hours	HR_A1	R	hr		0-9999	AV:60	hr_a1_1
Compressor A1 Starts	CY_A1	R			0-9999	AV:68	cy_a1_1
Compressor A2 Feedback	K_A2_FBK	R			ON_OFF	BV:17	k_a2_fbk_1
Compressor A2 Relay	K_A2_RLY	R			ON_OFF	BV:14	k_a2_rly_1
Compressor A2 Run Hours	HR_A2	R	hr		0-9999	AV:61	hr_a2_1
Compressor A2 Starts	CY_A2	R			0-9999	AV:69	cy_a2_1
Compressor A3 Feedback	K_A3_FBK	R			ON_OFF	BV:18	k_a3_fbk_1
Compressor A3 Relay	K_A3_RLY	R			ON_OFF	BV:15	k_a3_rly_1
Compressor A3 Run Hours	HR_A3	R	hr		0-9999	AV:62	hr_a3_1
Compressor A3 Starts	CY_A3	R			0-9999	AV:70	cy_a3_1
Compressor B1 Feedback	K_B1_FBK	R			ON_OFF	BV:22	k_b1_fbk_1
Compressor B1 Relay	K_B1_RLY	R			ON_OFF	BV:19	k_b1_rly_1
Compressor B1 Run Hours	HR_B1	R	hr		0-9999	AV:64	hr_b1_1
Compressor B1 Starts	CY_B1	R			0-9999	AV:72	cy_b1_1
Compressor B2 Feedback	K_B2_FBK	R			ON_OFF	BV:23	k_b2_fbk_1
Compressor B2 Relay	K_B2_RLY	R			ON_OFF	BV:20	k_b2_rly_1
Compressor B2 Run Hours	HR_B2	R	hr		0-9999	AV:65	hr_b2_1
Compressor B2 Starts	CY_B2	R			0-9999	AV:73	cy_b2_1
Compressor B3 Feedback	K_B3_FBK	R			ON_OFF	BV:24	k_b3_fbk_1
Compressor B3 Relay	K_B3_RLY	R			ON_OFF	BV:21	k_b3_rly_1
Compressor B3 Run Hours	HR_B3	R	hr		0-9999	AV:66	hr_b3_1
Compressor B3 Starts	CY_B3	R			0-9999	AV:74	cy_b3_1
Control Method	MSV Point for i-Vu / BACnet based on CCN point CONTROL	R		0	0 = Switch 1 = Occupancy 2 = CCN	MSV:5	control_msv_1
Control Mode	STAT	R			0 = Test 1 = Local Off 2 = CCN Off 3 = Clock Off 4 = Emergency Stop 5 = Local On 6 = CCN On 7 = Clock On 8 = IDF Off 9 = SPT SATS	AV:8	stat
Control Point	CTRL_PNT	R/W	°F		-20-70	AV:5	ctrl_pnt_1

LEGEND

R — Read
W — Write

Table G — Network Points List (cont)

POINT DESCRIPTION	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Cooling Demand Level		R			0-3	AV:9006	cool_demand_level_1
Cooling Ramp Loading	CRAMP	R/W	°F	1.0	0.2-2.0	AV:56	cramp_1
Cooling Reset Type	MSV Point for i-Vu / BACnet based on CCN point CRST_TYP	R		0	0 = No Reset 1 = 4-20 mA Input 2 = Outdoor Air Temp 3 = Return Temperature 4 = Space Temperature	MSV:7	crst_typ1_msv_1
Cooling Setpoint 1	CSP1	R/W	°F	60.0	-20-70	AV:53	csp1_1
Cooling Setpoint 2	CSP2	R/W	°F	55.0	-20-70	AV:54	csp2_1
Demand Level 1		R/W			0-100	AV:80	dmv_lvl_1_perct
Demand Level 2		R/W			0-100	AV:81	dmv_lvl_2_perct
Demand Level 3		R/W			0-100	AV:82	dmv_lvl_3_perct
Demand Limit Select	MSV Point for i-Vu / BACnet based on CCN point DMD_CTRL	R		0	0 = None 1 = Ext. Sw. Input 2 = 4-20 mA Input 3 = CCN Loadshed	MSV:8	dmd_ctrl_msv_1
Demand Limit Switch 1	DMD_SW1	R			ON_OFF	BV:25	dmd_sw1_1
Demand Limit Switch 2	DMD_SW2	R			ON_OFF	BV:26	dmd_sw2_1
Demand/Sound Limited	MODE_15	R			ON_OFF	BV:41	mode_15_1
Discharge Gas Temp	DIGCMPDT	R	°F		-40-245	AV:7	digcmpdt_1
Discharge Pressure	DP_A	R	psig		0-999	AV:13	dp_a_1
Discharge Pressure	DP_B	R	psig		0-999	AV:23	dp_b_1
Element Communications Alarm		R			0 = Comm Normal 1 = Comm Alarm	BV:58 (BALM)	comm_lost_alm
Element Comm Status		R			0 = No Comm 1 = Normal	BV:2999	element_stat_1
Emergency Stop	EMSTOP	R/W		0	0 = Enable 1 = Emstop	BV:6	emstop_1
Fan 1 Relay	FAN_1	R			ON_OFF	BV:60	fan_1_1
Fan 2 Relay	FAN_2	R			ON_OFF	BV:61	fan_2_1
Fan 3 Relay	FAN_3	R			ON_OFF	BV:62	fan_3_1
Fan 4 Relay	FAN_4	R			ON_OFF	BV:63	fan_4_1
Fan 5 Relay	FAN_5	R			ON_OFF	BV:64	fan_5_1
Fan Delta Active Time	FANDLTTM	R/W	sec		0-999	AV:10	fandlttm_1
Fan Stage Circuit A	FANSTGEA	R	sec		0-999	AV:35	fanstgea_1
Fan Stage Circuit B	FANSTGEB	R	sec		0-999	AV:15	fanstgeb_1
Head Set Point OFF	HSP_OFF	R/W	°F	72	0-150	AV:16	hsp_off_1
Head Set Point ON	HSP_ON	R/W	°F	110	0-150	AV:18	hsp_on_1
Hi Cool On Set Point	DMDHCON	R/W	°F	3	0.5-20	AV:25	dmdhcon_1
High SCT Circuit A	MODE_21	R			ON_OFF	BV:47	mode_21_1
High SCT Circuit B	MODE_22	R			ON_OFF	BV:48	mode_22_1
High Temperature Cooling	MODE_18	R			ON_OFF	BV:44	mode_18_1
Indoor Fan Status-CIRA	IDFA_FS	R			ON_OFF	BV:2	idfa_fs_1
Indoor Fan Status-CIRB	IDFB_FS	R			ON_OFF	BV:3	idfb_fs_1
Lead/Lag Circuit Select	LEAD_TYP	R/W		1	1 = Automatic 2 = Circuit A Leads 3 = Circuit B Leads	AV:43	lead_typ_1
Liquid Line Solenoid A	LLSV_A	R			ON_OFF	BV:8	llsv_a_1
Liquid Line Solenoid B	LLSV_B	R			ON_OFF	BV:9	llsv_b_1
Lo Cool Off Set Point	DMDLCOFF	R/W	°F	0.5	0.5-2	AV:30	dmdlcoff_1
Lo Cool On Set Point	DMDLCON	R/W	°F	1	-1-2	AV:31	dmdlcon_1
Loading Sequence Select	SEQ_TYPE	R/W		1	1-2	AV:77	seq_type_1
Low Sound Mode	MODE_25	R			ON_OFF	BV:51	mode_25_1
Low Temperature Cooling	MODE_17	R			ON_OFF	BV:43	mode_17_1

LEGEND

R — Read
W — Write

Table G — Network Points List (cont)

POINT DESCRIPTION	POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Machine Control Type	MSV Point for i-Vu / BACnet based on CCN point CTRLTYPE	R		4	1 = VAV 2 = Invalid 3 = Tstat Multi 4 = Tstat 2 Stg 5 = SPT Multi 6 = Invalid 7 = PCT Cap 8 = Dual Tsat 9 = VAV Setpoint	MSV:3	ctrltype_msv_1
Machine Operating Hours	HR_MACH	R	hr		0-9999	AV:57	mr_mach_1
Machine Starts	CY_MACH	R			0-9999	AV:58	cy_mach_1
Minimum Comp. On Time	MODE_23	R			ON_OFF	BV:49	mode_23_1
Minimum Load Valve Relay	MLV_RLY	R			ON_OFF	BV:79	mlv_rly_1
Minimum OFF time active	MODE_10	R			ON_OFF	BV:38	mode_10_1
Minutes Left for Start	MIN_LEFT	R	min		00:00-15:00	AV:32	min_left_1
Minutes Off Time	DELAY	R/W	min	0	0-15	AV:42	delay_1
Occupied	OCC	R			YES_NO	BV:2008	occ_status_1
Outside Air Temperature	OAT	R/W	°F		-40-245	AV:1003	oa_temp
Override Modes in Effect	MODE	R			YES_NO	BV:5	mode_1
Percent Available Cap.	CAPA_A	R	%		0-100	AV:12	capa_a_1
Percent Available Cap.	CAPB_A	R	%		0-100	AV:22	capb_a_1
Percent Total Capacity	CAP_T	R	%		0-100	AV:3	cap_t_1
Percent Total Capacity	CAPA_T	R	%		0-100	AV:11	capa_t_1
Percent Total Capacity	CAPB_T	R	%		0-100	AV:21	capb_t_1
Ramp Load Limited	MODE_5	R			ON_OFF	BV:33	mode_5_1
Requested Stage	STAGE	R			0-99	AV:9	stage_1
Return Air Temperature	RETURN_T	R	°F		0-125	AV:1010	ra_temp_1
Saturated Condensing Tmp	SCTA	R	°F		-40-245	AV:40	scta_1
Saturated Condensing Tmp	SCTB	R	°F		-40-245	AV:39	sctb_1
Saturated Suction Temp	SSTA	R	°F		-40-245	AV:17	ssta_1
Saturated Suction Temp	SSTB	R	°F		-40-245	AV:26	sstb_1
SCT Delta for Compressor A1	A1SCTDT	R/W	°F		0-99	AV:41	a1sctdt_1
SCT Delta for Compressor A2	A2SCTDT	R/W	°F		0-99	AV:46	a2sctdt_1
SCT Delta for Compressor B1	B1SCTDT	R/W	°F		0-99	AV:47	b1sctdt_1
SCT Delta for Compressor B2	B2SCTDT	R/W	°F		0-99	AV:48	b2sctdt_1
Slow Change Override	MODE_9	R			ON_OFF	BV:37	mode_9_1
Space T Cool Set Point	SPT_SP	R/W	°F	78.0	0-999	AV:51	spt_sp_1
Space T SP Plus Offset	SPSP_PO	R/W	°F		0-999	AV:76	spsp_po_1
Space Temp Control Mode	SPTMODE	R			0 = Cool Off 1 = Lo Cool 2 = Hi Cool 3 = Cool On	AV:52	sptmode_1
Space Temperature	SPT	R/W	°F		0-999	AV:2007	space_temp
Space Temperature Offset	SPTO	R/W	°F		0-99	AV:55	spto_1
Space Temperature Offset Enable	SPTOSENS	R/W			ENA_DIS	BV:10	sptosens_1
Space Temperature Offset Range	SPTO_RNG	R/W	°F		-20-99	AV:75	spto_rng_1
Space Temperature Sensor	SPTSENS	R			ENA_DIS	BV:11	sptsens_1
Suction Pressure	SP_A	R	psig		0-999	AV:14	sp_a_1
Suction Pressure	SP_B	R	psig		0-999	AV:24	sp_b_1
Suction Superheat Temperature	SH_A	R	°F		-40-245	AV:44	sh_a_1
Suction Superheat Temperature	SH_B	R	°F		-40-245	AV:45	sh_b_1
Supply Air Set Point	SAT_SP	R	°F		0-125	AV:78	sat_sp_1
Supply Air Temperature	SUPPLY_T	R	°F		-40-245	AV:1008	sa_temp_1
System Demand Limiting		R			Inactive_Active	BV:83	dem_lmt_act_1

LEGEND

R — Read
W — Write

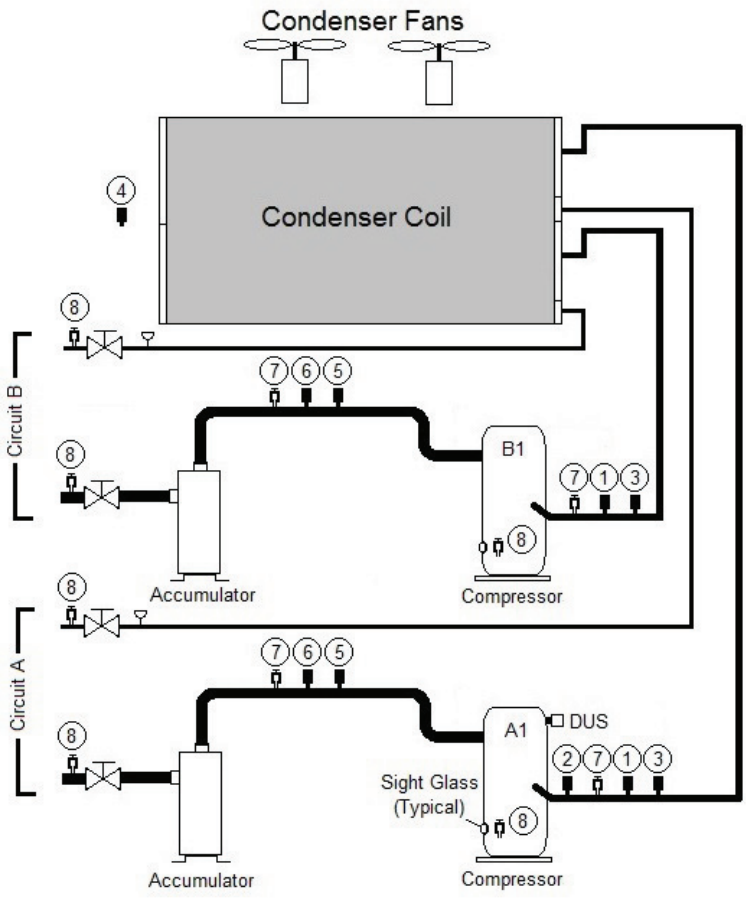
Table G — Network Points List (cont)

POINT DESCRIPTION	POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Temperature Reset	MODE_14	R			ON_OFF	BV:40	mode_14_1
Time Guard Active	MODE_TG	R			ON_OFF	BV:67	mode_tg_1
Timed Override in effect	MODE_6	R			ON_OFF	BV:34	mode_6_1
User Defined Analog 1		R/W				AV:2901	user_analog_1_1
User Defined Analog 2		R/W				AV:2902	user_analog_2_1
User Defined Analog 3		R/W				AV:2903	user_analog_3_1
User Defined Analog 4		R/W				AV:2904	user_analog_4_1
User Defined Analog 5		R/W				AV:2905	user_analog_5_1
User Defined Binary 1		R/W			ON_OFF	BV:2911	user_binary_1_1
User Defined Binary 2		R/W			ON_OFF	BV:2912	user_binary_2_1
User Defined Binary 3		R/W			ON_OFF	BV:2913	user_binary_3_1
User Defined Binary 4		R/W			ON_OFF	BV:2914	user_binary_4_1
User Defined Binary 5		R/W			ON_OFF	BV:2915	user_binary_5_1
Var Head Press Output Circuit A	VHPA_ACT	R	%		0-100	AV:19	vhpa_act_1
Var Head Press Output Circuit B	VHPB_ACT	R	%		0-100	AV:83	vhpb_act_1
Y1 Thermostat Input	Y1	R			ON_OFF	BV:27	y1_1
Y2 Thermostat Input	Y2	R			ON_OFF	BV:28	y2_1
Y3 Thermostat Input	Y3	R			ON_OFF	BV:29	y3_1
Y4 Thermostat Input	Y4	R			ON_OFF	BV:30	y4_1

LEGEND

R — Read
W — Write

APPENDIX D — PIPING AND INSTRUMENTATION DIAGRAMS

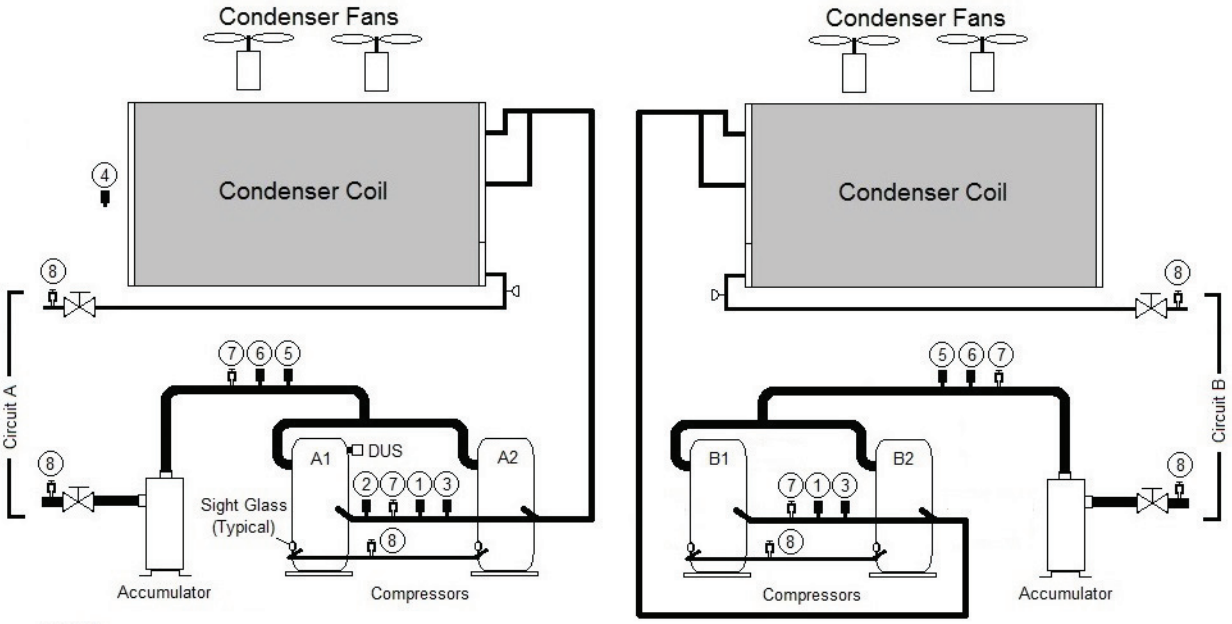


Legend:

1 - Discharge Pressure Transducer
2 - Discharge Temperature Thermistor (Digital Compressor Option Only)
3 - High Pressure Swtich
4 - Outdoor Air Thermistor
5 - Return Gas Thermistor
6 - Suction Pressure Transducer
7 - High Flow Access Fitting
8 - Standard Access Fitting
- Fusible Plug
- Device Connection
- Refrigerant Access Port
- Service Valve
DUS - Digital Unloader Solenoid (Digital Compressor Option Only)

NOTE: Discharge check valve located inside each compressor.

Fig. G — 38APD025-030 Piping and Instrumentation



Legend:

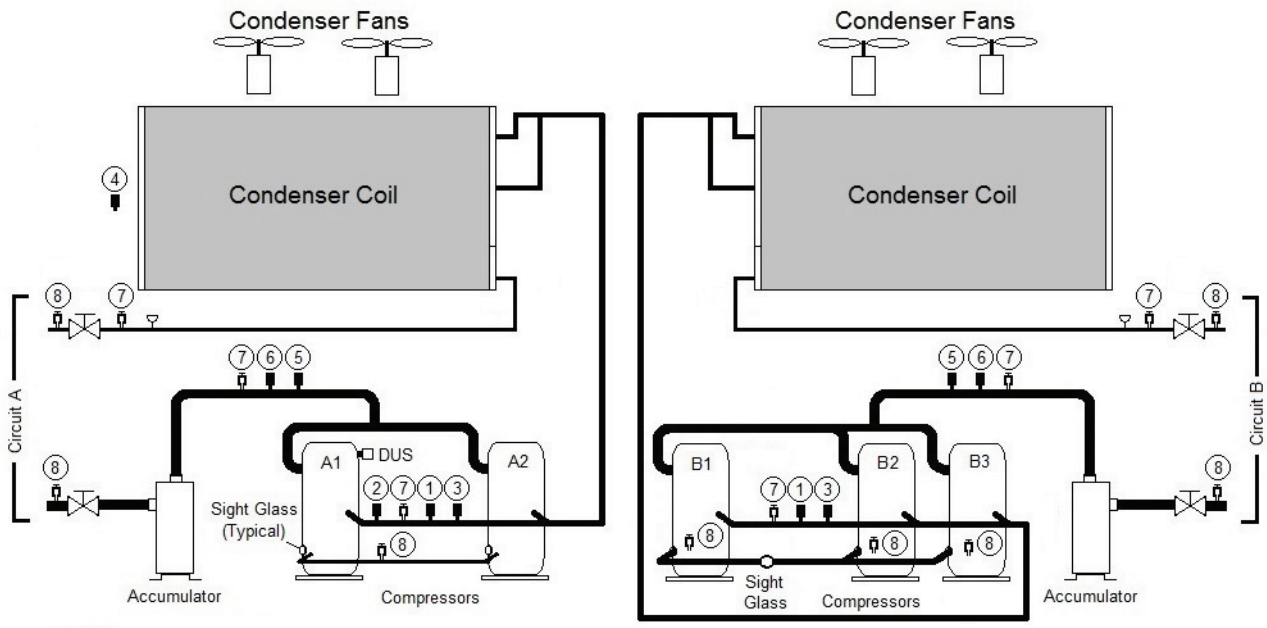
1 - Discharge Pressure Transducer
2 - Discharge Temperature Thermistor
(Digital Compressor Option Only)
3 - High Pressure Swtich
4 - Outdoor Air Thermistor
5 - Return Gas Thermistor
6 - Suction Pressure Transducer
7 - High Flow Access Fitting
8 - Standard Access Fitting

- Fusible Plug
- Device Connection
- Refrigerant Access Port
- Service Valve

DUS - Digital Unloader Solenoid
(Digital Compressor Option Only)

NOTE: Discharge check valve located inside each compressor.

Fig. H — 38APD040-060 Piping and Instrumentation



Legend:

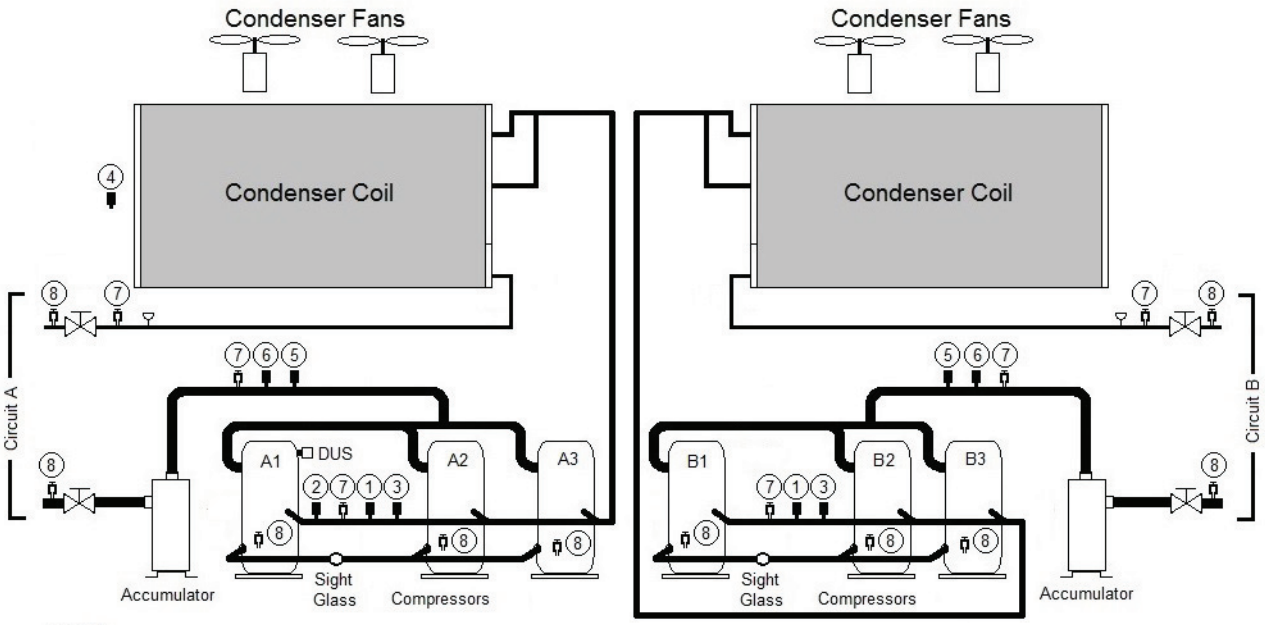
1 - Discharge Pressure Transducer
2 - Discharge Temperature Thermistor (Digital Compressor Option Only)
3 - High Pressure Swtich
4 - Outdoor Air Thermistor
5 - Return Gas Thermistor
6 - Suction Pressure Transducer
7 - High Flow Access Fitting
8 - Standard Access Fitting

- Fusible Plug
- Device Connection
- Refrigerant Access Port
- Service Valve

DUS - Digital Unloader Solenoid (Digital Compressor Option Only)

NOTE: Discharge check valve located inside each compressor.

Fig. I — 38APD070,080 Piping and Instrumentation



Legend:

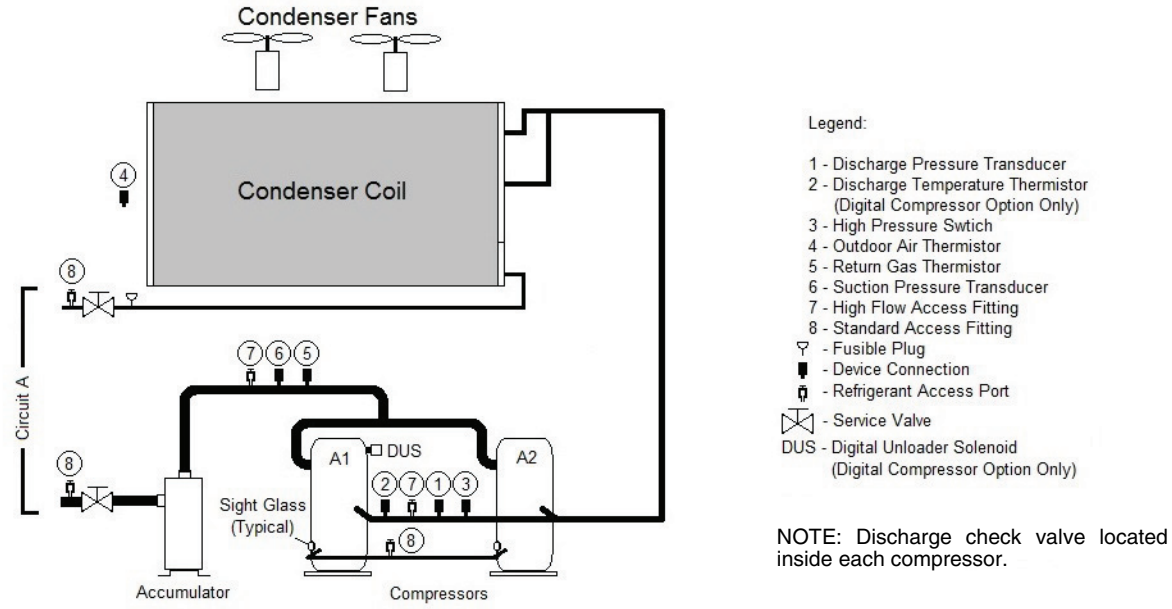
1 - Discharge Pressure Transducer
2 - Discharge Temperature Thermistor (Digital Compressor Option Only)
3 - High Pressure Swtich
4 - Outdoor Air Thermistor
5 - Return Gas Thermistor
6 - Suction Pressure Transducer
7 - High Flow Access Fitting
8 - Standard Access Fitting

- Fusible Plug
- Device Connection
- Refrigerant Access Port
- Service Valve

DUS - Digital Unloader Solenoid (Digital Compressor Option Only)

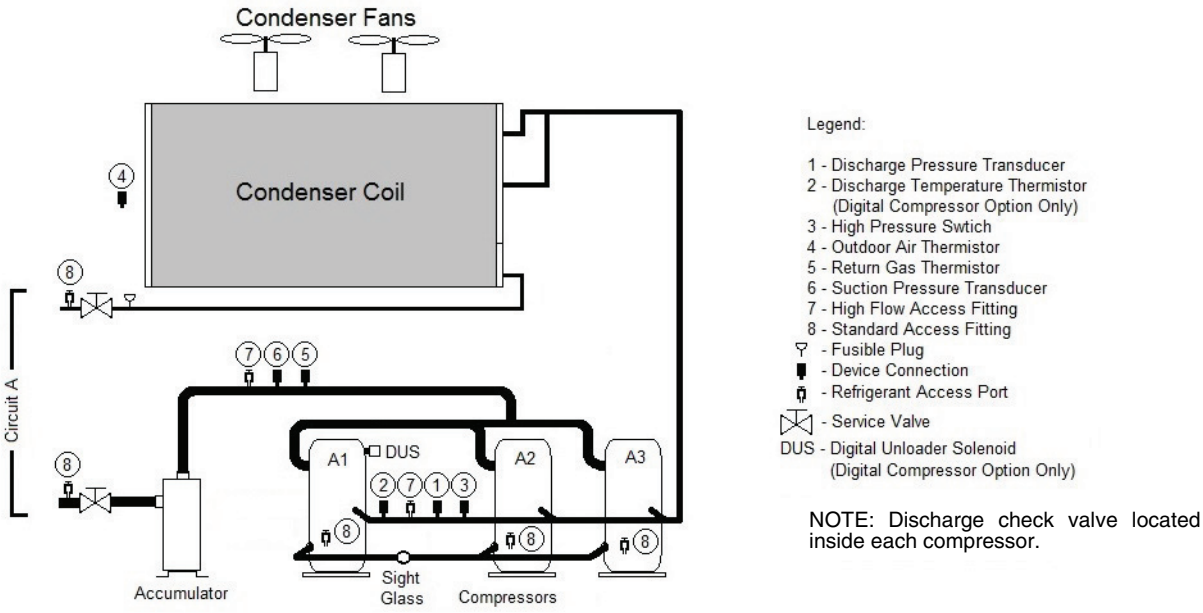
NOTE: Discharge check valve located inside each compressor.

Fig. J — 38APD090-130 Piping and Instrumentation



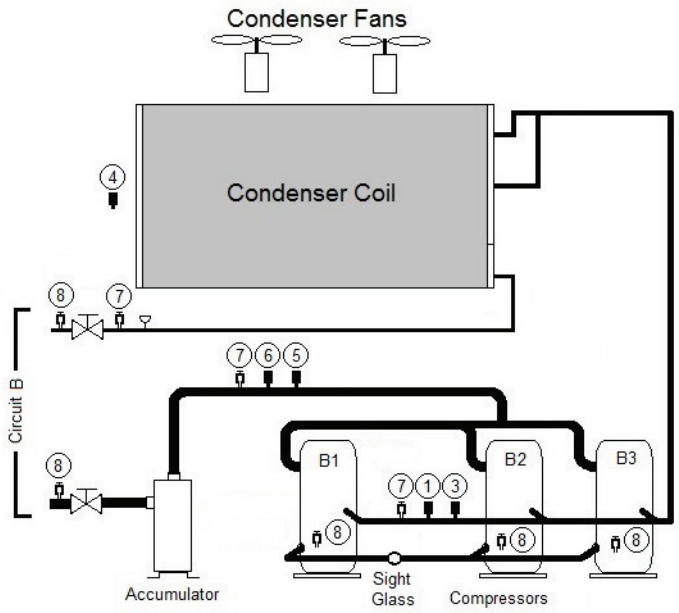
NOTE: Discharge check valve located inside each compressor.

Fig. K — 38APS025-030 Piping and Instrumentation



NOTE: Discharge check valve located inside each compressor.

Fig. L — 38APS040-050 Piping and Instrumentation



Legend:

1 - Discharge Pressure Transducer
3 - High Pressure Swtich
4 - Outdoor Air Thermistor
5 - Return Gas Thermistor
6 - Suction Pressure Transducer
7 - High Flow Access Fitting
8 - Standard Access Fitting
- Fusible Plug
- Device Connection
- Refrigerant Access Port
- Service Valve

NOTE: Discharge check valve located inside each compressor.

Fig. M — 38APS065 Piping and Instrumentation

APPENDIX E — CONTROL METHODS WITH INPUTS FOR CONTROL MODE COMPARISON

CTRL	DESCRIPTION	ENABLE-OFF-REMOTE SWITCH	OCCUPANCY SCHEDULE	CHIL_S_S VALUE	EMSTOP VALUE	INDOOR FAN STATUS SWITCH	SPT SATISFIED (C.TYP=3 OR 5)	ALARM	STAT
0	Switch Control	Enable	N/A	N/A	Enable	Closed	No	No	5 (ON LOCAL)
					Enable	Closed	Yes	No	9 (SPT SATISFIED)
					Enable	Open	Yes/No	No	8 (IDFS NOT ON)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Off	N/A	N/A	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Remote-Open	N/A	N/A	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Remote-Closed	N/A	N/A	Enable	Closed	No	No	5 (ON LOCAL)
					Enable	Closed	Yes	No	9 (SPT SATISFIED)
					Enable	Open	Yes/No	No	8 (IDFS NOT ON)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
2	Occupancy	Enable	Occupied	N/A	Enable	Closed	No	No	7 (ON TIME)
					Enable	Closed	Yes	No	9 (SPT SATISFIED)
					Enable	Open	Yes/No	No	8 (IDFS NOT ON)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
			Unoccupied	N/A	Enable	Closed/Open	Yes/No	No	3 (OFF TIME)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Off	Occupied	N/A	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
			Unoccupied	N/A	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Remote - Open	Occupied	N/A	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
			Unoccupied	N/A	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Remote-Closed	Occupied	N/A	Enable	Closed	No	No	7 (ON TIME)
					Enable	Closed	Yes	No	9 (SPT SATISFIED)
					Enable	Open	Yes/No	No	8 (IDFS NOT ON)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
			Unoccupied	N/A	Enable	Closed/Open	Yes/No	No	3 (OFF TIME)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)

APPENDIX E — CONTROL METHODS WITH INPUTS FOR CONTROL MODE COMPARISON (cont)

CTRL	DESCRIPTION	ENABLE-OFF-REMOTE SWITCH	OCCUPANCY SCHEDULE	CHIL_S_S VALUE	EMSTOP VALUE	INDOOR FAN STATUS SWITCH	SPT SATISFIED (C.TYP=3 OR 5)	ALARM	STAT
3	CCN	Enable	N/A	Start	Enable	Closed	No	No	6 (ON CCN)
					Enable	Closed	Yes	No	9 (SPT SATISFIED)
					Enable	Open	Yes/No	No	8 (IDFS NOT ON)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
			N/A	Stop	Enable	Closed/Open	Yes/No	No	2 (OFF CCN)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Off	N/A	Start/Stop	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Remote-Open	N/A	Start/Stop	Enable	Closed/Open	Yes/No	No	1 (OFF LOCAL)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
		Remote-Closed	N/A	Start	Enable	Closed	No	No	6 (ON CCN)
					Enable	Closed	Yes	No	9 (SPT SATISFIED)
					Enable	Open	Yes/No	No	8 (IDFS NOT ON)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)
			N/A	Stop	Enable	Closed/Open	Yes/No	No	2 (OFF CCN)
					Enable	Closed/Open	Yes/No	Yes	4 (OFF EMRGCY)
					EMSTOP	Closed/Open	Yes/No	Yes/No	4 (OFF EMRGCY)

INDEX

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

I. Project Information

JOB NAME _____

ADDRESS _____

CITY _____ PROVINCE/STATE _____ ZIP_____

INSTALLING CONTRACTOR _____

SALES OFFICE _____

START-UP PERFORMED BY _____

DESIGN INFORMATION

SYSTEM INFORMATION

CAPACITY	OUTDOOR AIR TEMPERATURE	SUPPLY AIR TEMPERATURE	RETURN AIR TEMPERATURE	EVAPORATOR COIL SIZE (SQ FT)

ROWS	FINS PER INCH	COIL CIRCUITING	ROW/FACE SPLIT	CFM

CONTROL INFORMATION

CONSTANT VOLUME OR VARIABLE AIR VOLUME	CONTROL TYPE (1-9) (*CONFIGURATION→OPT2→C.TYP*)

PIPING INFORMATION (Be sure to include units of measure)

SUCTION LINE DIAMETER	LIQUID LINE DIAMETER	TOTAL INTERCONNECTING PIPIE LENGTH	CONDENSER EQUAL, ABOVE, OR BELOW EVAPORATOR	DOUBLE SUCTION RISER USED? (Y/N)

RISER A DIAMETER	RISER B DIAMETER	REDUCED RISER USED? (Y/N)	REDUCED RISER DIAMETER	REDUCED RISER LENGTH

CONDENSING UNIT:

MARK FOR: _____

UNIT MODEL _____

SERIAL _____

AIR-HANDLING UNIT(S):

MARK FOR: _____ _____

MANUFACTURER_____ _____

UNIT MODEL_____ _____

SERIAL _____ _____

II. PRELIMINARY EQUIPMENT CHECK

A. CONDENSING UNIT

1. IS THERE ANY PHYSICAL DAMAGE?		☐ YES	☐ NO
DESCRIPTION _____			
_____			
WILL THIS DAMAGE PREVENT START-UP?		☐ YES	☐ NO
2. UNIT IS INSTALLED LEVEL AS PER THE INSTALLATION INSTRUCTIONS.		☐ YES	☐ NO
3. POWER SUPPLY AGREES WITH THE UNIT NAMEPLATE.		☐ YES	☐ NO
4. ELECTRICAL POWER WIRING IS SIZED AND INSTALLED PROPERLY.		☐ YES	☐ NO
5. UNIT IS PROPERLY GROUNDED.		☐ YES	☐ NO
6. ELECTRICAL CIRCUIT PROTECTION HAS BEEN SIZED AND INSTALLED PROPERLY.		☐ YES	☐ NO
7. ALL TERMINALS ARE TIGHT.		☐ YES	☐ NO
8. ALL PLUG ASSEMBLIES ARE TIGHT.		☐ YES	☐ NO
9. ALL CABLES AND THERMISTORS HAVE BEEN INSPECTED FOR CROSSED WIRES.		☐ YES	☐ NO
10. RETURN GAS THERMISTOR(S) IS/ARE FULLY INSERTED INTO WELLS.		☐ YES	☐ NO
11. MOTORMASTER(S) IS/ARE CONNECTED TO PROPER FANS, IF EQUIPPED.	☐ N/A	☐ YES	☐ NO
ARE WIND BAFFLES INSTALLED?		☐ YES	☐ NO
12. RETURN AND SUPPLY AIR THERMISTORS (RAT AND SAT) OR COMMUNICATION PROVISIONS MADE FOR CONTROL TYPES (***CONFIGURATION→OPT2→C.TYP***) 1, 3, 5 OR 9.	☐ N/A	☐ YES	☐ NO
13. SPACE TEMPERATURE SENSOR (SPT) OR COMMUNICATION PROVISIONS MADE FOR CONTROL TYPE (***CONFIGURATION→OPT2→C.TYP***) 5.	☐ N/A	☐ YES	☐ NO
14. LONG LINE OPTION KIT (LONG LINE CHECK VALVE) REQUIRED.		☐ YES	☐ NO
15. LONG LINE OPTION KIT (LONG LINE CHECK VALVE) INSTALLED PROPERLY, AT THE CONDENSING UNIT AND WITH FLOW IN THE CORRECT DIRECTION.	☐ N/A	☐ YES	☐ NO
16. ALL SERVICE VALVES OPEN.		☐ YES	☐ NO
17. ALL PIPING IS PROPERLY CONNECTED.		☐ YES	☐ NO
18. CRANKCASE HEATERS ARE TIGHT.		☐ YES	☐ NO
19. CRANKCASE HEATERS ARE OPERATIONAL AND HAVE BEEN ENERGIZED FOR 24 HOURS TO REMOVE ANY LIQUID REFRIGERANT FROM THE COMPRESSOR.		☐ YES	☐ NO

B. AIR-HANDLING UNIT

1. ALL SERVICE VALVES OPEN. ☐ YES ☐ NO
2. ALL PIPING IS PROPERLY CONNECTED. ☐ YES ☐ NO
3. ONLY BLEED PORT TXVS ARE INSTALLED. ☐ YES ☐ NO

CIRCUIT A			CIRCUIT B		
TXV	MFR	PART NUMBER	TXV	MFR	PART NUMBER

4. TXVS ARE PROPERLY INSTALLED, EQUALIZER LINES PROPERLY LOCATED, BULBS PROPERLY LOCATED AND INSULATED. ☐ YES ☐ NO
5. LIQUID LINE SOLENOID VALVE(S) ARE NEAR THE EVAPORATOR AND INSTALLED WITH PROPER FLOW DIRECTION, IF REQUIRED. ☐ N/A ☐ YES ☐ NO
6. LIQUID LINE SOLENOID VALVE MANUAL LIFT STEMS DISENGAGED, IF EQUIPPED. ☐ N/A ☐ YES ☐ NO
7. FILTER DRIERS AND SIGHT GLASSES ARE INSTALLED NEAR THE TXV(S). ☐ YES ☐ NO
8. EVAPORATOR FANS ARE TURNING IN THE PROPER DIRECTION. ☐ YES ☐ NO
9. THE FAN AND MOTOR PULLEYS OF THE INDOOR FAN HAVE BEEN CHECKED FOR PROPER ALIGNMENT. ☐ YES ☐ NO
10. FAN BELTS HAVE THE PROPER TENSION. ☐ YES ☐ NO
11. EVAPORATOR FAN STATUS SWITCH(ES) INSTALLED. ☐ YES ☐ NO
12. EVAPORATOR FAN STATUS SWITCH(ES) OPERATIONAL. ☐ N/A ☐ YES ☐ NO
13. WATER HAS BEEN PLACED IN THE DRAIN PAN TO CONFIRM PROPER DRAINAGE. ☐ YES ☐ NO
14. AIR FILTERS HAVE BEEN INSTALLED. ☐ YES ☐ NO
15. VERIFY PROPER EVAPORATOR CFM. ☐ YES ☐ NO

C. REFRIGERATION CIRCUIT

1. ALL SERVICE VALVES OPEN. ☐ YES ☐ NO
2. ALL PIPING HAS BEEN CHECKED FOR LEAKS WITH A LEAK DETECTOR. ☐ YES ☐ NO
3. LOCATE, REPAIR, AND REPORT ANY LEAKS. _____

_____

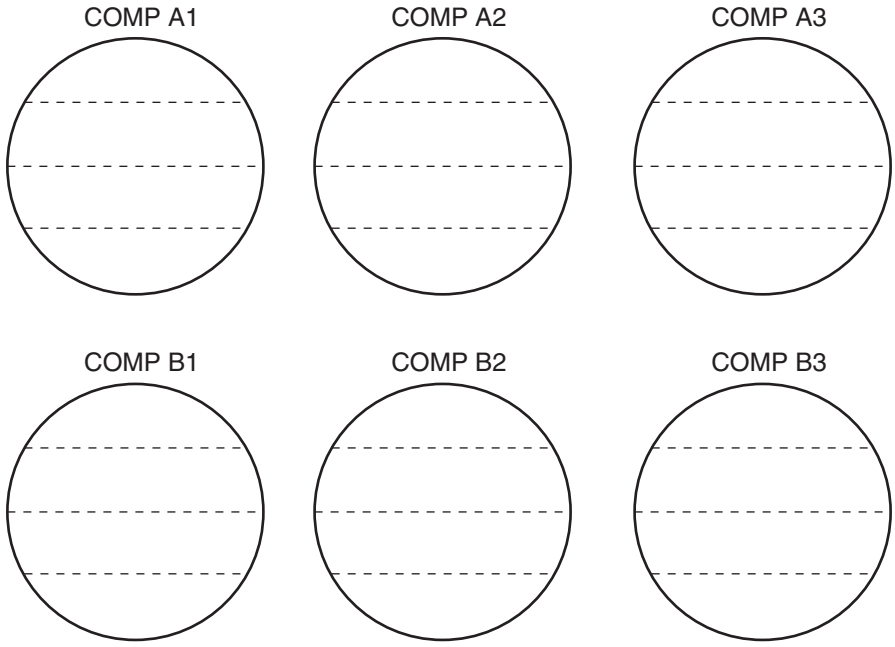
4. THE SYSTEM HAS BEEN CHARGED WITH THE APPROPRIATE INITIAL REFRIGERANT CHARGE. ☐ YES ☐ NO

CIRCUIT A PRELIMINARY REFRIGERANT CHARGE CALCULATION		CIRCUIT B PRELIMINARY REFRIGERANT CHARGE CALCULATION	
BASE UNIT, WITH 25 ft (7.6 m) INTERCONNECTING PIPING		BASE UNIT, WITH 25 ft (7.6 m) INTERCONNECTING PIPING	
EVAPORATOR COIL		EVAPORATOR COIL	
ADDITIONAL PIPING CHARGE, MORE THAN 25 ft (7.6 m) INTERCONNECTING PIPING		ADDITIONAL PIPING CHARGE, MORE THAN 25 ft (7.6 m) INTERCONNECTING PIPING	
TOTAL PRELIMINARY CHARGE	☐ lb ☐ kg	TOTAL PRELIMINARY CHARGE	☐ lb ☐ kg

C. REFRIGERATION CIRCUIT (cont)

5. ADDITIONAL OIL ADDED TO THE CIRCUITS, IF REQUIRED. ☐ N/A ☐ YES ☐ NO
   CIRCUIT A _____ ☐ oz ☐ ml
   CIRCUIT B _____ ☐ oz ☐ ml
6. OIL IS VISIBLE IN THE COMPRESSOR SIGHTGLASSES, AT LEAST $^{1}/_{8}$ TO $^{3}/_{8}$ FULL, AFTER CRANKCASE HAS BEEN ENERGIZED FOR A MINIMUM OF 24 HOURS ☐ YES ☐ NO

7. RECORD OIL LEVELS BELOW. COMPRESSORS MUST BE OFF.



PROJECT INFORMATION AND PRELIMINARY EQUIPMENT CHECK PERFORMED BY:

_____

COMPANY _____

ADDRESS _____

CITY, STATE/PROVINCE:

_____ DATE _____

III. SYSTEM START-UP (to be completed by the start-up technician)

A. PRE-START CHECK

1. ALL SERVICE VALVES OPEN. ☐ YES ☐ NO
2. COMPRESSOR OIL LEVEL IS CORRECT. ☐ YES ☐ NO
3. VERIFY COMPRESSOR MOUNTING BOLT TORQUE IS 10 TO 14 ft-lbs (13.5 TO 18.9 N-m) ☐ YES ☐ NO
4. LOCATE, REPAIR, AND REPORT ANY LEAKS. _____

_____

5. SUPPLY VOLTAGE IS WITHIN UNIT NAMEPLATE RANGE. ☐ YES ☐ NO
6. CONTROL TRANSFORMER(S) PRIMARY CONNECTION SET FOR PROPER VOLTAGE. ☐ YES ☐ NO
7. CONTROL TRANSFORMER (TRAN1) SECONDARY VOLTAGE _____ vac

   CONTROL TRANSFORMER (TRAN2) SECONDARY VOLTAGE _____ vac
8. CHECK VOLTAGE PHASE IMBALANCE:

   AB: _____ V AC: _____ V BC: _____ V

   AVERAGE VOLTAGE (AB + AC + BC)/3: _____ V

   MAXIMUM DEVIATION FROM AVERAGE VOLTAGE: _____ V

   VOLTAGE IMBALANCE: MAXIMUM DEVIATION/AVERAGE VOLTAGE x 100 _____ %
9. VOLTAGE IMBALANCE LESS THAN 2%. ☐ YES ☐ NO

   DO NOT START UNIT IF VOLTAGE IMBALANCE IS GREATER THAN 2%. CONTACT LOCAL UTILITY FOR ASSISTANCE.
10. EVAPORATOR FAN SWITCH(ES) OPERATIONAL, IF INSTALLED. ☐ N/A ☐ YES ☐ NO
11. PROPER CONDENSER FAN ROTATION CONFIRMED. ☐ YES ☐ NO
12. PROPER EVAPORATOR FAN ROTATION CONFIRMED. ☐ YES ☐ NO
13. RECORD SOFTWARE VERSION INFORMATION. PRESS [ENTER] AND [ESCAPE] TO OBTAIN SOFTWARE VERSIONS. ☐ YES ☐ NO

	SOFTWARE VERSION NUMBERS			
Run Status→VERS	MBB	CESR131466—	_____ —	_____
	AUX	CESR131333—	_____ —	_____
	CXB	CESR131173—	_____ —	_____
	EMM	CESR131174—	_____ —	_____
	MARQ	CESR131171—	_____ —	_____
	NAVI	CESR130227—	_____ —	_____

14. TIME AND DATE SET PROPERLY. ☐ YES ☐ NO

B. START AND OPERATE THE SYSTEM. Complete the following:

1. COMPLETE COMPONENT TEST. ☐ YES ☐ NO
2. CHECK REFRIGERANT AND OIL CHARGE. ☐ YES ☐ NO
3. TRIM REFRIGERANT PER CHARGING CHART. ☐ YES ☐ NO

CIRCUIT A FINAL REFRIGERANT CHARGE		CIRCUIT B FINAL REFRIGERANT CHARGE	
PRELIMINARY CHARGE		PRELIMINARY CHARGE	
TRIM CHARGE		TRIM CHARGE	
TOTAL CHARGE	☐ lb ☐ kg	TOTAL CHARGE	☐ lb ☐ kg

4. RECORD COMPRESSOR CURRENT AT FULL LOAD.

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

5. RECORD CONDENSER FAN MOTOR CURRENT.

CONDENSER FAN MOTOR	L1	L2	L3
FAN MOTOR 1			
FAN MOTOR 2			
FAN MOTOR 3			
FAN MOTOR 4			
FAN MOTOR 5			
FAN MOTOR 6			
FAN MOTOR 7			
FAN MOTOR 8			

B. START AND OPERATE THE SYSTEM (cont):

6. RECORD CONFIGURATION MODE SETTINGS.

SUBMODE	ITEM	ITEM DESCRIPTION	VALUE
DISP	DISPLAY CONFIGURATION		
	TEST	Test Display LEDs	
	METR	Metric Display	
	LANG	Language Selection	
	PAS.E	Password Enable	
	PASS	Service Password	
UNIT	UNIT CONFIGURATION		
	SIZE	Unit Size	
	NCKT	Number of Refrig Ckts	
	SZ.A1	Compressor A1 Size	
	SZ.A2	Compressor A2 Size	
	SZ.A3	Compressor A3 Size	
	SZ.B1	Compressor B1 Size	
	SZ.B2	Compressor B2 Size	
	SZ.B3	Compressor B3 Size	
	FAN.S	Fan Sequence Number	
	A1.TY	Compressor A1 Digital?	
	MAX.T	Maximum A1 Unload Time	
CCN	CCN NETWORK CONFIGS		
	CCNA	CCN Address	
	CCNB	CCN Bus Number	
	BAUD	CCN Baud Rate	

6. RECORD CONFIGURATION MODE SETTINGS (cont)

SUBMODE	ITEM	ITEM DESCRIPTION	VALUE
OPT1	UNIT OPTIONS 1 HARDWARE		
	MLV.S	Minimum Load Valve Select	
	CSB.E	CSB Boards Enable	
	SPT.S	Space Temp Sensor	
	SP.O.S	Space Temp Offset Enable	
	SP.O.R	Space Temp Offset Range	
	RAT.T	RAT Thermistor Type	
	SAT.T	SAT Thermistor Type	
	EMM	EMM Module Installed	
OPT2	UNIT OPTIONS 2 CONTROLS		
	C.TYP	Machine Control Type	
	CTRL	Control Method	
	LOAD	Loading Sequence Select	
	LLCS	Lead/Lag Circuit Select	
	DELY	Minutes Off Time	
M.MST	MOTORMASTER		
	MMR.S	Motormaster Select	
	P.GAN	Head Pressure P Gain	
	I.GAN	Head Pressure I Gain	
	D.GAN	Head Pressure D Gain	
	MIN.S	Minimum Fan Speed	

6. RECORD CONFIGURATION MODE SETTINGS (cont)

SUBMODE	ITEM	ITEM DESCRIPTION	VALUE
RSET	RESET COOL TEMP		
	CRST	Cooling Reset Type	
	MA.DG	4-20 — Degrees Reset	
	RM.NO	Remote - No Reset Temp	
	RM.F	Remote - Full Reset Temp	
	RM.DG	Remote - Degrees Reset	
	RT.NO	Return - No Reset Temp	
	RT.F	Return - Full reset Temp	
	RT.DG	Return - Degrees Reset	
	DMDC	Demand Limit Select	
	DM20	Demand Limit at 20 mA	
	SHNM	Loadshed Group Number	
	SHDL	Loadshed Demand Delta	
	SHTM	Maximum Loadshed Time	
	DLS1	Demand Limit Switch 1	
	DLS2	Demand Limit Switch 2	
SLCT	SETPOINT AND RAMP LOAD		
	RL.S	Ramp Load Select	
	CRMP	Cooling Ramp Loading	
	SCHD	Schedule Number	
	Z.GN	Deadband Multiplier	

6. RECORD CONFIGURATION MODE SETTINGS (cont)

SUBMODE	ITEM	ITEM DESCRIPTION	VALUE
SERV	SERVICE CONFIGURATION		
	EN.A1	Enable Compressor A1	
	EN.A2	Enable Compressor A2	
	EN.A3	Enable Compressor A3	
	EN.B1	Enable Compressor B1	
	EN.B2	Enable Compressor B2	
	EN.B3	Enable Compressor B3	
	REV.R	Reverse Rotation Enable	
	TCOM	Two Comp Ckt Oil Mgmt	
BCST	BROADCAST CONFIGURATION		
	T.D.BC	CCN Time/Date Broadcast	
	OAT.B	CCN OAT Broadcast	
	G.S.BC	Global Schedule Broadcst	
	BC.AK	CCN Broadcast Ack'er	

7. RECORD SETPOINTS MODE SETTINGS

SUBMODE	ITEM	ITEM DESCRIPTION	VALUE
COOL	COOLING SET POINTS		
	CSP.1	Cooling Setpoint 1	
	CSP.2	Cooling Setpoint 2	
	SPS.P	Space T Cool Setpoint	
	SPT.O	Space Temperature Offset	
	ST.P.O	Space T SP Plus Offset	
	P.CAP	Percent Cap. Requested	
	L.C.ON	Lo Cool On Setpoint	
	H.C.ON	Hi Cool On Setpoint	
	L.C.OF	Lo Cool Off Setpoint	
	OAT.L	OAT Lockout Temperature	
HEAD	HEAD PRESSURE SET POINTS		
	H.SP	Head Setpoint On	
	H.SP.F	Head Setpoint Off	
	F.ON	Fan On Set Point	
	F.OFF	Fan Off Set Point	
	F.DLT	Fan Stage Delta	
	F.TME	Fan Delta Active Time	

8. RECORD OPERATING TEMPERATURES AND PRESSURES WHEN STABLE OPERATION HAS BEEN CONFIRMED.

UNIT DATA	
CONTROL POINT (***Run Status→VIEW→CTPT***)	
TOTAL CAPACITY (***Run Status→VIEW→CAP***)	
RETURN AIR TEMPERATURE (***Temperature→UNIT→RAT***)*	
SUPPLY AIR TEMPERATURE (***Temperature→UNIT→SAT***)*	
OUTSIDE AIR TEMPERATURE (***Temperature→UNIT→OAT***)	
SPACE TEMPERATURE (***Temperature→UNIT→SPT***)	
CIRCUIT A DATA	
SATURATED CONDENSING TEMP (***Temperature→CIR.A→SCT.A***)	
SATURATED SUCTION TEMP (***Temperature→CIR.A→SST.A***)	
RETURN GAS TEMPERATURE (***Temperature→CIR.A→RGT.A***)	
DISCHARGE GAS TEMPERATURE (***Temperature→CIR.A→D.GAS***)*	
SUCTION SUPERHEAT TEMP (***Temperature→CIR.A→SH.A***)	
DISCHARGE PRESSURE (***Pressure→PRC.A→DP.A***)	
SUCTION PRESSURE (***Pressure→PRC.A→SP.A***)	
LIQUID LINE TEMPERATURE AT SERVICE VALVE*	
LIQUID LINE PRESSURE AT SERVICE VALVE	
CIRCUIT B DATA	
SATURATED CONDENSING TEMP (***Temperature→CIR.B→SCT.B***)	
SATURATED SUCTION TEMP (***Temperature→CIR.B→SST.B***)	
RETURN GAS TEMPERATURE (***Temperature→CIR.B→RGT.B***)	
DISCHARGE GAS TEMPERATURE*	
SUCTION SUPERHEAT TEMP (***Temperature→CIR.B→SH.B***)	
DISCHARGE PRESSURE (***Pressure→PRC.B→DP.B***)	
SUCTION PRESSURE (***Pressure→PRC.B→SP.B***)	
LIQUID LINE TEMPERATURE AT SERVICE VALVE*	
LIQUID LINE PRESSURE AT SERVICE VALVE	
READINGS IN: ☐ °F ☐ °C ☐ psi ☐ kPa	

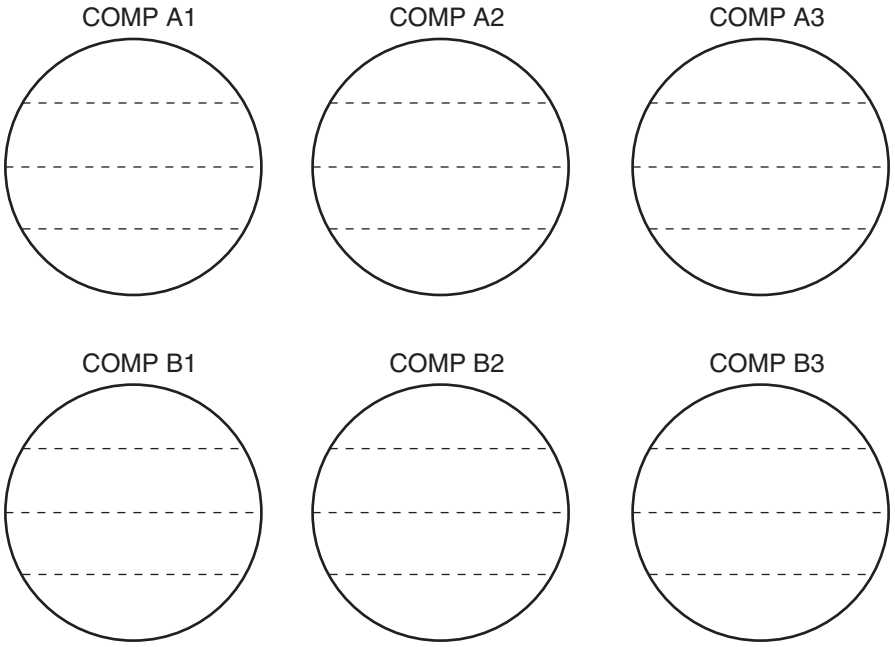
* Taken with a digital thermometer if sensors are unavailable.

9. PROVIDE OPERATING INSTRUCTIONS TO OWNER'S PERSONNEL. ☐ YES ☐ NO

INSTRUCTION TIME _____ HOURS

10. AFTER 20 MINUTES OF OPERATION, OIL LEVEL IS CORRECT IN SIGHTGLASS. ☐ YES ☐ NO

11. RECORD OIL LEVELS BELOW. COMPRESSORS MUST BE OFF.



COMMENTS:

SIGNATURES:

START-UP TECHNICIAN:

COMPANY _____

DATE _____

CUSTOMER REPRESENTATIVE:

COMPANY _____

ADDRESS _____

CITY, STATE/PROVINCE:

DATE _____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE